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RESEARCH ARTICLE

URBAN ENVIRONMENT AS A SYSTEM OF IMPRESSIONS AND IMAGES: ANALYSIS OF COMFORT THROUGH THE CITY'S APPEARANCE USING THE EXAMPLE OF ALMATY

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Abstract. *This study examines Almaty's urban environment as a system of impressions and images, using a comparative analysis of three streets: Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street. The research is motivated by the need to clarify how different types of urban streets shape the city's architectural image, cultural identity, and visual perception. The study is based on a comparative urban analysis that combines morphological interpretation, visual-spatial analysis, field observations, photographic documentation, and an assessment of the historical, functional, environmental, and symbolic characteristics of the selected streets. A unified analytical framework was applied to evaluate historical-cultural significance, compositional integrity, functional diversity, pedestrian accessibility, greenery and environmental comfort, safety, symbolic expressiveness, and each street's contribution to Almaty's image. The results demonstrate that the three streets play different roles in the city's structure. Dostyk Avenue functions as the most compositionally coherent and culturally saturated urban axis; Raiymbek Batyr Avenue acts primarily as a transport corridor that retains important markers of historical memory but has weaker environmental cohesion; Navoi Street reveals considerable landscape and public-space potential, although its spatial structure remains fragmented and insufficiently integrated. The study shows that the image of Almaty is formed not by a uniform urban fabric but by the interaction of streets with different morphological, functional, and symbolic qualities. The findings may be used in urban planning and architectural practice to preserve urban identity, improve pedestrian and public spaces, and strengthen the visual and compositional coherence of the urban environment.*

Keywords: *urban environment, city image, urban morphology, street perception, cultural identity, public space, Almaty.*

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ҒЫЛЫМИ МАҚАЛА

ҚАЛАЛЫҚ ОРТА ӘСЕРЛЕР МЕН БЕЙНЕЛЕР ЖҮЙЕСІ РЕТІНДЕ: АЛМАТЫ ҚАЛАСЫ МЫСАЛЫНДА ҚАЛАНЫҢ КЕЛБЕТІ АРҚЫЛЫ ЖАЙЛЫЛЫҚТЫ ТАЛДАУ

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Аңдатпа. *Бұл зерттеу Алматы қаласының қалалық ортасын әсерлер мен бейнелер жүйесі ретінде қарастырады және үш көшені – Достық даңғылы, Райымбек батыр даңғылы және Науаи көшесін – салыстырмалы талдау арқылы зерттейді. Зерттеу әртүрлі типтегі қалалық көшелердің қаланың сәулеттік бейнесін, мәдени бірегейлігін және визуалдық қабылдануын қалыптастыруға қалай қатысатынын нақтылау қажеттілігімен негізделген. Зерттеу морфологиялық түсіндіруді, кеңістіктік-көрнекі талдауды, далалық бақылауды, фотодокументацияны, сондай-ақ таңдалған көше бөліктерінің тарихи, функционалдық, экологиялық және символдық сипаттамаларын бағалауды біріктіретін салыстырмалы қалатану талдауына негізделген. Бірыңғай талдау жүйесі тарихи-мәдени маңыздылықты, композициялық тұтастықты, функционалдық әртүрлілікті, жаяу жүргіншілерге қолжетімділікті, көгалдандыру мен экологиялық жайлылықты, қауіпсіздікті, символдық мәнерлілікті және әрбір көшенің Алматы қаласының бейнесіне қосатын үлесін бағалау үшін қолданылды. Нәтижелер үш көшенің қалалық құрылымдағы әртүрлі рөлдерді атқаратынын көрсетеді. Достық даңғылы композициялық тұрғыдан ең тұтас және мәдени тұрғыдан қанықкан қалалық ось ретінде қызмет етеді; Райымбек батыр даңғылы негізінен көлік дәлізі ретінде әрекет етеді, маңызды тарихи жад белгілерін сақтай отырып, бірақ экологиялық тұтастығы әлсіз; Науаи көшесі ландшафттық және қоғамдық кеңістік әлеуетінің айтарлықтай екенін көрсетеді, дегенмен оның кеңістіктік құрылымы фрагменттелген және жеткілікті түрде біріктірілмеген. Зерттеу Алматы қаласының бейнесі біртекті қалалық құрылым арқылы емес, морфологиялық, функционалдық және символдық қасиеттері әртүрлі көшелердің өзара әрекеттесуі арқылы қалыптасатынын көрсетеді. Зерттеу нәтижелері қалалық бірегейлікті сақтау, жаяу жүргіншілер және қоғамдық кеңістіктерді жақсарту, сондай-ақ қалалық ортаның визуалдық және композициялық тұтастығын күшейтуге бағытталған қала құрылысы мен сәулет тәжірибесінде қолданылуы мүмкін.*

Түйін сөздер: *қалалық орта, қала бейнесі, қалалық морфология, көше қабылдауы, мәдени бірегейлік, қоғамдық кеңістік, Алматы.*

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НАУЧНАЯ СТАТЬЯ

ГОРОДСКАЯ СРЕДА КАК СИСТЕМА ВПЕЧАТЛЕНИЙ И ОБРАЗОВ: АНАЛИЗ КОМФОРТНОСТИ ЧЕРЕЗ ВНЕШНИЙ ОБЛИК ГОРОДА НА ПРИМЕРЕ АЛМАТЫ

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Аннотация. *Данное исследование рассматривает городскую среду Алматы как систему образов через сравнительный анализ трех улиц: проспекта Достык, проспекта Райымбек Батыра и улицы Навои. Исследование обусловлено необходимостью уточнить, каким образом различные типы городских улиц участвуют в формировании архитектурного облика, культурной идентичности и визуального восприятия города. Исследование основано на сравнительном градостроительном анализе, который объединяет морфологическую интерпретацию, визуально-пространственный анализ, полевые наблюдения, фотодокументацию, а также оценку исторических, функциональных, экологических и символических характеристик выбранных участков улиц. Единая аналитическая система была применена для оценки историко-культурной значимости, композиционной целостности, функционального разнообразия, пешеходной доступности, озеленения и экологического комфорта, безопасности, символической выразительности и вклада каждой улицы в образ Алматы. Результаты показывают, что три улицы выполняют различные роли в структуре города. Проспект Достык функционирует как наиболее композиционно целостная и культурно насыщенная городская ось; проспект Райымбек батыра выступает преимущественно как транспортный коридор, сохраняя важные маркеры исторической памяти, но обладая более слабой экологической связностью; улица Навои демонстрирует значительный ландшафтный и общественно-пространственный потенциал, хотя ее пространственная структура остается фрагментированной. Исследование показывает, что образ Алматы формируется не через однородную городскую ткань, а через взаимодействие улиц с различными морфологическими, функциональными и символическими качествами. Полученные результаты могут быть использованы в градостроительной и архитектурной практике, направленной на сохранение городской идентичности, улучшение пешеходных и общественных пространств, а также усиление визуальной и композиционной целостности городской среды.*

Ключевые слова:. *городская среда, образ города, городская морфология, восприятие улицы, культурная идентичность, общественное пространство, Алматы.*

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1 INTRODUCTION

In contemporary architectural and urban studies, the urban environment is understood not merely as an aggregate of buildings, streets, and engineering infrastructure, but as a spatial system in which the morphology of the built fabric, the structure of the street network, the character of public spaces, and the visual organisation of the environment shape how the city is perceived. Within this framework, characteristics such as accessibility, spatial enclosure and openness, compositional legibility, visual comfort, and the quality of the pedestrian environment take on particular analytical importance. Accordingly, the street is interpreted not only as an element of the transport framework, but also as a fundamental unit of urban structure through which perceptions of urban character and city image are formed [1; 2; 3].

This perspective is especially significant in the study of historically evolved and culturally layered cities. In such urban contexts, street morphology, the ratio of building height to street width, the degree of visual permeability, the character of building frontages, and the overall composition of the street environment affect not only functional performance but also visual perception and experiential quality. Recent studies indicate that spatial openness, sky visibility, street-section configuration, and the overall compositional structure of historic environments are directly related to perceived comfort and the quality of the urban experience. This issue is particularly relevant in areas where the preservation of historical character must be reconciled with the demands of contemporary development and adaptation [4].

Almaty is a particularly instructive case in this regard. The city has been shaped by successive layers of architectural and urban development, with the Soviet period especially influential in shaping the compositional and symbolic characteristics of its central districts. Studies of twentieth-century architecture in Almaty show that the city's cultural identity emerged from the interplay between broader Soviet architectural tendencies and their local reinterpretation within Kazakhstan's regional context. However, architectural identity remains a key concern in contemporary regional architecture in Kazakhstan, where image, symbolism, and connections to local cultural traditions continue to underpin design thinking and urban planning practice [5; 6; 7; 8].

At the same time, studies of Almaty's urban morphology show that the quality of public space and the intensity of urban life are closely tied to the spatial organisation of the environment. Accessibility, functional mix, ground-floor permeability, building density, and the character of the street frontage all shape patterns of spatial use and levels of social activity. Where spatial connectivity is weak, functional diversity is limited, and the relationship between buildings and the street is disrupted, public space tends to lose both its vitality and spatial coherence. In Almaty, this issue is particularly important because major urban streets serve as transport corridors, compositional axes, and carriers of the city's historical and cultural attributes [9;10]. In this context, the uniqueness of public spaces, their compositional integrity, and the safety and comfort of the urban environment also become critical conditions for their sustainable functioning and positive perception [11; 12]

Against this background, the present study examines Almaty's urban environment through the case of three streets: Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street. These cases were selected for their distinct positions within the urban structure and their contrasts in built morphology, functional composition, and visual-spatial organisation. The aim of the study is to identify how the historical and cultural characteristics, spatial structure, functional organisation, compositional features, and current environmental conditions of these streets contribute to the formation of Almaty's urban image. The scientific novelty of the research lies in its comparative analysis of three urban streets as elements that shape the city's architectural and spatial identity. Its practical significance lies in the potential application of the findings to the development of approaches for preserving the identity of the urban environment, improving public spaces, and enhancing the quality of architectural and urban planning decisions in Almaty [5; 6; 7; 11; 12].

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In contemporary architectural and urban studies, the perception of the urban environment is increasingly understood as the outcome of interactions among spatial form, urban morphology, and the visual organisation of the street. Research has shown that the street should be interpreted not only as a component of the transport framework but also as a primary unit through which urban structure is perceived. It is through the street that observers perceive scale, building frontage, depth of perspective, degree of spatial enclosure, and the character of visual dominants. In this respect, subjective evaluations of urban space are closely related to objective morphological properties, while the visual perception of the street environment is commonly examined through parameters such as composition, texture, linear structure, chromatic relationships, and spatial heterogeneity [2; 3]. In historically formed urban settings, particular importance is attributed to spatial openness, visibility, and street-section configuration, since these factors directly affect visual comfort and the overall assessment of environmental quality [4] (Figure 1).

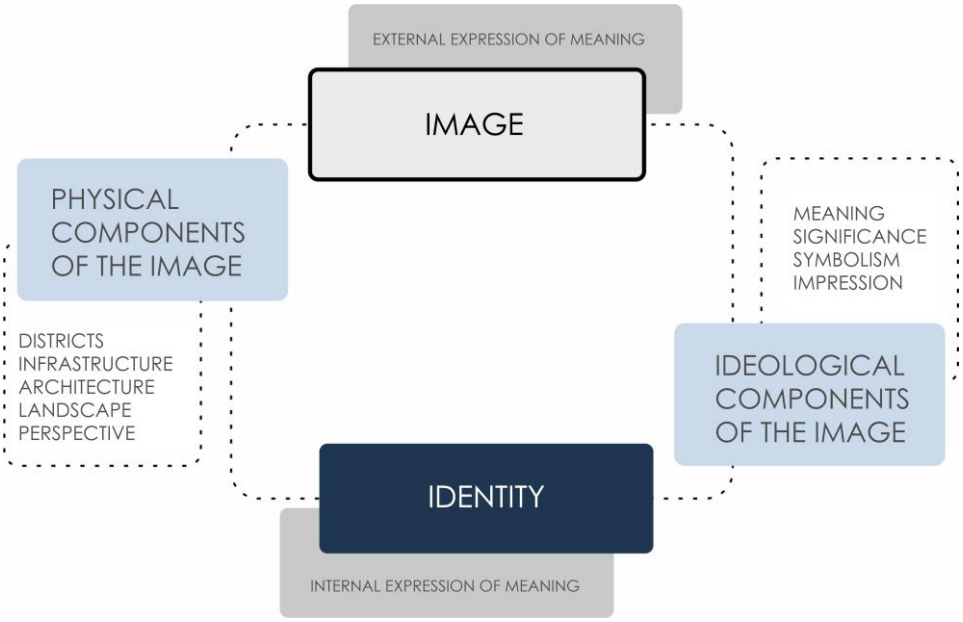


Figure 1 – Conceptual relationship between urban image and urban identity [Author's materials]

A related body of research addresses the problem of imageability, demonstrating that a durable image of the city is produced through spatial elements that are highly recognisable and repeatedly encountered during everyday movement through urban space. Such elements include major routes, nodal intersections, and functionally intensive segments of the urban fabric where mobility, public activity, and visually significant landmarks are concentrated. These components serve as perceptual anchors through which individuals construct a mental map of the city, relate its parts to one another, and retain its most distinctive spatial characteristics in memory. From this perspective, the street functions not merely as a linear element of transport infrastructure but as a carrier of the architectural and spatial identification of the urban environment, since it is along the street that scale, rhythm of development, functional character, visual dominants, and the broader logic of urban organisation are sequentially perceived [13; 15].

According to a sociological study of Kazakhstan's national identity, none of the foreign respondents used words related to architecture, the built environment, or the urban environment when asked to "Describe the country in three words". All the positive characteristics were related to nature, natural beauty, multiculturalism, hospitality, and local friendliness. By contrast, the negative characteristics were associated with high prices, poor service, and corruption [16].

A substantial body of the literature also examines the relationship between urban morphology, public space, and urban activity. Systematic reviews emphasise that social connectedness and the quality of public space are shaped by accessibility, mixed land use, visual quality, safety, and the extent to which everyday practices are spatially embedded in the urban structure [1]. For architectural

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and urban analysis, this implies that public space cannot be considered in isolation from the morphology of surrounding development, the character of the street frontage, and the organisation of movement. In the local context of Almaty, this relationship is supported by studies showing that accessibility, density, functional diversity, permeable ground floors, and environmental intensity directly influence the vitality of public space and the overall intensity of urban life [9; 10; 14]. Similar conclusions are advanced in studies linking the public character of space to its spatial form, path configuration, and degree of integration into the wider urban structure [21]. Street morphology, therefore, should be understood not only as a physical attribute of the environment but also as a factor shaping public activity and urban significance.

Another important line of research concerns architectural identity, environmental authenticity, and place memory. Studies on the architecture of Almaty indicate that the city's cultural identity emerged through a combination of broader Soviet architectural tendencies and their local reinterpretation within the context of Kazakhstan. Consequently, the image of the city should be regarded as the result of the long-term development of its architectural and spatial structure rather than as a mere collection of isolated buildings. The influence of the political agenda on the figurative and architectural development of Kazakhstan's two capital cities was studied by A. Akhmedova and P. Posokko. The formation of the image of the republic's capital in the context of a union state and the formation of the image of the capital of an independent state carry a distinctive thesis and demonstrate an active position in the creation of a new city [5; 6]. In a broader sense, architectural images and symbols are regarded as foundations of regional identity, closely associated with place specificity, cultural tradition, and the spatial expressiveness of the environment [17]. Recent research further suggests that the authenticity of the historic urban environment plays a significant role in the formation of local community identity and in sustaining the value of cultural heritage; in this respect, significance resides not only in individual monuments but also in the integrity of the urban fabric as a whole [18]. This issue is closely connected to place memory, since stable environmental perception develops through long-term interaction between people and space, while the historical significance of a street depends not solely on its age but also on its capacity to preserve recognisable spatial features associated with collective memory and accumulated patterns of use [19].

At the same time, the literature increasingly addresses the uniqueness of public space, its compositional coherence, and the conditions of safety and comfort. Research indicates that the distinctiveness of urban environments depends on the consistency of their planning and compositional structure, whereas disruptions to scale, stylistic unity, and spatial order tend to weaken the individual character of place [11]. Urban safety is likewise understood as an architectural and urban characteristic associated with visual control, spatial permeability, movement organisation, and the general condition of the environment [12]. Alongside these concerns, the importance of pedestrian and climatic comfort is emphasised, including greening, shading, and protection from adverse environmental conditions, since such parameters substantially determine the quality of everyday street use [20]. However, these tendencies may not always take into account the comfort of living. While focusing on a general understanding of regional architecture, the urban environment struggles to fulfil basic comfort needs of its inhabitants [6]. Taken together, the existing literature provides a substantial theoretical basis for the analysis of Almaty's urban environment. However, the comparative study of the city's key streets as carriers of morphology, identity, compositional expressiveness, and urban image remains insufficiently developed. It is precisely this gap that defines the research problem of the present study.

2 MATERIALS AND METHODS

The present study is based on a comparative analysis of Almaty's urban environment, focusing on three streets that differ in their position within the city structure, built morphology, functional composition, and visual-spatial organisation: Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street. These case studies were selected because each represents a distinct type of urban environment, enabling examination of different forms of interaction among historical and cultural characteristics,

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planning structure, transport function, public activity, and architectural image. Such an approach enables a move beyond the description of isolated fragments of the urban fabric and allows comparison within a unified analytical framework.

The research is grounded in an integrated architectural and urban-planning approach that combines comparative analysis, urban morphological study, visual-spatial analysis, and field survey methods. As shown in Figure 2, the study employs a set of architectural and planning criteria to assess urban identity. The research methods included analysis of academic and planning-related sources, examination of historical and urban development materials, field observation, photographic documentation, and comparison of the spatial characteristics of the selected streets. This combination of methods aligns with contemporary studies that examine the urban environment through the interrelationship between morphology, perception, public space, and the qualitative characteristics of urban structure [2; 3; 10; 12; 21].

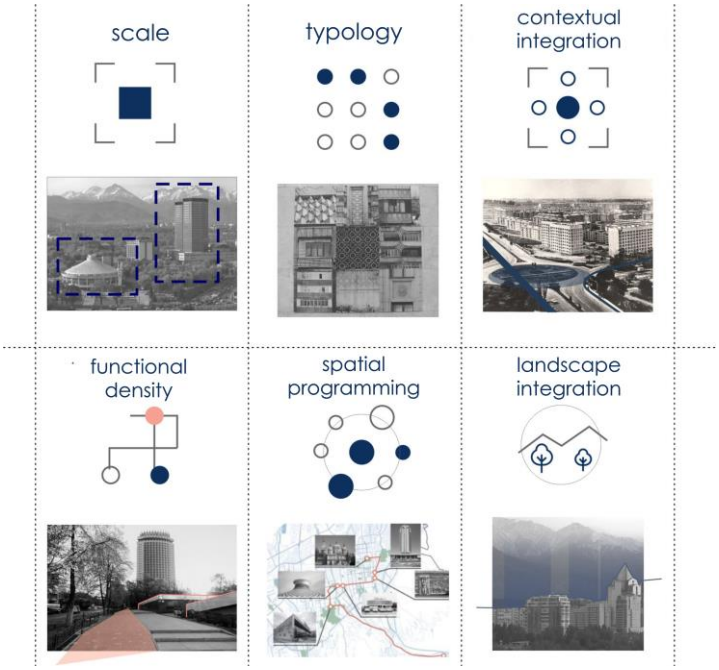


Figure 2 – Key architectural and planning criteria of urban identity assessment [Author's materials]

Each street was analysed using a common set of criteria to ensure comparable results. The principal criteria included historical and cultural significance, the morphological structure of development, functional mix, pedestrian accessibility, the quality of the visual environment, the level of greening and environmental comfort, safety and visual control, the presence of symbolically significant elements, and the street's contribution to the formation of the city image. These criteria were selected based on contemporary research, which treats compositional integrity, uniqueness of public space, safety, place memory, comfort, and street-environment quality as interrelated parameters for architectural and urban evaluation [10; 11; 12; 19; 20].

Within this framework, each of the three streets was examined sequentially in terms of its position within the urban structure, the historical conditions of its formation, development pattern, functional organisation, the condition of pedestrian and transport infrastructure, visual and compositional characteristics, and elements of urban identity. The results for each case were then synthesised into a comparative model that enabled the identification of differences in their architectural and spatial roles and the determination of how these streets contribute to the formation of Almaty's urban image. This research design allows the street to be understood not as an isolated linear element, but as a complex unit of the urban environment in which morphological, functional, compositional, and culturally significant characteristics intersect.

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3 RESULTS AND DISCUSSION

3.1 Analysis of Dostyk Avenue

Dostyk Avenue occupies a distinctive position within Almaty's urban structure as one of the city's most important historical, cultural, and public streets. The section examined in this study, located between Kazybek Bi Street and Satpayev Street, is characterised by a complex spatial and functional organisation in which residential, public, commercial, educational, and recreational elements coexist. Owing to this combination, the avenue serves not only a transport function but also acts as one of the city's principal urban axes through which the architectural identity, historical memory, and visual image of central Almaty are articulated (Figure 3).

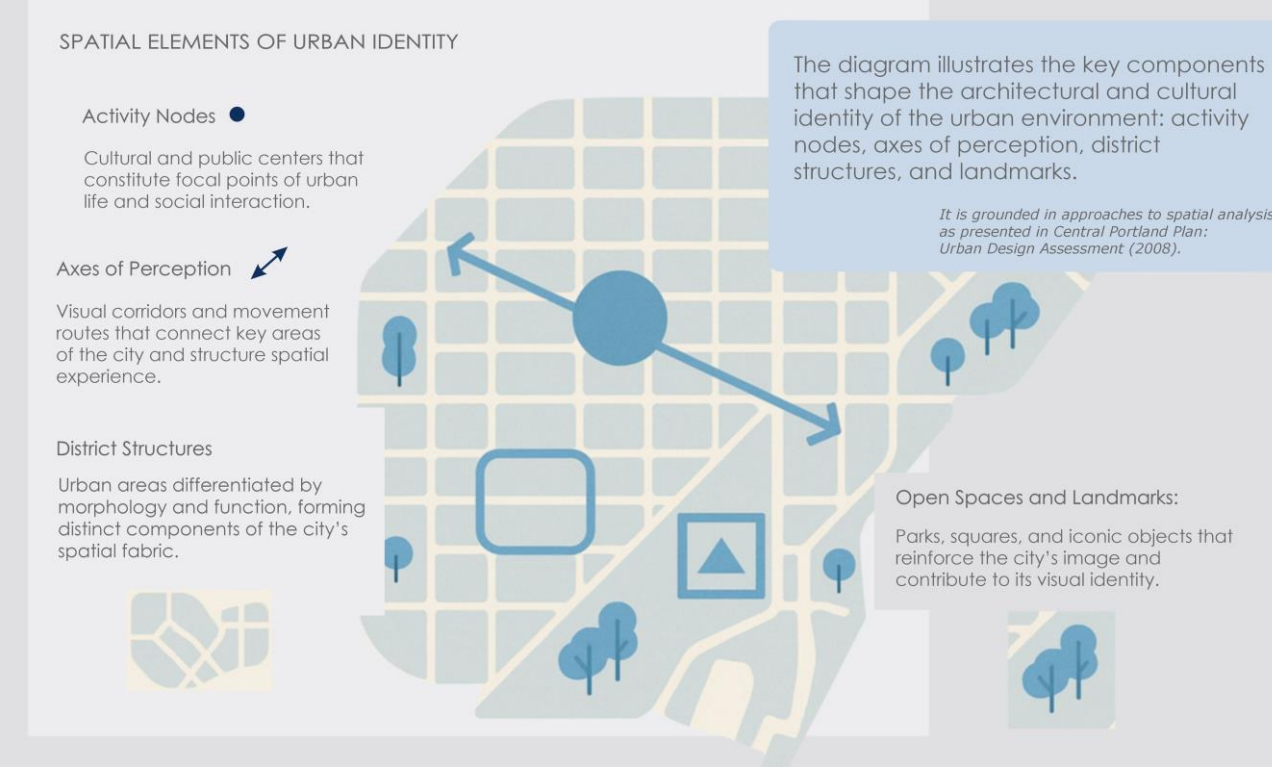


Figure 3 –Spatial framework of urban identity formation [Author's materials]

The functional zoning, transport accessibility, and visual-spatial characteristics of Dostyk Avenue are shown in Figure 4. The avenue's historical and cultural significance begins with its longstanding role in the development of the city centre and with the presence of sites that contribute to Almaty's public and cultural representation. It is among the oldest and most representative urban corridors in the city. Its development reflects several stages in Almaty's urban history, while the area near the intersection with Abai Avenue is a particularly important compositional focal point, where major public and cultural facilities are concentrated. Within the studied segment, features of Soviet ensemble-based development remain visible, complemented by later insertions and reconstructions. As a result, the avenue represents a space in which historical continuity coexists with subsequent transformations of the urban environment. Decorative architectural elements, memorial plaques, public buildings, and cultural institutions further reinforce its role as a carrier of urban memory and identity.

The morphological structure of Dostyk Avenue is marked by a high degree of spatial intensity and a relatively strong level of compositional organisation. The area is characterised by a mix of perimeter development, public buildings, residential blocks with active ground floors, and open sections that create visual pauses within the urban fabric.

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The functional structure of Dostyk Avenue is distinguished by a high level of diversity. A substantial proportion of the territory is occupied by public functions, including cultural, commercial, educational, and administrative facilities, which create an active urban environment and maintain a stable level of use throughout the day. Residential development also occupies a significant share of the avenue, while the ground floors of many residential buildings are used for commercial purposes, thereby strengthening the public character of the space and sustaining the continuity of everyday activity. The presence of educational institutions, public centres, and recreational facilities further complicates the street's functional structure and enhances its role in urban life. Consequently, Dostyk

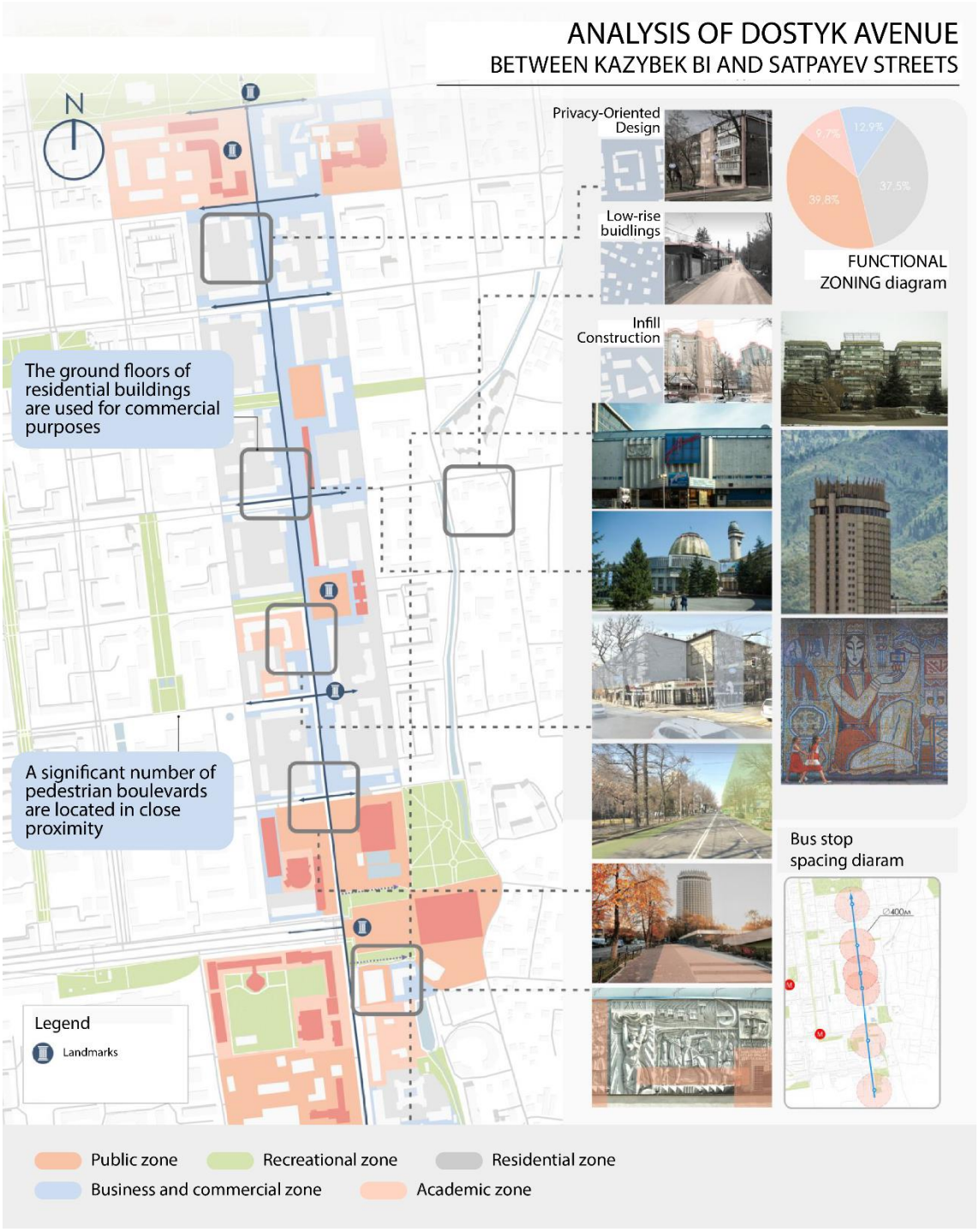


Figure 4 –Functional zoning, transport accessibility, and visual-spatial characteristics of Dostyk Avenue within the Kazybek Bi–Satpayev segment [Author's materials]

Avenue should be understood not as a monofunctional traffic corridor, but as a multilayered urban environment with a clearly expressed public orientation.

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The quality of the environment along Dostyk Avenue is also strongly influenced by the condition of its pedestrian and transport infrastructure. The avenue is served by a developed transport network and accommodates intensive flows of both private and public transport. At the same time, wide pedestrian spaces have been formed along its length, supporting a high level of walkability and reinforcing its public significance. Pedestrian crossings are located at key points where movement flows intersect, and the street structure is oriented towards balancing transport capacity with pedestrian accessibility. However, heavy traffic volumes, the uneven distribution of public transport stops, and the placement of certain parking areas along the carriageway reduce the overall efficiency of transport organisation and diminish the comfort of everyday street use. In addition, some internal block passages and adjacent spaces are insufficiently illuminated in the evening, weakening the sense of safety and reducing the perceptual quality of specific segments of the environment.

The visual-spatial environment of Dostyk Avenue is largely shaped by the combination of architectural expressiveness, a green framework, and publicly significant buildings. The street contains a noticeable amount of greenery: tree-lined sections, landscaped areas, and small squares perform not only ecological but also compositional functions, structuring the space and mitigating the impact of intensive traffic.

The rhythm of façades, public buildings, decorative elements, and commemorative objects supports the visual image of the avenue. At the same time, numerous extensions, reconstructions, and contemporary insertions in some areas disrupt the original continuity of the façade line and weaken the perception of the street's ensemble. This becomes particularly evident where new additions conflict with the scale, plasticity, and stylistic character of the historically formed development.

The symbolic expressiveness of Dostyk Avenue is associated with the concentration of cultural institutions, public buildings, and architectural details that establish its status as one of Almaty's most recognisable streets. Theatres, monuments, public buildings, memorial elements, and sites with stable urban recognisability create a dense system of symbolic markers. For this reason, the avenue is perceived not only as a functional axis of movement but also as a space where ideas of cultural significance and the representational character of the central urban environment are concentrated. At the same time, the reduction of green areas, local disruptions in the building frontage, and the uneven character of reconstruction interventions weaken the integrity of this symbolic structure and gradually shift parts of the environment from an ensemble-based condition towards a more fragmented one.

Dostyk Avenue may be characterised as a street of high historical and cultural significance, pronounced functional intensity, and substantial importance in shaping Almaty's architectural image. Its principal strengths include active public use, a strong compositional role within the city structure, a green framework, and the concentration of symbolically significant sites. At the same time, its future development requires a more careful approach to preserving the ensemble integrity of the environment, maintaining its decorative and artistic features, and sustaining a balance between transport function, pedestrian comfort, and the street's architectural identity.

3.2 Analysis of Raiymbekbatyr Avenue

Raiymbek Batyr Avenue is one of the longest and most functionally significant urban corridors in Almaty, playing a major role in organising east–west connections and linking the city's central districts with peripheral territories. Unlike Dostyk Avenue, which has a more clearly articulated ensemble character and a cultural-representative function, Raiymbek Batyr Avenue primarily serves as a major transport artery. At the same time, its significance cannot be reduced to transport alone, since its structure retains important traces of historical memory associated with the early stages of urban development, trade routes, and subsequent transformations of the urban environment.

The functional zoning, transport structure, and visual-spatial characteristics of Raiymbek Batyr Avenue are presented in Figure 5.

The historical and cultural context of Raiymbek Batyr Avenue was shaped by its long-standing role as a trade and transport route that contributed to the early development of the city's spatial structure. The historical significance of this street lies in its former role as an important corridor linking the city to surrounding territories. This role became embedded over time in both its planning

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logic and symbolic status. Within the studied segment, individual elements of place memory remain visible in the form of toponymy, monuments, and sites associated with different periods of the city's history. These markers preserve the historical richness of the space; however, within the avenue's present-day structure, they are largely fragmented and do not form a coherent ensemble. As a result, historical memory is expressed here not through a unified architectural composition, but through separate points of symbolic concentration embedded within an intensive transport environment.

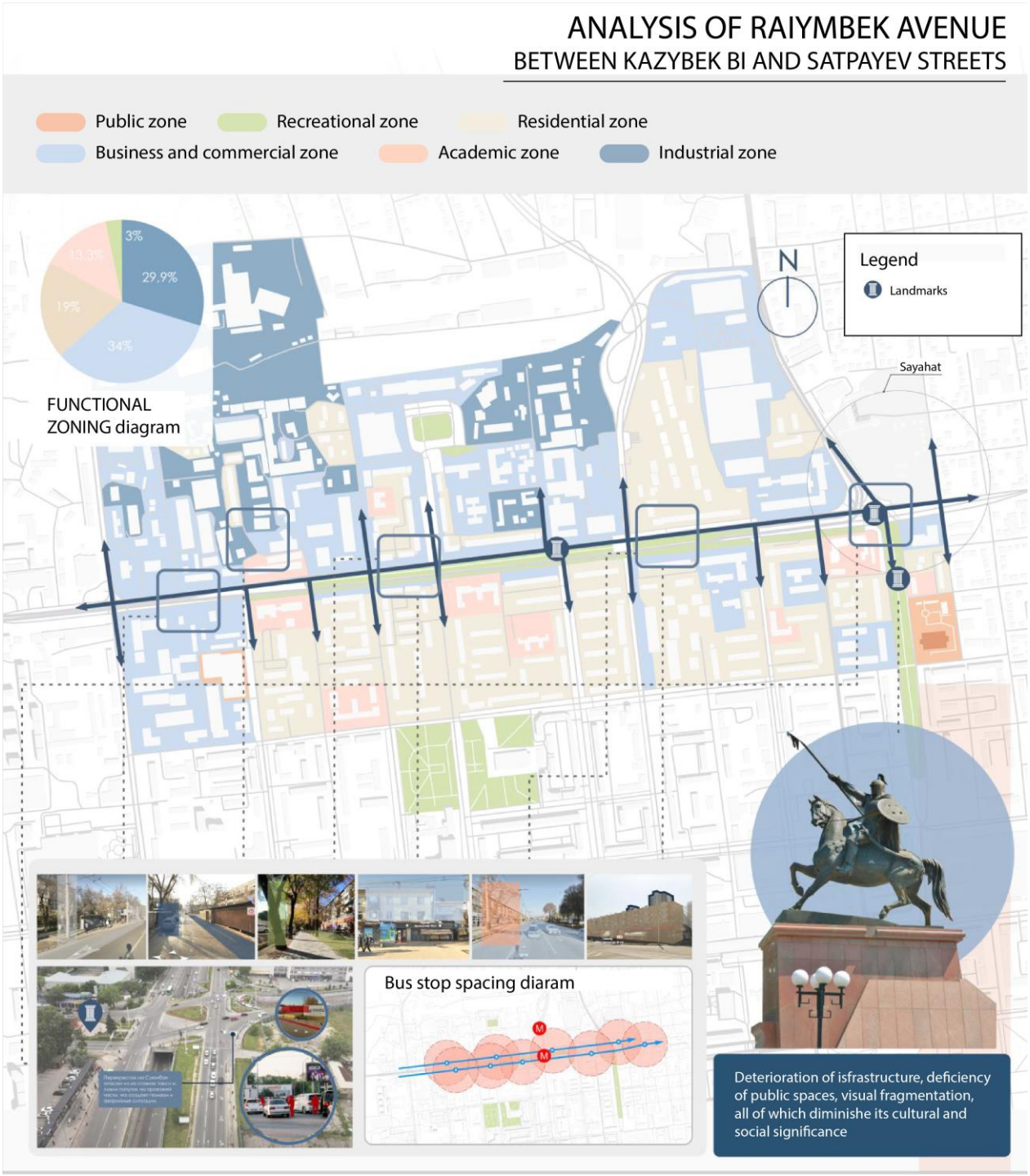


Figure 5 –Functional zoning, transport accessibility, and visual-spatial characteristics of Raimbek Batyr Avenue within the Seifullin–Pushkin segment [Author's materials]

The morphological and functional structure of the studied section of Raiymbek Batyr Avenue is characterised by pronounced linearity and the predominance of transport and commercial use. Within this fragment, the avenue forms a rigidly organised urban corridor with predominantly mid-

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rise development incorporating residential, commercial, administrative, and, to a lesser extent, public functions. The street's visual structure is governed by the logic of an extended building frontage; however, this frontage lacks a high degree of compositional coherence. The relative uniformity of the main building mass is periodically interrupted by contemporary insertions, upper-volume extensions of newer buildings, and individual structures that are discordant with the overall scale of the street. Functionally, the avenue is saturated with retail and service facilities. Yet this intensity is largely utilitarian and transit-oriented, and it does not generate a stable public environment with a pronounced cultural or recreational dimension.

The dominance of its transport function strongly shapes the avenue's character. High traffic intensity, substantial pressure on the street and road network, and the avenue's role as one of the city's key transit corridors determine its spatial perception. Despite the presence of public transport stops, pedestrian crossings, and certain improvements, the overall organisation of the environment remains largely subordinated to traffic flows. This diminishes the quality of the pedestrian experience and limits the street's potential as a public space. Additional problems stem from uneven infrastructure, the unsatisfactory condition of certain sections of the pavement, barriers to pedestrian movement, local-level changes, and insufficient connectivity between some areas and public and cultural facilities. At the same time, the presence of numerous crossings and transit stops indicates a high level of use, although this does not compensate for the avenue's overall transport overload.

Raiymbek Batyr Avenue may be characterised as a street of high transport and historical significance, yet with limited public-spatial coherence. Its strengths include its strategic role within the urban structure, the presence of markers of historical memory, and continuing potential to form a more expressive urban environment. At the same time, the dominance of the transport function, visual heterogeneity, insufficient development of public spaces, and the fragmented nature of the pedestrian environment reduce its contribution to the formation of a coherent, architecturally expressive image of Almaty. Strengthening the avenue's role within the city structure requires measures to improve pedestrian conditions, organise the visual environment more systematically, preserve symbolic elements, and integrate public functions more coherently into its spatial framework.

3.3 Analysis of Navoi Street

Navoi Street represents a different type of urban environment from both Dostyk Avenue and Raiymbek Batyr Avenue. Whereas the former retains a clearly articulated cultural and representative role, and the latter functions primarily as a major transport corridor, Navoi Street developed mainly as part of the residential planning structure of south-western Almaty. At present, its spatial character is defined by a combination of residential development, local commercialisation, proximity to major urban attractors, and adjacency to natural and recreational areas. As a result, the street combines the features of a residential environment, a transit route, and a potentially significant public space; however, these qualities have not yet been integrated into a coherent architectural and urban system. The spatial configuration, functional composition, and transport accessibility of Navoi Street are presented in Figure 6.

The historical and planning background of Navoi Street is associated with the development of the residential districts in the southwestern part of the city, particularly the formation of the Orbita neighbourhood. Initially, this territory developed predominantly as a residential environment supported by everyday service facilities and green open spaces. Over time, however, the character of the street began to change under the influence of urban expansion, increasing residential density, and growing commercial activity. Its current condition has been significantly shaped by its proximity to major urban facilities, including the Mega Alma-Ata shopping and entertainment centre, the Bolshaya Almatinka embankment, the Kazakh Leading Academy of Architecture and Civil Engineering, and the First President's Park.

These surrounding facilities have increased the street's urban significance. Still, they have also altered its original role, shifting it from a relatively calm residential axis towards a more intensively used and morphologically heterogeneous urban space. The functional structure of the studied section of Navoi Street, however, remains relatively limited in composition. Residential use continues to

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dominate, supplemented by local commercial facilities on the ground floors of buildings and near major attractions.

At the same time, the proportion of fully organised public spaces along the street itself remains small. Despite the proximity of recreational and public facilities of citywide importance, their influence on the street structure is not expressed as an integrated system of public activity, but rather as an external factor that increases transport and pedestrian pressure on adjacent areas. The continued presence of garage complexes and gated residential developments further constrains the formation of a more permeable and publicly oriented spatial structure. As a result, Navoi Street does not acquire the qualities of a fully developed public urban space and instead retains a predominantly linear-residential character with isolated commercial insertions.

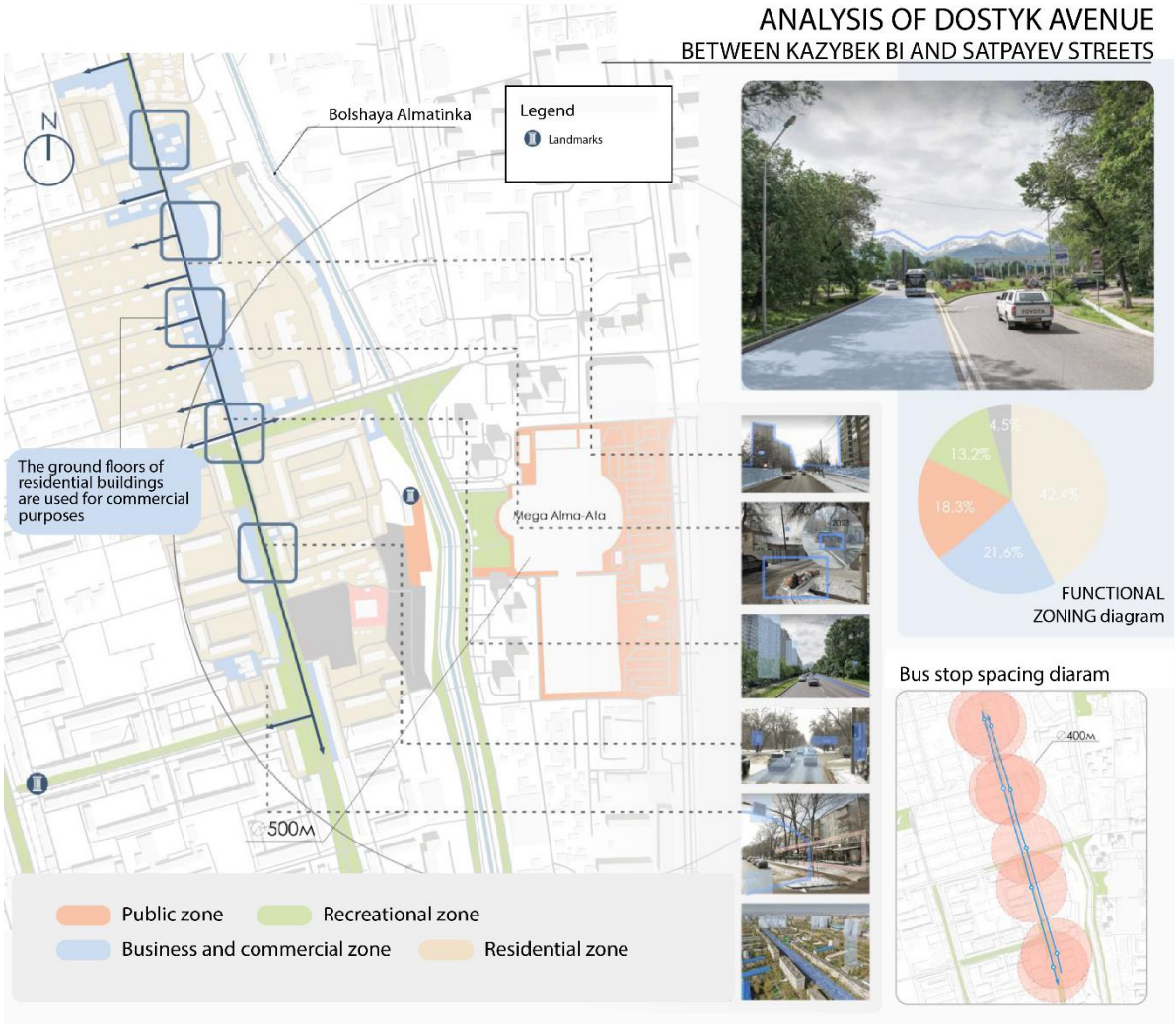


Figure 6 – Functional zoning, transport accessibility, and visual-spatial characteristics of Navoi Street within the Cherepanov–Birzhan segment [Author's materials]

The morphological organisation of Navoi Street is characterised by pronounced heterogeneity. In different sections, Soviet-era apartment blocks, private housing, new residential complexes, and service facilities coexist, producing a visible contrast in scale, density, and the character of spatial boundaries. The southern segments preserve more features of a green residential environment. In contrast, in the northern and more intensively developed sections, density, visual enclosure, and the role of car infrastructure become more pronounced. Gated residential compounds, differences in façade treatment, and the absence of a unified compositional logic weaken the street's spatial coherence. Unlike Dostyk Avenue, where a more distinct rhythm of the façade line is preserved, and

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unlike Raiymbek Batyr Avenue, where the linear transport framework dominates, Navoi Street is perceived as a morphologically fragmented space with an unstable architectural identity.

The symbolic expressiveness of Navoi Street is markedly weaker than that of the other two streets under study. It lacks a comparable concentration of publicly significant architectural objects, monuments, or established urban markers. At the same time, the street possesses a different type of potential—one that is environmental and landscape-based rather than memorial and representative. Its significance is less connected to an already established symbolic status than to the possibility of future architectural and urban enhancement through environmental improvement, the development of open public spaces, stronger pedestrian connectivity, and the formation of a more coherent visual structure. In this sense, Navoi Street may be regarded as a territory with unrealised potential for urban integration.

Navoi Street may be characterised as a space with high natural-visual and functional potential, but with insufficient architectural and spatial coherence. Its principal strengths include proximity to major recreational and public facilities, green spaces, and its significant role within the surrounding residential districts. At the same time, morphological fragmentation, limited provision of public spaces, insufficient development of pedestrian infrastructure, and weak expression of symbolic markers reduce its contribution to the formation of a coherent image of Almaty. Strengthening the role of Navoi Street within the urban structure requires improvements in pedestrian conditions, a reduction in spatial barriers, a more integrated organisation of public functions, and the formation of a stable architectural and spatial identity for the street.

3.4 Comparative Synthesis of the Three Streets

The comparative analysis of Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street shows that each of the studied streets occupies a distinct position in shaping Almaty's architectural and spatial image. Their differences are evident in historical and cultural significance, degree of compositional integrity, functional composition, quality of the pedestrian environment, level of transport pressure, and character of visual-environmental organisation. It is precisely this comparison of these parameters that enables a move beyond the description of individual fragments of the urban environment and the identification of their differing roles within the structure of the city.

Dostyk Avenue demonstrates the strongest relationship among historical and cultural significance, public activity, and architectural representativeness. It is distinguished by a high degree of functional diversity, the presence of symbolically significant objects, a clearly expressed green framework, and a more coherent visual image. Despite certain disruptions to its ensemble character, this avenue most consistently preserves the features of a street that forms a culturally and compositionally articulated urban axis. Raiymbek Batyr Avenue, by contrast, performs a different role. Although it possesses considerable historical and transport significance, its spatial perception is shaped primarily by traffic intensity, visual heterogeneity, and limited public-spatial coherence. As a result, it functions more as a corridor of movement and memory than as a fully integrated public environment. Navoi Street occupies a third position within this comparative system. Despite its substantial natural and visual potential, proximity to recreational areas, and important role within the structure of surrounding residential districts, it remains morphologically fragmented and insufficiently integrated as a полноценное public urban space.

Three streets represent three distinct types of urban environment. Dostyk Avenue may be characterised as a culturally representative and compositionally articulated urban axis; Raiymbek Batyr Avenue as a transport-dominant and historically significant, yet environmentally less coherent urban corridor; and Navoi Street as a residential axis with high landscape and public-space potential that has, at present, been realised only partially. This allows us to argue that the image of Almaty is formed not by the uniformity of its street structure, but by the interaction of spatial elements of different character, each of which makes a distinct contribution to the perception of the city (Table 1).

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Table 1 – Comparative characteristics of Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street [Author's materials]

Parameter	Dostyk Avenue	Raiymbek Batyr Avenue	Navoi Street
Historical-cultural value	High	High	Moderate
Compositional integrity	Relatively high, partially disturbed by later interventions	Moderate to low	Low
Functional diversity	High	Moderate	Moderate
Pedestrian comfort	Relatively high, with local deficiencies	Moderate to low	Low to moderate
Transport pressure	High	Very high	Moderate
Greenery / environmental comfort	High	Moderate, fragmented	Moderate, uneven
Symbolic expressiveness	High	Moderate	Low
Contribution to the image of Almaty	Strong cultural and representative axis	Transport and memory corridor	Street with unrealised environmental and public-space potential

This comparative section concludes the Results chapter and provides a transition to the Discussion, where the identified differences are interpreted through the lenses of morphology, identity, place memory, safety, and the quality of the urban environment.

Further, to illustrate and visualise the results, the street sections are shown in Figures 7-9. The sections were selected to provide a general overview of streets with similar layouts along the examined routes. Three main zones are shown on the section: Pedestrians - the lane dedicated to pedestrians, Green buffer - a buffer zone filled with trees and bushes, Road and transportation - the part of the street dedicated only to public transport and cars.

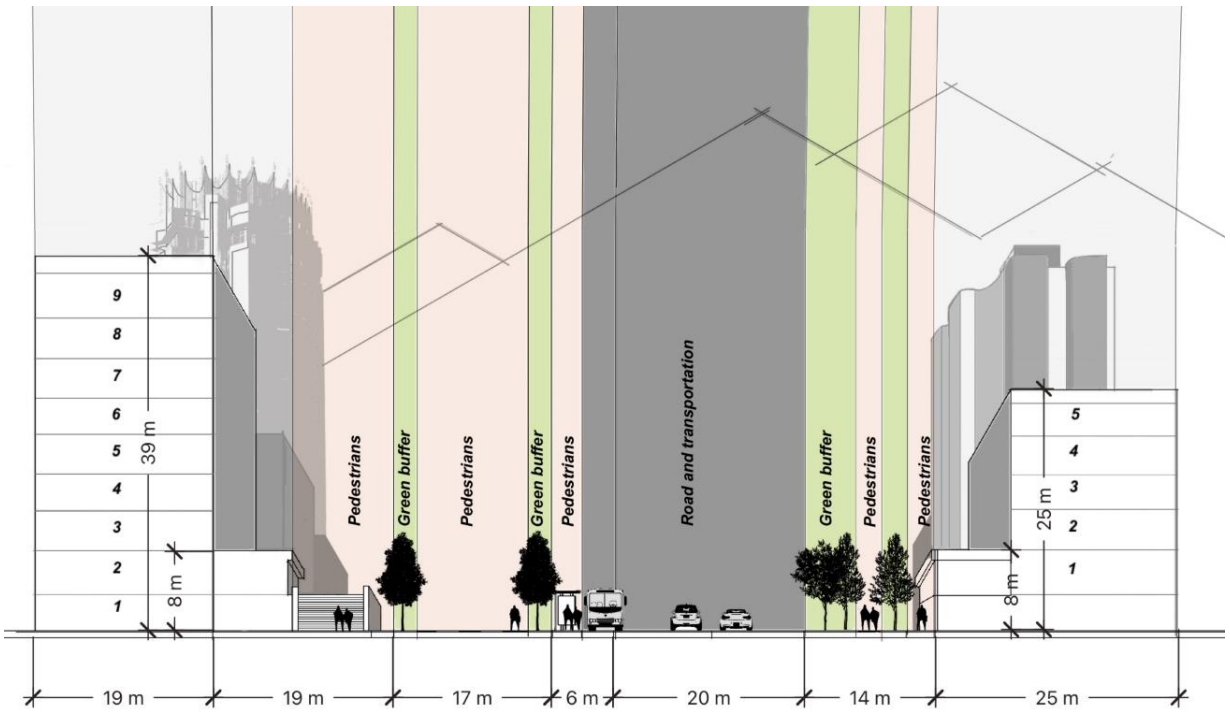


Figure 7 – Dostyk Avenue section [Author's materials]

Dostyk Avenue is situated in the old city centre and features a variety of building typologies on its ground floors. There are shops, cafes, and restaurants available for people. At the same time, the

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street has various public transport options. The road is separated from the pedestrian area by a small green buffer zone.

Figure 8 illustrates a section of Rayimbek Avenue. The street has very little space dedicated to pedestrians. Although there are more green buffer zones in comparison to Dostyk Avenue. On the other hand, the zone dedicated to roads and transportation is busier and exhibits more heavy transport, such as trucks and vans.

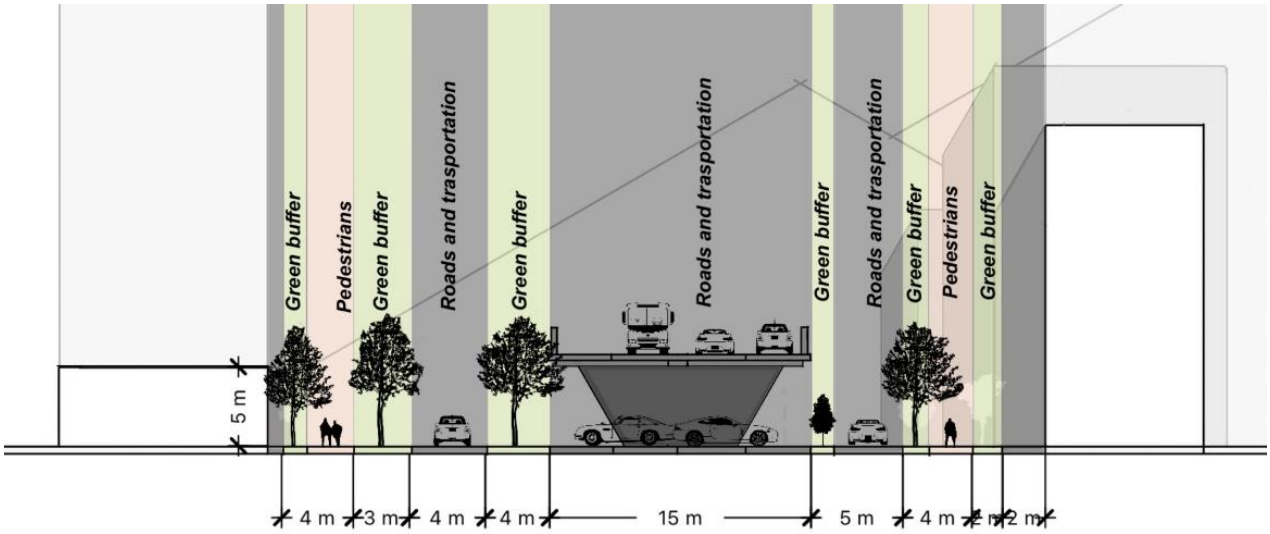


Figure 8 – Rayimbek Avenue section [Author's materials]

Figure 9 shows the section of Navoi Street. The street has an uneven distribution of building heights. Compared to other streets, Navoi has the least space available for pedestrians and the fewest public transportation routes passing through it. The roads have an adjacent parking lot in some parts of the street, close to the buildings.

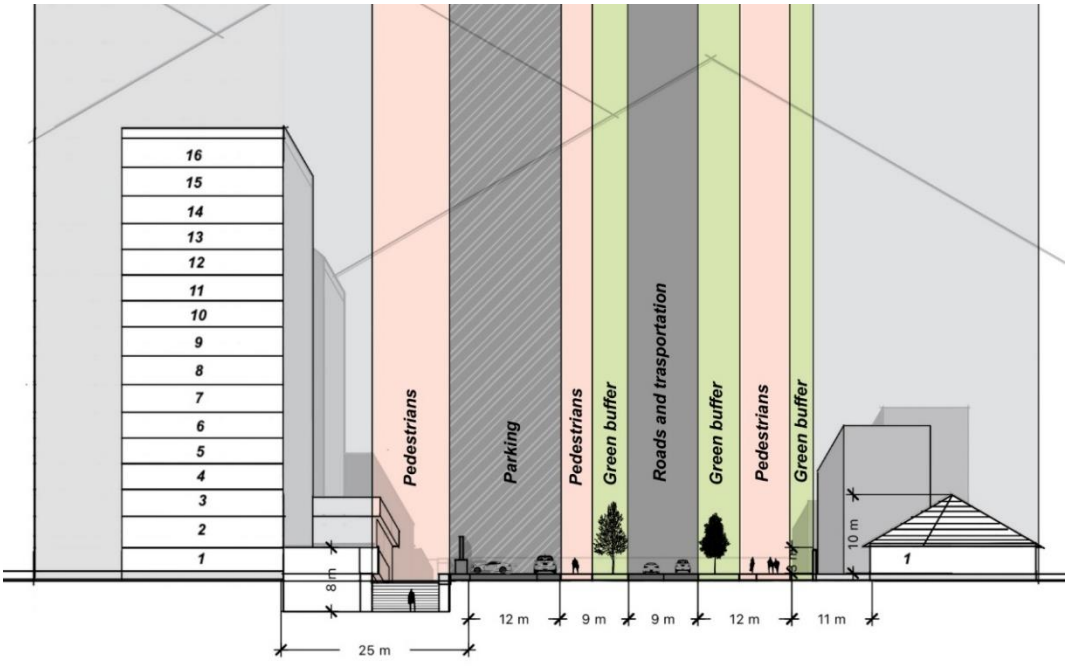


Figure 9 – Navoi section [Author's materials]

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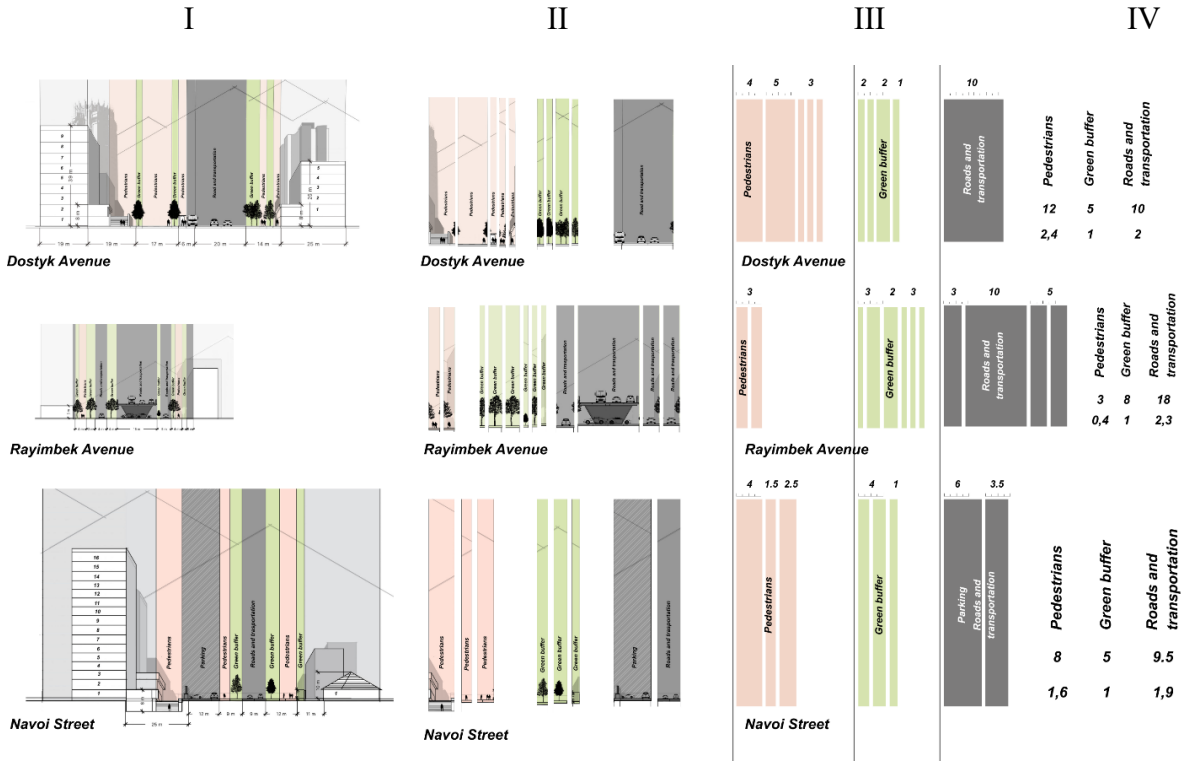


Figure 10 – Comparative diagram of the examined street sections [Author's materials]

Table 2 – Comparative shares of typologies presented on three streets, Dostyk Avenue, Raiymbek Batyr Avenue and Navoi Street [authors' materials]

Street	Pedestrians (P)	Green Buffer (G)	Roads & Transport (R)	Total (P+G+R)	P (%)	G (%)	R (%)	P / G / R
Dostyk Avenue	12	5	10	27	44.4	18.5	37.0	2.4 / 1 / 2
Raiymbek Batyr Avenue	3	8	18	29	10.3	27.6	62.1	0.4 / 1 / 2.3
Navoi Street	8	5	9.5	22.5	35.6	22.2	42.2	1.6 / 1 / 1.9

Furthermore, the data were combined into a comparative illustration shown in Figure 10. The diagram uses a research-by-design method to illustrate the hierarchical distribution of space usage. Dostyk Avenue exhibits a more balanced, symmetrical spatial distribution, prioritising both pedestrian comfort and transport regulation. Raiymbek Batyr Avenue features a more expansive transport network with multiple layers of transport zones. At the same time, the pedestrian zones are significantly narrower. Navoi Street is comparatively simple in terms of layering and has smaller pedestrian zones. To digitalise the outputs, four further steps were taken to classify and organise the data (Figure 10). Step I preserved the scales of three street sections to portray their differences and morphology. Step II organised the data according to a specific typology (Pedestrians, Green Buffer, and Roads and transportation) and grouped the typologies into segments: peach colour corresponds to Pedestrians, green colour corresponds to Green Buffer, and grey colour corresponds to Roads and transportation. Step III scaled down the organised segments

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while defining the scale and dimensions, including not only the widths of the typologies but also the visual height of the street sections. Finally, Step IV calculated the shares of typology on the street, normalising them. The total results are presented in Table 2 as shares corresponding to the total percentage. The numbers corroborated the morphological analysis, providing numerical values that justify the imbalance of typologies on the examined streets. For example, Dostyk Avenue had the highest percentage of the zone for Pedestrians (44.4%), while Raiymbek Batyr Avenue had the highest share of the road for cars and transportation (62.1%).

3.5 Discussion

The findings indicate that the differences among Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street are determined not only by their functional specialisation but also by the character of their morphological organisation and the quality of public space. In this respect, the study confirms the proposition that urban morphology directly influences the intensity of public life, the degree of spatial connectivity, and the quality of everyday use of the environment [1; 10; 21]. Dostyk Avenue offers the most balanced combination of functional diversity, public activity, and compositional organisation, and, for this reason, retains its role as a fully developed urban axis. Raiymbek Batyr Avenue, by contrast, despite its major transport significance, supports the quality of public space to a lesser extent, as traffic intensity, environmental fragmentation, and the limited presence of public functions weaken its spatial coherence. Navoi Street occupies an intermediate position: although it contains important attractors and considerable environmental resources, its morphological heterogeneity and weak integration of public spaces reduce its public expressiveness. These results, therefore, suggest that the significance of a street within the urban structure is determined not by transport or residential functions in themselves, but by the interaction among morphology, accessibility, and publicness in the urban environment.

The comparative analysis also shows that the city's architectural image is shaped by spatial elements organised in different ways, through which identity, authenticity, and symbolic density are expressed to varying degrees. In the case of Dostyk Avenue, historical and cultural significance is sustained not only by the presence of individual landmark buildings but also by the relative preservation of the street's representative character, which aligns with the understanding of urban identity as a property of the architectural and spatial environment as a whole rather than of isolated buildings alone. Raiymbek Batyr Avenue reveals a different form of identity: here it is expressed through historical and toponymic markers, yet it does not receive sufficient support from the street's compositional and public-spatial structure. In the case of Navoi Street, the problem of identity is even more pronounced. Despite its substantial natural and urban development potential, its image remains insufficiently stable due to morphological fragmentation and weak symbolic articulation. These observations are consistent with studies showing that architectural images, symbols, and environmental authenticity play a decisive role in the formation of regional and local identity. At the same time, the loss of coherence in the urban fabric reduces the distinctiveness and cultural expressiveness of place [17; 18].

The results also allow Almaty's streets to be interpreted as carriers of place memory and as elements that stabilise the urban image. In this respect, the differences among the three streets are particularly revealing. Dostyk Avenue preserves a stable connection with the city centre's historically formed image; Raiymbek Batyr Avenue concentrates memory associated with Almaty's transport, commercial, and industrial history; Navoi Street, by contrast, reflects a later stage of urban expansion and does not yet possess a comparable degree of historically consolidated symbolic expressiveness. These differences confirm that the urban environment is perceived not only through its current spatial parameters but also through accumulated historical experience embedded in routes, nodes, place names, public buildings, and enduring spatial images [13; 19]. Accordingly, the role of a street within the urban image depends not only on its present-day functions but also on its capacity to retain and transmit spatially embedded memory perceived as integral to the city's identity.

Particular attention should be paid to differences in safety, pedestrian comfort, and visual control. The results demonstrate that even a functionally important street may lose the qualities of a

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high-quality urban environment when it is subject to excessive transport pressure, insufficiently connected pedestrian infrastructure, and disruption of visual coherence. In this regard, Raiymbek Batyr Avenue and Navoi Street are more vulnerable than Dostyk Avenue. For Raiymbek Batyr Avenue, the principal factor is transport dominance, which weakens the pedestrian experience and the environment's integration with the public. For Navoi Street, the main constraints are insufficiently developed pedestrian infrastructure, the spatial closure of certain fragments, and the weak organisation of open public areas. These conclusions are consistent with studies in which safety is understood as a consequence of spatial permeability, visual control, and coherence of the urban structure. At the same time, pedestrian comfort is interpreted as the result of greening, shading, accessibility, and overall environmental order [2; 12; 20]. Consequently, improving the quality of Almaty's streets requires not only isolated technical measures but also a more integrated approach that considers the interrelationships among transport organisation, visual legibility, greening, and spatial safety [22].

The current study introduced a research-by-design method to interpret and classify the typological and morphological structures of Almaty's street sections. This approach integrates analytical drawing, spatial decomposition and design as a primary tool of knowledge production. This methodological approach is particularly relevant when working with spatial data that is inherently visual, scale-dependent and relational. In this study, the diagrams act as a bridge between empirical observation and conceptual generalisation, enabling both the classification of data and its interpretation.

In a broader context, the results are important for understanding the future development of Almaty's urban environment and the regional architecture of Kazakhstan more generally. The study demonstrates that preserving urban identity cannot be reduced to either the protection of individual heritage objects or the formal improvement of street amenities. What is required instead is engagement with the environment's morphological structure, its symbolic markers, public functions, and pedestrian quality, since these parameters determine an urban street's capacity to contribute to the formation of a coherent city image [23]. In this sense, Dostyk Avenue requires the preservation of its ensemble and symbolic integrity; Raiymbek Batyr Avenue requires a reduction in environmental fragmentation and a strengthening of its public-spatial quality; and Navoi Street requires a more active integration of its natural potential, open public spaces, and continuous pedestrian infrastructure.

4 CONCLUSIONS

The present study has demonstrated that the image of Almaty is formed not as an abstract sum of individual architectural objects, but through specific elements of the urban environment, among which streets occupy a central position. It is through their spatial organisation, functional composition, visual structure, and historical and cultural density that the principal characteristics of urban identity are expressed. The comparative analysis confirmed that the street may be understood as an independent carrier of the city's architectural image and as an essential unit of urban perception.

1. The results show that Dostyk Avenue, Raiymbek Batyr Avenue, and Navoi Street play different roles within Almaty's structure and, accordingly, contribute differently to the formation of the city's image. Dostyk Avenue functions as the most coherent cultural and representative axis, combining historical and cultural significance, functional diversity, and pronounced symbolic density. Raiymbek Batyr Avenue retains high transport and historical importance; however, it is perceived primarily as a corridor of movement and memory rather than as a compositionally integrated public environment. Navoi Street possesses considerable environmental and landscape potential, yet, in its current state, this potential has been realised only partially.

2. The findings indicate that the quality of an urban street is determined not by a single parameter, but by the interaction of morphological organisation, the degree of functional mix, the character of the pedestrian environment, the level of greening, visual coherence, and the presence of symbolically significant elements. When these characteristics reinforce one another, a more stable

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and expressive urban image emerges. When discontinuities arise among them, the street may retain certain strong qualities, but it loses its spatial and representational coherence.

3. The comparison of the three streets further indicates that the preservation and development of Almaty's urban image cannot be achieved solely by protecting individual heritage objects or by isolated improvement measures. What is required is a more consistent engagement with street morphology, building frontage, ground-floor permeability, the quality of public spaces, pedestrian accessibility, and the visual-compositional structure of the environment. Such an approach enables the urban street to be regarded not as a fragment of the transport network, but as an architectural and urban-planning element that directly influences the city's identity.

4. The practical significance of the study lies in the potential to apply its findings to improve Almaty's urban environment. For Dostyk Avenue, priority should be given to preserving the ensemble and symbolic coherence. For Raiymbek Batyr Avenue, the key task is to reduce environmental fragmentation and improve the quality of public and pedestrian space. For Navoi Street, priority should be placed on strengthening public integration, developing open spaces, and creating a more coherent visual structure. In this sense, the results may be applied in architectural and urban planning practice to reinforce urban identity and improve environmental quality.

5. Furthermore, the research-by-design methods used in the current study connected the spatial data and helped to organise and classify it. This approach enabled us to construct conceptual and empirical comparisons between street sections and to translate conceptual characteristics of street morphology into numerical values. For example, the imbalance in road allocation and transport use on Rayimbek Batyr Avenue (62.1%) versus the more walkable, pedestrian-friendly Dostyk Avenue (44.4%) reflects functional priorities across the street sections. On the other hand, the study suggests that street morphology should be identified through a proportionate allocation of typologies that collectively constitute the overall street hierarchy. Nonetheless, the study requires further investigation into best practices and insights to determine the most effective combinations of typologies and the allocation of typology zones.

At the same time, the study has certain limitations. The analysis focused on three streets, which enabled identification of the main types of urban environment in Almaty but did not capture the full diversity of the city's street structure. In addition, the study was based primarily on morphological, visual-spatial, and comparative analyses. It did not include a separate survey-based component that would have allowed expert assessments of the environment to be compared more directly with the perceptions of residents and users.

Further research may therefore broaden the range of streets under consideration and incorporate mapping methods, more detailed visual analysis, and empirical studies of user perception. Such an approach would help clarify how different types of urban environments in Almaty contribute to the formation of a coherent city image and enable more differentiated recommendations for its architectural and urban development.

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CONFLICT OF INTEREST

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The authors declare that no generative artificial intelligence technologies or AI-based tools were used in the preparation of this article.

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