

Original Research Article

Development and Road Landscape (The Role of Development on Road Landscape Changes, Case Study: Natanz City)*

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Abstract | Roads, as one of the main elements of the urban landscape structure, play a fundamental role in the perceptions of space, urban identity, and citizens' quality of life. However, contemporary urban developments in many Iranian cities, including Natanz, have often overlooked a holistic approach, leading to significant physical and semantic changes in the city structure. This study aims to analyze the impact of road development measures on the landscape of Natanz on three scales: macroscale (intercity road network), mesoscale (streets and principal axes), and microscale (alleys and local paths). The research method is qualitative and based on a descriptive-analytical approach, and by relying on documentary studies, comparative analysis of texts, and field observation, changes in the city's landscape over time have been examined. The findings show that recent development plans in Natanz, especially the construction of wide boulevards and the widening of passages, have caused a break in the city's historical and cultural connection with the traditional road network and have reduced spatial coherence, historical identity, and the concept of a garden city. At the microscale, the historic alleys and organic paths have given way to geometric and uniform patterns that have reduced legibility, sense of place, and social interactions. Overall, the results indicate that the development of roads in Natanz, despite facilitating movement, has led to physical, visual, and perceptual breaks. The research emphasizes that preserving the road landscape as part of the city's cultural heritage and identity requires institutionalizing a holistic approach in urban planning and design.

Keywords | Urban Landscape, Landscape Changes, Development, Road, Natanz.

Introduction | As a reflection of human interaction with the environment and a citizen's perception of the city, the urban landscape plays a decisive role in the quality of life and urban identity. Roads, as one of the main structural elements of the city landscape, not only play a role in transportation and communication, but also are effective in citizens' visual and

perceptual experience. Roads, as axes of vision and movement, play a key role in forming the urban landscape. They are not only communication routes, but also frames for observing urban and natural elements. Therefore, the design of the road landscape should be carried out with visual corridors, a sense of place, and harmony with the urban context. Roads, as the city's main arteries, not only have the function of transportation, but also play an important role in forming visual perception, a sense of place, and social interactions. Therefore, if carried out without considering the essence of the landscape and spatial characteristics, urban development

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can destroy the city's visual image and decrease the quality of citizens' experience of public spaces. In studies of Iranian urban development, the lack of a holistic approach to roads in the city landscape has caused many urban development projects in the road sector to fail to meet the needs of citizens. From this perspective, roads are not simply places for passing through and going from one place to another, but instead paths for a better understanding of the city and, as a result, improving the quality of the urban landscape, and are components for a better understanding of the whole, which is the urban landscape. This landscape is functional in historical cities and carries its cultural and historical identity. With its special geographical location and traditional context, the city of Natanz is a clear example of cities whose road landscape requires special attention in development. In this regard, this article seeks to answer the question of how the development of roads in the city of Natanz has affected the urban landscape of Natanz.

Research Method

This research is applied in nature and qualitatively in strategy employing an interpretive approach. Data collection was carried out through library, documentary, and field methods. In the first step, scientific sources, articles, and studies on urban landscape, road landscape, and urban development were reviewed to extract a theoretical framework. Then, using documentary analysis, the historical evolution of the road network and spatial developments of Natanz city were identified based on the master plan. In the field stage, direct observation of urban spaces and communication routes, photographic collection, and comparative analysis of historical and new axes were carried out to identify the perceptual and identity dimensions of the road landscape. The data were evaluated in the form of comparative analysis and interpretation. The analysis method was based on the landscape approach, which includes, in addition to physical aspects, cultural, social, and historical dimensions of space. This approach allowed the impact of road development on the landscape of Natanz to be analyzed not only at the physical level, but also at the perceptual and semantic levels.

Research Background

In general, little research has been conducted on the road landscape in Iran. The few studies in this field include the article "Road Landscape in Iran," which examined the concept of "road" in Iran and pointed out its role in diversity in life, nomadism, and interaction between ethnic groups. In the author's opinion, in Iran, the road was not considered a route or a place of passage, but rather itself is a destination, encompassing relevant elements and signs and various events, and walking along some of these roads was considered reaching the destination (Talebian, 2016). In another article

focusing more on the natural context of the road, the author highlighted the importance of paying attention to the nature of the road context, indigenous materials, and the visual and cultural connections of the road with the surrounding environment to show how the design of roads should be in harmony with the surrounding environment so that the landscape is well preserved (Gholampour, 2022). In another study, the author argued that the road is not just a passageway. However, also a part of the life, culture, and social memory of humans, and these semantic layers should be considered in its planning and design. These semantic aspects include political: a tool for dominating or independence of territories, social: changing lifestyles, social classes, economic: developing trade and exchanging products, cultural: creating indigenous terms and languages (for example, on the Chalus Road), religious: maintaining privacy, cleanliness, respecting the road in Islamic education and history: a connection with past events and personalities has been argued (Gholampour & Hadi Zadeh, 2025).

In relation to development and roads, most studies have also addressed road development's environmental and physical impacts. In a study in Qazvin province, changes in land use were studied between 1990 and 2010. The results showed that the development of the road network close to agricultural lands has caused the conversion of agricultural lands to non-agricultural uses, especially in proximity to roads (Asadi et al., 2016). This impacts the road's landscape as the green texture and nature around the road are reduced, and the visual view is transformed into urban construction and infrastructure instead of nature. Studies in Iran and elsewhere have shown that road development causes fragmentation of the natural landscape and increases ecological risk; this pattern has been seen in studies of Iranian highways and landscape-ecological studies (Mohammadi & Fatemizadeh, 2021). They have highlighted that the construction of the Isfahan-Shiraz freeway has caused landscape fragmentation and destruction. Another study also showed that the traffic dimension, the road's proximity to sensitive environments, and the degree of landscape fragmentation significantly affect ecology and landscape (Mo et al., 2016). Another paper also examined the impact of roads on landscape types (garden, lawn, forest, agricultural land). The results showed that with the development of roads, sensitive parts of the landscape are more fragmented, and the edges between natural landscape and built-up land are more exposed to change; that is, both the visual quality and ecological function of the landscape are reduced (Yan et al., 2023). In another study, the researchers believe that road development sometimes causes landscape disruption and consider functional disruption more important than physical disruption (Lindenmayer & Fischer, 2013). What is clear from the review of studies related to road development and landscape is that most studies in this field

focus on the visual, climatic, environmental, ecological, and ultimately physical impacts of development on the landscape of roads. This study attempts to take a holistic view of the “road landscape” and, with a landscape approach, not merely from a physical perspective, focusing on the cultural, social, and historical aspects of the impacts of development measures on the landscape.

Research Literature

The urban landscape is an important component in shaping the identity and public image of the city. Paths and roads are recognized as fundamental foundations of the landscape structure. Roads, in particular, form significant parts of the visual experience of citizens and visitors; building facades, vegetation, urban furniture, lighting, and roadside elements and equipment (such as walls, terraces, and utilities) also form the urban image in combination with the road. The study of road landscapes helps to strengthen urban identity and improve citizens’ perception of the city. Several general aspects can be identified in the search for research literature in the field of road landscape:

• Urban development and road landscape

- Aesthetic impacts

Urban roads often reduce visual quality, especially when commercial development lacks natural features. However, integrating trees and green infrastructure can significantly enhance the aesthetic appeal (Hyunjin & Yue, 2019).

- Improving the urban user experience / improving people’s quality of life

Roads are not just for cars or pedestrians; they are spaces where people interact: walking, socializing, resting, observing, accessing uses and services. The quality of the road landscape affects people’s comfort, safety, attractiveness, and subjective satisfaction. For example, greenery, noise reduction, broader views (sky view, distant view), the presence of urban furniture, and appropriate lighting all improve people’s experience. Research has shown that street greenery helps reduce stress, increase walking, and strengthen social cohesion (Vriers et al., 2013).

- Urban economy and investment

A beautiful and desirable road landscape can increase property values, attract tourists, and attract investment. Beautiful and more usable public spaces encourage small businesses along the roads (coffee shops, stores, service businesses). In addition, maintenance and repair costs are usually lower in well-designed landscapes, as negative environmental and human impacts (erosion, destruction, litter, visual damage) are lower.

- Social sustainability and public participation

Roads and paths can create places for social interaction, social activities, and a sense of belonging. When people like these spaces, they visit them, become more sensitive to their

neighborhood, and participate in maintenance. This also helps to increase urban safety, reduce crime, and improve the quality of life. Road landscape bridges physical infrastructure (road width, location, and quality of sidewalks, lighting, pavement, road grade) and landscape design (vegetation, furniture, facades, color, peripheral elements). To achieve the desired landscape, it is necessary to consider these two aspects in urban planning. Urban development plans focusing only on traffic or transit function may sacrifice landscape for efficiency. Conversely, landscape design without regard to function creates accessibility, safety, and sustainability problems (Fachrudin et al., 2025). Urban road landscape affects social cohesion, mobility, and the multi-use of urban spaces. The triple approach: balancing economic, social, and environmental objectives, is increasingly applied in urban road planning (Tartaglia et al., 2021). Therefore, if urban development is not fully controlled, it will lead to the degradation of the ecological, visual, social, and economic quality of the landscape. Table 1 briefly mentions some development processes related to roads and the effects of these processes on the road landscape.

The literature suggests that the relationship between development and road landscape is multifaceted. Road infrastructure accelerates economic and social development by increasing connectivity and accessibility. However, it can also cause ecological disruptions such as habitat destruction and fragmentation, biodiversity loss, and negative visual impacts. Research in this area focuses on the impacts of urban versus rural development, ecological consequences, integrating natural elements (such as trees) for aesthetic and environmental benefits, and using conceptual frameworks (e.g., road centrality criteria) to analyze landscape change. Understanding the relationship between development and road landscape is particularly important for urban, rural, and environmental planning. Roads are not simply for transportation; they are transformative agents that shape land use, economic activity, social cohesion, and environmental integrity. As global development accelerates, the challenge is to harness the benefits of road infrastructure - such as improved accessibility and economic growth - while reducing its adverse impacts on landscape aesthetics, biodiversity, and ecosystem services.

Theoretical Foundations

• Urban landscape and the landscape approach to the city

The concept of urban landscape has been proposed in recent decades as one of the key approaches in urban studies and environmental design. In contrast to the purely visual perception of the city’s appearance, urban landscape has a holistic view of the city as a “lived, perceived, and dynamic phenomenon” that is the result of the

Table 1. Some development processes related to roads and the impacts of these processes on the road landscape. Source: Authors.

Development process	Impacts on the road landscape
Road network expansion (highways and widening of roads) (Mohammadi et al., 2021)	<ul style="list-style-type: none"> - Increasing asphalt coverage, lanes, and traffic lanes leads to a reduction in roadside green spaces. - Widening road widths to increase traffic capacity leads to less visibility of sidewalks, vegetation, and side views. - Removing or reducing vegetation and branches for better visibility or more space; this may lead to a reduction in visual diversity and natural views.
Land use change in the vicinity of roads and trails (Lin et al., 2025)	<ul style="list-style-type: none"> - Conversion of gardens and agricultural lands to residential/commercial, reduction of green landscape - Landscape fragmentation: Urban roads fragment habitats, which is not only an ecological and physical phenomenon but also a cultural one. <ul style="list-style-type: none"> - New facades with modern materials that may conflict with the old texture. - Building heights increase, blocking views of natural spaces or the sky. - Creation of parking spaces, warehouses, and roadside structures that shape the edges of the road and reduce the attractiveness of the routes.
Changes in sub-infrastructure: lighting, street furniture, sidewalks, etc. (Vriers et al., 2013)	<ul style="list-style-type: none"> - If poorly designed or poorly maintained, the road will look bad. - Unnecessary signs, wire stands, electric poles, and inappropriate lamp posts cause visual monotony or crowding. <ul style="list-style-type: none"> - Lack of shade or canopy vegetation causes increased temperatures, direct sunlight, and visual discomfort. - Increased advertising, signs, and commercial lighting on the side of the road cause visual disturbance.
Changes in vegetation (Lin et al., 2025)	<ul style="list-style-type: none"> - Reduction of roadside greenery leading to increased heat and the urban heat island effect. <ul style="list-style-type: none"> - Increased air and noise pollution due to increased traffic. - Impact on wildlife and ecosystems if roads cut through natural areas.
Impact on human experience and pedestrian walking	<ul style="list-style-type: none"> - As roads become wider and the focus is on cars, sidewalks may become fewer or of poor quality. <ul style="list-style-type: none"> - The safety and comfort of movement for pedestrians and cyclists decreases. - A sense of separation, discontinuity, or visual barrier is created between spaces.
Social and economic consequences (Antrop, 2005; Lindenmayer & Fischer, 2013; Al-Mumaiz & Evdorides, 2019; Fachrudin et al., 2025)	<ul style="list-style-type: none"> - Unsuitable road landscape reduces property values, while a desirable road landscape attracts tourists and capital. - If development is inappropriate for the local context, it reduces social interactions and community activities. <ul style="list-style-type: none"> - Rural roads alter agricultural patterns and social cohesion. - Rapid changes in land use, unbalanced urban growth, and excessive modernization cause disruptions in the historical continuity of spaces.

interaction between humans, the environment, and time (Cullen, 1961; Lynch, 1960). Theoretically, the city is not a collection of physical elements, but a network of spatial, cultural, and semantic relationships formed in everyday life. Thus, the urban landscape is a “readable text of the city” that integrates physical structures, cultural signs, and human experiences (Cosgrove, 1984; Corner, 1999).

The landscape approach to urban planning and design emphasizes an integrated and holistic understanding of nature, culture, and society. This approach considers the city not part of the built environment but a “cultural ecosystem” in which physical, historical, and perceptual layers are intertwined (Antrop, 2005). Therefore, adopting a landscape approach in urban policymaking means simultaneously paying attention to space’s physical and semantic dimensions. That is, a view that understands the city as a “lived and perceived” phenomenon, not simply “made.” Therefore, the urban landscape is not a decorative layer of the city, but a way to understand and organize its physical and semantic complexities. The landscape approach, with its emphasis on historical continuity, spatial legibility, and human presence in the context of everyday life, can be a fundamental strategy for rethinking contemporary urban development in Iran and recovering the identity of place.

• Road landscape

The road landscape is the visual, spatial, and semantic experience that road users have of the road-related environment, including the road itself, vegetation, surrounding land use, form and materials of construction, road equipment, views of natural or urban landscapes, as well as cultural, historical, and symbolic elements. The road landscape is more than just the function of the road for passage and transit, meaning not only “traffic and transportation”, but also human experience, spatial identity, aesthetics, and interaction with the natural and historical environment. From a historical perspective in Iran, roads can be examined from two aspects: first, why roads emerged in Iran (primary and secondary routes, route selection based on natural features and communication needs), and second, the formation of the road landscape, i.e. road and road management facilities, road-related equipment, and the cultural and historical impacts of these infrastructures on the landscape. Therefore, the history of the “road landscape” in Iran shows that roads have not only been a route for transportation but also a phenomenon with cultural, environmental, and social layers; And historical, natural components and road services (connections, rest houses, caravanserais, etc.) have been effective in shaping this landscape (Rahmdel, 2016). From this perspective, it

can be said that the road is a landscape and the meaning and experience of the road as a landscape; the human view of the road not only as a means to reach the destination, but also considers the road itself as an experience, visual connections, spatial and social effects, and its role in shaping the sense of place. Perhaps a beautiful and scenic road can positively impact human perception, and the road is not only a route for commuting, but also a kind of “space in between” that shapes the spatial experience (Mansouri, 2016). The importance of visual connections, the connection of humans with nature and the environment, and how the road can be the site of social events, the culture of movement and stillness, are considered in the road landscape. Therefore, paying attention to the “road landscape” means taking a holistic view of the road, emphasizing the combination of nature, history, meaning, and human experience, rather than simply the engineering and functional aspects of roads. Roads are elements beyond a means of transportation: the road as a symbol of movement, connection, social service, and a landscape with a historical identity.

Case Study: Natanz City

Natanz is a historical city that has emerged since pre-Islamic times at the intersection of the historical route of the South-North Silk Road and the local microclimate at the foot of the Karkas Mountain (Mansouri, 2025). The favorable bioclimatic conditions of the Natanz region, its position in the communication network from the south to the central plateau, and especially the two strategic cities of Kashan and Isfahan, which are one of the important locations of the Rey-Isfahan highway and have provided the basis for the formation of numerous settlements and diverse and valuable architectural works in this city (Mohammadi et al., 2022). Therefore, one of the influential elements, and in fact, the shaping and identity-building elements of the city of Natanz, are the roads, which significantly impact the recognition and understanding of the city of Natanz. The city of Natanz has been formed in the context of the interaction of three fundamental components: road, climate, and civilization. Its location at the intersection of important communication axes of Iran, especially the southern-northern branch of the Silk Road and the historical Rey-Isfahan highway, has long caused this city to play a pivotal role in the communication network and cultural and economic exchanges. Such a position has made Natanz one of the strategic points on the route of caravans and interactions between Iran’s central and southern regions. On the other hand, the city’s location at the foot of the Karkas Mountain and within diverse microclimates has provided favorable conditions for human life. This foothill location with access to water resources, fertile soil, and environmental diversity has provided a suitable environment for forming sustainable habitats. As a result, the harmony

between natural features and historical communication routes has led to the development of diverse patterns of human settlement, vernacular architecture, and spatial structure in Natanz. Thus, Natanz can be considered the result of a long-term connection between the natural environment and the historical network of roads; a city that over time has gained meaning not only from its route, but also from its “road landscape” and “livable climate,” and has become one of the leading examples of the continuity of urban life in the cultural context of Central Iran.

Findings

The impact of development measures on the road landscape in Natanz city can be examined at three scales: macroscale, mesoscale, and microscale.

• Macro scale: roads and main roads

- Roads, the main element and factor of vitality of the Natanz city landscape

Natanz was essential in the early years of Islam’s arrival in Iran due to its location on the route from Rey and Khorasan, so much so that geographers of that time mentioned Natanz to explain the cities located on the route from Iraq to Rey and Iraq to Khorasan (Jeyhani, 1989, 156; Ibn Hawqal, 1987). This route was considered a branch of the Silk Road and connected the north and south of Iran (Riyazi, 2005, 54). During the Safavid period, Natanz was also on the route of one of the largest communication highways to the capital and connected Isfahan to other parts of the country. Therefore, since Natanz has always been part of important communication networks, roads have always been one of the important factors shaping the city, and roads and communication routes have played a key role in the spatial organization and connection between urban components. Therefore, in the historical memory of the city, the urban landscape and, as a result, the citizens’ perception of their living space and even the city as a whole, have a significant impact.

Urban expansion and road construction are closely related to each other and have profound effects on the structure and function of landscapes. In the meantime, highway projects, as the most prominent symbols of physical development, can be both connecting and divisive. Within the framework of the national plan for constructing the North-South Highway in the country, the Kashan-Isfahan Freeway project is a telling example that shows how decisions based on technical and economic logic can affect cultural and landscape phenomena. In this plan, the route was determined based on the criteria of efficiency, economy, and ease of implementation, and the freeway’s passage through the historical city of Natanz was considered unnecessary (Fig. 1). As a result, the route extended directly to Isfahan without passing through the historical context of the city. Although it seemed desirable from an engineering and economic perspective, this decision caused a

break in the city's historical and cultural connection with the traditional road network and the fabric of the land. Natanz, which had been formed along communication highways for centuries, and especially along the historical Silk Road route, derived an important part of its identity from its presence in this communication network. Removing it from the main route means separating the city from the spatial, social, and economic flows that have been its dynamism and meaning for centuries. Therefore, the deviation of the freeway route can be considered a physical change and a kind of "landscape and cultural break" that has weakened the historical connection between the city, the road, and the surrounding land. In other words, in this particular case, in the absence of a holistic and landscape approach, the infrastructure development did not go beyond a purely engineering stage and, as a result, ignored the intangible and historical aspects of the Natanz road landscape. Such an event shows that the design and routing of roads is not just a technical decision, but a process that must simultaneously include the cultural, historical, and perceptual dimensions of the landscape, because in societies with a history of civilization, such as Iran, the road itself is part of the social memory and territorial identity.

On the other hand, this action has caused the old road, which was once a busy route and was considered the center of economic and social activities, to lose its importance and vitality after the construction of the new freeway and the development of communication routes. This situation raises a fundamental question: At what cost is urban development? Natanz was previously more than just a connection point between two metropolises; it was a place to stop, rest, and enjoy the mild climate and natural scenery. On the one hand, these features helped its development and prosperity and provided urban vitality. On the other hand, this route showcased the entire city and its history and identity. An example is one of the famous Haft-Chenar of the city, which is located on this route. In the past, when it was a tourist route, it demonstrated well the natural and green landscape of the city and the historical and natural identity of the city (Fig. 2). Haft-Chenar is one of the most important landscape and place-making elements of the city of Natanz. The actions of the city's urban management today also show their importance in the city's historical memory. However, today, this route has become a street solely for the passage of cars. Of course, it cannot be denied that such measures are taken to facilitate matters (for example, shortening the route, speeding up transportation, etc.) and are necessary in some cases. However, the point is that the basis of such development measures must be based on a holistic view, and the characteristics of the place must be preserved so that they do not have destructive effects on the city's identity.

• Mesoscale: main streets and routes of the city

- Physical and semantic break of the landscape

In the past, the spatial structure of Natanz was formed based

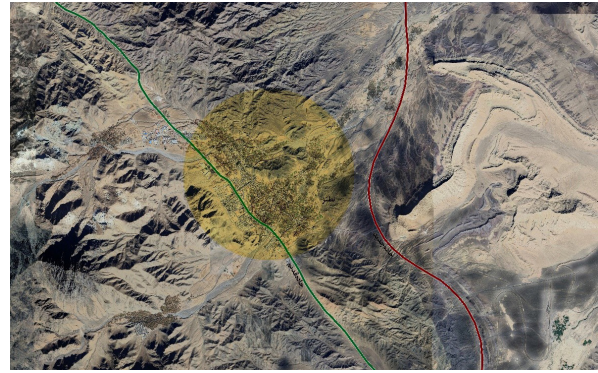


Fig. 1. The old Kashan-Isfahan Road (in green), passing through the city's heart, brought dynamism and vitality to the city of Natanz. However, the construction of the new freeway (in red) led to the abandonment of the city of Natanz and its bypass. Source: Authors.

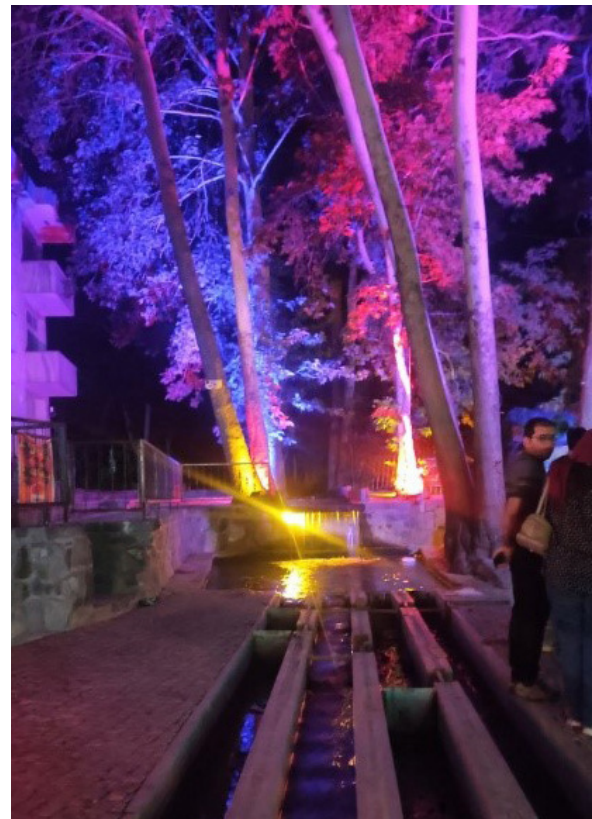


Fig. 2. The picture of Haft-Chenar, which used to be on the old road from Kashan to Natanz. The lighting of Haft-Chenar on this street shows the city administration's attention to the importance of this element in the historical and social memory of the people of Natanz. In the past, travelers passing through this road, even in passing, would encounter one of the most important elements of the landscape of Natanz, which led to a better experience and understanding of the city of Natanz. Today, this experience has been lost with the construction of the new road. Photo: Alireza Afzali, 2025.

on an organic order that was in accordance with its natural and cultural context. The network of urban roads and passages not only played a communicative role in linking physical elements such as the city center, bazaar, neighborhoods, and gardens, but also served as a social and cultural framework that paved the way for forming meaning and identity in

urban spaces. This spatial system, which was based on a hierarchy between public and private spaces, created a kind of interconnection between the body, function, and meaning; in such a way that the main routes were directed towards significant elements such as the Jama Mosque and the Sheikh Abdul Samad Complex, and these symbolic buildings formed the organizing axes of the historical context. However, this historical structure underwent profound changes with new urban development patterns in the contemporary era. The city's physical expansion towards the plain, the introduction of pedestrian-oriented street networks, the widening of traditional passages, and the break between historical centers and new areas led to the collapse of the hierarchical system and the weakening of the functional and social role of the historical road network. In this process, physical development without considering the spatial and semantic logic of the historical city caused a kind of "landscape break"; a break that is not limited to the physical level, but also includes the cultural, psychological, and perceptual dimensions of space. This break results from the loss of the historical continuity of spaces and the elimination of traditional patterns of human-environment interaction; a process that ultimately leads to the decline of "social memory, sense of place, and people's perception of the landscape." Therefore, what has happened in Natanz is not simply a change in the city's appearance, but rather the loss of the historical and cultural continuity of the perception of the city, and therefore the city's landscape; An event that shows that development without regard to local and semantic structures inevitably leads to a break in the connection between humans and the environment. The break in the city landscape gradually disrupts citizens' legibility and perception of the city. Legibility means that the components of the environment can be easily recognized and connected in the mind in an interconnected form. Having a clear image of the environment and context will make the perception of the city easier. The break in the landscape has led to consequences such as a memory break, an economic break, a socio-cultural break, and a historical break.

- The distortion of the nature of the garden city and the spatial coherence of the city

The city of Natanz is the result of the coexistence of people with the slopes of the Karkas Mountain throughout history. In fact, the existential element of this city is the Karkas Mountain (Maghsoudi, 2017), which, with its special topography in the region and the facilitation of water movement, has created a special climate in the desert part, which has made the land conducive to the formation of gardens and, subsequently, a garden city in the desert part of Iran. The urban development process in the garden city of Natanz has weakened and disappeared the garden city concept. The organic and historical texture of Natanz, which had been formed over the past centuries, has transformed contemporary development,

and by creating new roads and adopting a checkerboard pattern, it has lost its former spatial order and coherence. These spatial changes have not only led to changes in the city's physical structure, but also, in the long term, have reduced the dynamism and vitality of urban places and spaces that previously hosted active social life. The initial development plan largely preserved the spatial independence and historical coherence of Natanz Garden City. This plan, with a holistic approach and coordination with the organic fabric of the city, ensured the city's spatial coherence and environmental unity; an example of this is the old Natanz-Isfahan Road, which played an important role in the flow of urban life. However, in the secondary development plan, we witness a rupture and fragmentation in the garden city texture, disrupting the previous order and integrity and directly impacting the citizens' perception of the city environment. With a fragmented approach and limited to specific areas, this development has marginalized the nature of Natanz's garden city. In other words, a city once on the path of development and dynamism is now subject to oblivion and isolation. Now, when passing through the streets of Natanz, the concept of the garden city, as an important landscape and place-making element of Natanz, is not felt or perceived. The entirety of the garden city of Natanz has lost many of its qualitative components due to the dominance of a quantitative and purely functional approach in the face of unbridled contemporary development arising from the multitude of new demands and functions.

- Out-of-scale development

In recent years, the implementation of development plans in Natanz, especially the widening of streets in accordance with the master plan, has led to a kind of "out-of-scale development" (Fig. 3); in the sense that the dimensions and spatial proportions of public spaces have become distant from the logic of the daily life of residents and have become at the service of traffic flow and vehicular function. Wide, car-oriented streets, with a scale larger than the local structure, have created a break rather than a connection. Streets that



Fig. 3. Wide, out-of-scale streets, regardless of the characteristics of the context, have created streets devoid of pedestrians and solely focused on cars. Source: Authors' archives.

were previously a platform for social interaction, stopping, shopping, and social experience have now become mere transit routes. Such a situation is an example of what Jan Gehl (2010) refers to as the “death of life among buildings”; that is, where urban spaces are emptied of social function and reduced to only the physical infrastructure of traffic. This type of development, which has shifted from a holistic to a detail-oriented approach and from a human scale to a physical and vehicle-oriented scale, has led to a disconnection between the historical context and the new network of streets in Natanz. As a result, the relationship between speed of movement, human visual scale, and sense of place has been lost, and streets are no longer perceived as “urban space” but simply as “traffic intersections.” According to urban design studies (Lynch, 1960; Jacobs, 1961), such a development harms visual perception and landscape quality and decreases the economic and cultural dynamism of the surrounding areas. Therefore, the out-of-scale development in Natanz, although a sign of modernization on the surface, is a kind of decline in the city’s spatial, social, and historical quality.

- Uniformity in development measures

One of the fundamental challenges in the urban development process of Natanz is adopting a uniform approach in development plans that have been implemented without considering the city’s historical, physical, and identity differences. Diversity is considered a value from this perspective. Instead of explaining policies based on local characteristics and local values, the master plan has imposed a single development model on all urban structures with a general and homogenizing view. As a result, streets and paths with different backgrounds - from historical axes to new roads - have all been designed and widened with similar forms and materials, without considering their cultural or spatial differences. This has led to the gradual elimination of local structures, cutting garden paths, and destroying old organic patterns in several locations in the city’s fabric. According to Madanipour (2003) and Carmona et al. (2010), spatial homogenization in contemporary developments leads to the loss of “spatial diversity,” which is a fundamental element of vitality and sense of place. In fact, Natanz, which once maintained its distinct identity through the continuity of gardens, local paths, and public spaces, is now faced with a kind of “spatial leveling,” which, according to Jan Gehl (2010), is a sign of ignoring the human scale and spirit of place in the city. Although this homogenizing perspective may lead to physical order and visual integrity on the surface, it has weakened the city’s historical identity, legibility, and environmental diversity. It has destroyed citizens’ understanding of the diversity of spaces. Therefore, it can be said that “homogeneous development” in Natanz has led to spatial integration and the city towards uniformity and identitylessness by eliminating local distinctions.

• Microscale: alleys and passages

- Uniform development: meaningful meandering

Analysis of recent physical developments in the city of Natanz shows that the “uniform development” pattern has permeated the street level and the city’s microscale and inner fabric. The alleys of Natanz, which in the past had an organic, natural structure and were interconnected with the region’s nature, have today become straight paths lacking spatial diversity. In the past, the meandering of the alleys was not merely a physical feature. However, also a carrier of meaning and experience: changing directions regulated shadow and sunlight in relation to human movement, protrusions and depressions revealed spatial hierarchies, and intersections provided opportunities for encounters, pauses, and social interaction (Fig. 4). This organic structure created a kind of “spatial rhythm” that, according to Lynch (1960), played an important role in shaping the “mental image of the city” and the sense of orientation of citizens. However, recent developments, implemented based on master plans and engineered regulations, have replaced these complex qualities with straight lines and uniform sections. The result is the loss of sensory and perceptual qualities of space and the transformation of alleys into purely functional passages. As Jacobs (1961) emphasizes, urban life is about diversity, unpredictability, and multi-layering of spaces, characteristics that in today’s Natanz, due to uniform development, have given way to stillness and uniformity. In the words of Jan Gehl (2010), spaces that lack rhythmic variation, variety, and human proportion lose their ability to stimulate the senses



Fig. 4. Organic twists and turns of the alleys, not only for climatic considerations, but also to create diversity. Photo: Soheila Jabbari, 2025.

and create human interaction. In Natanz, new alleys with regular sections and no spatial breaks allow the pedestrian to experience space gradually. In fact, moving through the new alleys of Natanz is not a journey in space, but an indifferent passage through a linear path. These changes, in addition to affecting the perceptual experience, have led to a break between social memory and the city environment, because the historical alleys of Natanz were part of the lived memory of the residents and signs of the city's identity.

To sum up, it can be said that the uniform development on the small scale of Natanz is a sign of the dominance of the physical perspective and the neglect of the phenomenological layers of space. Urban quality lies not in geometric order, but in "experienceability" and "perceptual diversity." Bringing back the twists, turns, and human details to the alleys of Natanz could be a step toward reviving the spirit of the place and the experience of living in this historic garden city.

- Solitude and insecurity: lack of presence

One of the notable consequences of recent developments in Natanz is the solitude and reduced social dynamism in the alleys of this city. This phenomenon directly relates to the change in these spaces' spatial structure and social nature. In the past, alleys were part of the "everyday life" of residents; semi-private spaces that formed the boundary between home and city and provided a platform for interaction, conversation, and social solidarity. With the implementation of development plans and the change in the pattern of alleys to straight, wide, and uniform paths, these social spaces have gradually been emptied of their social function. The decrease in habitability, the elimination of pause spaces, and the lack of visual diversity have led to a decrease in the presence of passersby and, as a result, an increase in the sense of insecurity. The nighttime solitude of these alleys not only reinforces the feeling of insecurity, but also weakens the emotional bond of residents with the environment (Fig. 5). According to Carmona et al. (2010), the social quality of space is directly related to the "intensity of presence and interaction"; where space is devoid of presence, security and sense of place also disappear. Natanz was once known for its lively and humane alleys, but physical development without regard for social dimensions has transformed these memorable spaces into cold and lifeless paths. Revitalizing alleys as small-scale social arenas is a fundamental necessity in restoring urban life and security to the historical fabric of Natanz.

- The evolution of the meaning and function of the road: the alley, an extension of home life

In the historical context of Natanz, the remains of Iwans, overhangs, and outcroppings of houses in the alley space were signs of the continuity of life on an intermediary scale between the "house" and the "city" (Fig. 6). These physical elements were, in fact, a manifestation of the continuation of private life in a semi-public space and indicated a spatial and

semantic continuity between the inside and the outside. As Norberg-Schulz (1980) states in the concept of the "spirit of place", traditional spaces are the result of a balance between functional needs and existential needs of humans; and the alley in such a context was not simply a passageway, but an arena for the manifestation of human life. In the past, the "road" in Natanz was considered a service element (Fig. 7); a form of space that served life, interaction, and residence. Paths and passages were not the goal of development, but its result. In the words of Alexander (1977), living forms are shaped in response to real-life patterns. However, with the arrival of development plans resulting from the master plan,

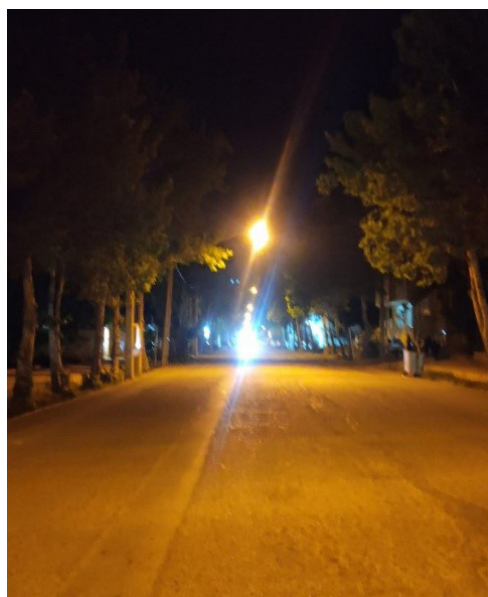


Fig. 5. A picture of one of the streets in Natanz city at night, showing the solitude of the space and creating a sense of insecurity for passers-by at night. Photo: Alireza Afzali, 2025.



Fig. 6. The alley, an extension of life in the city. The Iwan of the house with a projection in the passage space indicates the extension of life in the house in the alley space. Photo: Alireza Afzali, 2025.



Fig. 7. The alley as a path, serving humanity. Canopies along the paths and alleys created a cool climate and comfort for passersby.

Photo: Soheila Jabbari, 2025.

this ratio was reversed: today, roads are defined not in the service of life, but life in the service of the road. Streets and alleys were redesigned based on geometric and traffic criteria, and intermediary elements such as Iwans and awnings that made the connection between house and alley possible were eliminated. As a result, residents' emotional and existential connection with the space is severed. In the words of Relph (1976), this situation creates a kind of "placelessness"; a state in which spaces lose identity and meaning, and the experience of living in them becomes neutral and abstract. In contemporary Natanz, the alley is no longer an extension of the life of the house, but a boundary that separates the house from the city. Sansot (1973), in his analysis of everyday urban life, also calls the alley "the small but main stage of the spectacle of social life," a stage that is now, as a result of uniform physical developments, devoid of human action. Therefore, what has been lost in Natanz is not simply the body or facade, but the "system of spatial continuity" between the house, the alley, and the city. Rethinking the road concept, not as infrastructure, but as a human phenomenon, will be a condition for the revival of urban life in this city.

Discussion

The findings of this study show that development efforts in the city of Natanz, despite the stated goals of modernizing and improving infrastructure, have caused a deep rupture in the city's spatial, perceptual, and cultural structure. At three scales, macroscale, mesoscale, and microscale, urban spaces' historical and identity continuity has given way to a uniform body unrelated to the internal logic and "contextual space." At a macro scale, the removal of Natanz from the main route of the national road network has weakened the city's economic and social life and severed its social memory from its historical connection with the surrounding land. This shows that the road, in the cultural context of Iran, is not simply a physical infrastructure, but is part of the "spirit of place" phenomenon linked to the people's history, memory, and lived experience. At the medium scale, new street patterns with a checkerboard and car-centric logic have disrupted the

organic and hierarchical system of the historical fabric. Urban life continues in human-scale and experiential spaces, not spaces with a purely traffic function. From this perspective, contemporary developments in Natanz are an example of the "death of life," where streets are no longer arenas for interaction and stopping, but rather pathways for passage. At the micro scale, the alleys of Natanz have become monotonous, lifeless spaces devoid of social interaction. This situation reflects the dominance of the quantitative approach. Such development results in a "placelessness" in which spaces lose meaning and identity, and living in them becomes a neutral experience. In sum, it can be said that the development process in Natanz suffers from neglect of the connection between the body, meaning, and human experience. Today's Natanz, more than ever, needs to reconsider the understanding of the concept of "road," not as a means of passage, but as an extension of life, memory, and the relationship between man and the city. Reviving the spatial continuity between the house, the alley, and the city can be the first step in reviving the spirit of the place and bringing life back to it.

Conclusion

The present study focused on analyzing the impact of development measures on the landscape of roads and communication networks in the city of Natanz, and, according to observations, showed that the development process in this city, despite having positive physical and infrastructural goals, has, in practice led to a profound rupture in the connection between the body, meaning, and human experience. Natanz, a city with a long history along Iran's historical and cultural roads, has lost part of its identity and historical continuity due to the implementation of development plans lacking a holistic approach. Physical ruptures in road and street networks, the elimination of the city's organic and urban garden structure, and the uniformity of small-scale spaces such as alleys all indicate the dominance of a technical and uniform approach over a cultural and human phenomenon. The results show that roads and alleys in Natanz have not only been movement infrastructures, but also part of the social memory and social life of the residents; Spaces that linked meaning and experience to urban life in the form of organic forms, light shadows, and spatial rhythms. With the loss of this connection, the city has been emptied of its "perception of landscapes," and the sense of place among residents has been weakened. The disruption of the urban landscape caused by unbalanced development has numerous consequences in different areas, including memory, economic, socio-cultural, and historical disruption. These consequences not only threaten the spatial identity of the city but also limit its social and economic functions. As a result, the Natanz experience demonstrates the importance of paying attention to spatial coherence,

historical unity, and social dynamics in urban development processes, and the need for urban planning to consider the harmony between new development and organic and historical textures, rather than focusing solely on access and new transportation networks. Therefore, rethinking Natanz's development policies and plans requires moving beyond a purely physical perspective and returning to the lived logic and spatial landscapes. Restoring the continuity between the house, alley, and city, redefining the road as a cultural and human phenomenon, and strengthening the human scale in the city can provide a path to reviving the spirit of the place and revitalizing the historical garden city of Natanz. A study of the road landscape in the city of Natanz shows that urban development, if carried out without considering the

local region's natural, historical, and cultural characteristics, without considering the spatial context, can lead to severe damage to the city. With its historical background, Natanz requires a holistic approach in developing its communication routes. Recent developments in the road sector, including widening of routes, construction of new roads, and changes in the visual scale of routes, have sometimes reduced the sense of place, destroyed natural elements, and degraded the quality of the visual experience for citizens and tourists. This emphasizes the need to review urban development policies.

Conflict of Interest

The authors declare that there is no conflict of interest in the execution of this research.

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