

## **Principles of Architectural and Spatial Organization of Commercial and Service Facilities in Highway Roadside Areas**

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**Abstract:** This article analyzes the issue of the architectural and planning organization of trade and service facilities in highway roadside areas from the perspectives of contemporary urban planning theory, transport safety, functional zoning, landscape organization, and territorial identity. The main idea of the research is that highway roadside areas should not be regarded merely as vacant spaces adjacent to transport infrastructure, but rather as complex urban spaces that guide urban and suburban development, shape economic activity, and define the visual image of city entrance areas. The Urban Planning Code of the Republic of Uzbekistan is considered the principal legal document aimed at regulating relations in the field of urban planning activities. The Law “On Highways” interprets highways as a complex of engineering structures ensuring the safe movement of vehicles. Based on this approach, the article develops six principal guidelines for organizing roadside trade and service areas: functional zoning, transport safety, pedestrian convenience, architectural and compositional integrity, ecological and landscape sustainability, and territorial identity principles.

**Keywords:** Highway, Roadside Area, Trade and Service Facilities, Architectural and Planning Principles, Transport Safety, Functional Zoning, City Entrance Area, Landscape Architecture, Sirdaryo.

### **1. Introduction**

In contemporary urban planning, highways are regarded not only as linear infrastructure designed for the movement of vehicles, but also as important spatial and planning factors shaping territorial development, economic activity, service systems, and the urban image. Highway roadside spaces located between urban and suburban areas often accommodate functions such as retail trade, public catering, car services, fuel stations, household services, short-term recreation, and logistics. As a result, these territories are transformed from mere transport corridors into multifunctional urban environments.

The Urban Planning Code of the Republic of Uzbekistan identifies the regulation of relations in the field of urban planning activities as one of its principal objectives. This situation necessitates the scientific study of highway roadside areas as an integral component of the overall urban planning system.

The Law “On Highways” defines a highway as a complex of engineering structures that ensures

the regular and safe movement of vehicles at designated speeds, weights, and dimensions. This definition demonstrates that the planning of highway roadside areas should involve not only the placement of buildings, but also the consideration of issues related to transport safety, land use, and engineering infrastructure.

From this perspective, the organization of trade and service facilities in the highway roadside areas surrounding Sirdaryo is particularly relevant. This is because the disorderly placement of facilities, inadequately regulated access points, insufficient pedestrian infrastructure, uncontrolled outdoor advertising, and the lack of landscape elements in such territories directly affect the quality of urban planning.

### **The aim of the research**

The aim of this study is to develop scientifically grounded principles for the architectural and spatial organization of commercial and service facilities in roadside areas along highways, and to determine the possibilities of their application in the conditions of roadside zones around the city of Sirdaryo.

To achieve this aim, the following tasks are considered important: to identify the role of highway roadside areas in the urban planning system; to analyze the functional structure of commercial and service facilities; to assess the relationship between transport and pedestrian movement; to substantiate the importance of landscape and environmental protection elements; and to develop principles for creating a unified architectural image in city entrance zones.

## **2. Methodology**

The study employed methods of complex architectural and urban planning analysis, a systematic approach, comparative analysis, regulatory and legal analysis, and conceptual modeling. The system analysis makes it possible to consider highway roadside areas as a single spatial system in which transport, retail, pedestrian movement, landscape, advertising and information systems, and architectural image are interrelated components.

In the regulatory and legal analysis, the Urban Planning Code of the Republic of Uzbekistan, the Law “On Automobile Roads,” and SHNQ 2.07.06-24 “Urban Streets and Roads. Design Requirements” were used as the main sources [1], [2], [3]. SHNQ 2.07.06-24 defines requirements related to the classification of urban streets and roads, technical standards, design elements, standard design solutions, and planning schemes for their placement.

In the comparative analysis, the NACTO Urban Street Design Guide was considered an important theoretical basis. This guide interprets streets not only as transport corridors, but also as public spaces that support pedestrians, cyclists, public transport, social activity, and the local economy.

In addition, the AASHTO Roadside Design Guide was considered an important professional source for ensuring roadside safety, proper design of roadside elements, and reducing transport-related risks [4].

## **3. Results**

**Urban planning essence of highway roadside commercial-service areas.** Highway roadside areas perform three main functions within the urban planning system: transport-communication, economic-functional, and architectural-compositional.

First, from a transport-communication perspective, highways connect cities with other settlements, districts, regions, and economic centers. Commercial and service facilities located along such roads serve transit users, drivers, passengers, and the daily needs of the local population. Therefore, roadside commercial-service facilities should not be organized in isolation from traffic flows, but rather in coordination with them.

Second, from an economic-functional perspective, roadside areas represent favorable locations

for small and medium-sized businesses, catering services, auto repair, retail trade, household services, and logistics. However, uncontrolled growth of such facilities may lead not only to increased economic activity but also to spatial disorder. Therefore, economic interests must be harmonized with urban planning regulations, traffic safety requirements, and environmental balance [5].

Third, from an architectural-compositional perspective, highway roadside areas form the visual image of city entrance zones. Kevin Lynch, in his theory of urban image perception, emphasized that paths, edges, nodes, landmarks, and districts play a key role in shaping the image of a city. From this viewpoint, roadside areas can be considered spatial elements that form the outer layer of the city's visual identity.

Scientific formulation of the problem. Practical observations and urban planning experience indicate that commercial and service facilities along highway roadside areas are often developed as isolated objects, without a unified architectural and spatial concept [6]. In such cases, each facility is constructed based on its own commercial interests; however, the overall roadside environment, transport safety, pedestrian movement, the visual image of city entrances, and environmental sustainability are not sufficiently considered.

**As a result, several problems arise.** The first problem is functional disorder: retail, food service, auto service, parking areas, pedestrian pathways, and loading zones are not clearly separated or properly organized. The second problem is reduced transport safety, as an excessive number of access points leads to sudden maneuvers, unexpected stops, and an increased risk of accidents. The third problem is the insufficient development of a pedestrian-friendly environment. The fourth problem is the compositional inconsistency of facades, advertising elements, materials, and color solutions. The fifth problem is the lack of green buffer zones, tree planting, and shading elements, which results in reduced environmental comfort.

To address these issues, highway roadside commercial-service areas should be interpreted not as a collection of separate facilities, but as an integrated urban planning system that combines transport, pedestrian movement, commercial functions, landscape, and architectural image [7]. Such an approach is consistent with international perspectives on sustainable urbanization and well-managed urban development.

Principles of architectural and spatial organization. As a result of the study, the following key principles for organizing commercial and service facilities in highway roadside areas were developed.

### **1. Functional zoning principle**

Within highway roadside areas, transport movement, access points, parking areas, pedestrian zones, commercial-service blocks, catering facilities, household service areas, loading/unloading zones, and green buffer zones must be arranged in a clearly defined spatial order. Each function should have its own independent space, while remaining integrated within the overall territorial system.

The functional zoning principle reduces chaotic movement patterns, creates clear orientation for users, and increases the efficiency of commercial and service facilities [8]. This approach is consistent with the requirements of SHNQ 2.07.06-24 regarding the systematic arrangement of design elements and planning schemes of urban streets and roads.

### **2. Principle of traffic safety and access control**

Commercial and service facilities should not be directly and irregularly connected to the highway. They must be linked to the highway system through dedicated service roads, common access points, or safe turning facilities. Reducing the number of entry and exit points, separating

parking areas from the main carriageway, isolating loading/unloading zones from customer circulation, and ensuring adequate sight distances are key requirements of this principle.

The AASHTO Roadside Design Guide is an important professional reference widely used in international practice for the safe organization of roadside elements and for reducing roadside hazards [9]. Therefore, in the placement of highway roadside commercial-service facilities, issues of roadside safety and access management should be considered as separate and essential design criteria.

### **3. Principle of pedestrian accessibility and social usability**

Highway roadside areas should be convenient not only for automobile users, but also for pedestrians, local residents, passengers, and all groups of service users. Therefore, pedestrian movement should not be treated as a secondary element of architectural and spatial design, but as a core structural component [10].

Pedestrian walkways, shaded walking routes, safe crossing points, short-term resting areas, and accessible entry conditions for persons with disabilities increase the social value of commercial and service facilities. In *Cities for People*, Jan Gehl emphasizes that urban environments should be organized based on human scale, pedestrian movement, and the quality of social use. This approach also requires that highway roadside service facilities be designed in a human-centered manner.

### **4. Principle of architectural and compositional integrity**

Commercial and service facilities along highway roadside areas should be formed on the basis of a unified architectural image. Facade rhythm, building height, roof forms, materials, color schemes, shopfronts, canopies, signage, and lighting elements must be subordinated to a single compositional system [11].

This principle is especially important in city entrance zones, as the ordered or disordered appearance of roadside areas creates the first aesthetic impression for users entering the city. Kevin Lynch's theory of the urban image demonstrates that paths and visual elements play a crucial role in the perception of the city.

### **5. Principle of ecological and landscape sustainability**

Highway roadside areas are exposed to higher levels of dust, noise, heat, vehicle emissions, and visual pressure. Therefore, landscape organization in such areas should not be treated as a decorative element, but as a tool for environmental protection, microclimate regulation, and spatial structuring.

Green buffer zones, tree rows, shrubs, shaded pedestrian pathways, landscaped parking areas, and water-efficient landscape solutions improve the ecological quality of the roadside environment. The UN-Habitat World Cities Report 2022 emphasizes that future cities must develop through sustainable, resilient, and well-managed urbanization processes.

### **6. Principle of territorial identity and city entrance image**

Highway roadside areas are an important spatial layer that expresses urban identity in the external environment [12]. In particular, commercial and service facilities located in city entrance zones should be designed by considering the local climate, landscape conditions, construction materials, national-modern architectural expression, and the regional design code.

For commercial and service facilities along roadside areas around the city of Sirdaryo, the formation of territorial identity requires several key directions: the use of climate-responsive canopies and awnings; application of modern facade solutions with regional character; regulation of advertising and information signage through a unified system; softening of the roadside

environment through green landscape elements; and creating a memorable but restrained architectural image at city entrances without excessive decoration.

### **Proposed conceptual model.**

For the effective organization of commercial and service facilities in highway roadside areas, the following stepwise spatial model is proposed: highway → safety buffer zone → green protective belt → service road → parking area → pedestrian zone → commercial-service buildings → utility and loading/unloading area

In this model, the main traffic flow does not directly interact with commercial-service facilities. Instead, safety, environmental protection, transport servicing, pedestrian movement, and commercial activities are arranged in a sequential and structured manner. Such an approach ensures order, safety, accessibility, and architectural integrity within the area [13].

For the highway roadside areas around the city of Sirdaryo, the application of this model results in the regulation of access points, the organization of commercial-service facilities within a unified architectural system, the safe arrangement of parking areas and pedestrian pathways, the improvement of the visual quality of city entrance zones, and the enhancement of environmental conditions through green buffer belts. This model is considered appropriate when aligned with the normative requirements of Uzbekistan and international urban design approaches.

## **4. Discussion**

The organization of commercial and service facilities in highway roadside areas requires a multidisciplinary approach, as transport safety, economic activity, architectural image, pedestrian comfort, advertising systems, landscape organization, and environmental sustainability are closely interrelated.

In international urban design practice, streets and road spaces are interpreted not only as corridors for vehicular movement, but also as important environments for people, economic activity, pedestrians, cyclists, public transport, and public life [14]. This approach is also relevant in the context of Uzbekistan, particularly in the roadside areas around the city of Sirdaryo. Although such areas are in practice becoming economically active through the development of commercial and service facilities, their architectural and spatial organization is often insufficiently structured.

Therefore, the proposed principles serve as a scientific and practical basis for the gradual reconstruction of existing facilities and the orderly development of new construction. This approach makes it possible to consider highway roadside areas not merely as zones of commercial placement, but as an important spatial resource connected to city entrance identity, transport safety, and regional development strategy [15].

## **5. Conclusion**

Highway roadside areas represent a multifunctional urban space of strategic importance in the modern urban planning system. They integrate transport movement, commercial and service functions, local economic activity, city entrance identity, environmental conditions, and pedestrian comfort.

As a result of the study, six key principles for the architectural and spatial organization of commercial and service facilities in highway roadside areas were developed: functional zoning; traffic safety and access control; pedestrian accessibility and social usability; architectural and compositional integrity; ecological and landscape sustainability; and territorial identity and city entrance image.

The main scientific outcome of the article is that highway roadside commercial-service areas are

interpreted not as a collection of separate commercial objects, but as a unified spatial and planning system that integrates transport, pedestrian movement, commercial functions, landscape organization, and architectural image. This approach has practical significance for regulating and reconstructing roadside areas around the city of Sirdaryo, as well as for scientifically based design of new commercial and service facilities.

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