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SCIENTIFIC FOUNDATIONS OF THE ARCHITECTURAL AND PLANNING ORGANIZATION OF THE ZARAFSHAN RIVERFRONT AREAS FOR THE DEVELOPMENT OF TOURISM AND RECREATIONAL INFRASTRUCTURE (A CASE STUDY OF THE CHUPAN-ATA AREA IN SAMARKAND CITY)

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Abstract: This article examines the theoretical and practical foundations of the architectural and planning organization of the Zarafshan River waterfront areas for the development of tourism and recreational infrastructure. The relevance of the research stems from the need to make rational use of undeveloped and underutilized waterfront spaces, preserve the natural landscape, and create a comfortable urban environment. Particular attention is given to the Chupan-Ata area in Samarkand, which has potential for the development of recreational spaces, ecotourism, pedestrian routes, and public service facilities. An integrated research approach is proposed, incorporating landscape, urban planning, environmental, functional, and social analyses. The article identifies the principal design and planning principles for waterfront areas and proposes approaches to their sustainable development for tourism and recreation, taking into account natural constraints and regional climatic conditions.

Keywords: Zarafshan River, Chupan-Ata, architectural and planning organization, waterfront areas, tourism and recreational infrastructure, landscape architecture, ecotourism, sustainable development, urban environment.Characteristics of Quarries as Sites for Solar Power Plants

Quarries possess several features that make them attractive for the installation of solar energy facilities. First, they offer large areas of unused land that are generally unsuitable for agriculture or residential development, reducing competition for land use. In addition, quarries are often located near urban or industrial areas, which facilitates connection to existing energy infrastructure. This is an important factor, as long-distance energy transmission is associated with additional costs and losses. The topography of quarries is also significant. The presence of slopes and terraces allows solar panels to be installed at optimal angles without extensive ground modification. In some cases, this can even enhance the efficiency of solar installations. Furthermore, the use of quarries does not require the allocation of new land resources, which aligns with the principles of sustainable development and rational land use.

Introduction: Contemporary urban development is characterized by an increasing need to use territorial resources rationally, preserve the natural environment, and create high-quality public spaces. Under conditions of urbanization, riverfront areas are becoming particularly important because of their ecological, spatial, recreational, and urban-planning value. When appropriately planned and managed, these areas can accommodate public parks, walking routes, tourist trails, and spaces for cultural and leisure activities.

Waterfront areas constitute a complex system in which water bodies, topography, vegetation, urban development, and public functions interact. Their development should not be limited to the placement of individual landscaping facilities. Instead, an integrated approach is required to ensure coordination between natural processes, the urban spatial structure, the needs of local residents, and the prospects for tourism development.

The importance of this approach is supported by contemporary research on urban waterfront regeneration. In particular, studies of nature-based solutions emphasize the importance of ecological restoration, the protection of riverbanks, and improved public access to waterfront spaces as components of sustainable urban development [1].

This issue is especially relevant to Samarkand, given its combination of historical and cultural heritage, tourism potential, and regional natural resources. The Zarafshan River is an important element of the natural framework of the Samarkand oasis. However, the use of certain riverfront areas for organized recreation and tourism requires a comprehensive assessment of their current condition, functional potential, and environmental constraints.

In this context, the Chupan-Ata area is considered a case study through which scientifically grounded approaches to waterfront planning can be developed, taking into account natural conditions, the existing urban structure, and tourism and recreational needs.

The aim of the study is to develop scientific and methodological principles for the architectural and planning organization of the Zarafshan River waterfront areas to support the development of tourism and recreational infrastructure, using the Chupan-Ata area of Samarkand as a case study.

To achieve this aim, the following research objectives are established:

To examine theoretical approaches to the architectural and planning organization of riverfront areas.

To identify the main natural, spatial, and functional factors influencing their development.

To establish a methodology for the comprehensive assessment of waterfront areas.

To define principles for functional zoning and the organization of tourism and recreational spaces.

To propose approaches for integrating the natural landscape, public spaces, and tourist service facilities.

To formulate recommendations for environmentally responsible and sustainable development of the study area

•[photo-1]

1. Theoretical Foundations of Waterfront Area Planning

The architectural and planning organization of waterfront areas is a process of developing a spatial structure that ensures the rational interaction of natural components and human activities. Its primary objective is to create an environment in which tourism and recreational activities can develop without significantly disrupting the natural balance.

Unlike conventional urban sites, waterfront areas are directly influenced by hydrological processes, riverbank conditions, seasonal changes in water levels and flow, topography, and vegetation. Consequently, architectural design should be based on a preliminary assessment of natural conditions and the identification of appropriate land-use functions.

From a scientific perspective, waterfront planning incorporates three interrelated levels. The first is the landscape and ecological level. It involves preserving natural areas, protecting vegetation, considering the hydrological regime, preventing erosion, and maintaining ecological connections between the river valley and adjacent territories.

The second is the architectural and planning level. It encompasses functional zoning, pedestrian routes, recreational areas, access points, public spaces, and the location of visitor service facilities.

The third is the social and functional level. It addresses the needs of different population groups, accessibility, pedestrian safety, opportunities for cultural and leisure activities, and the development of tourism services.

These levels should be considered as parts of a unified system. For example, a walking path along a riverbank must be designed not only for pedestrian convenience but also with regard to soil stability, vegetation conservation, safety during seasonal water-level changes, and accessibility for people with reduced mobility.

Contemporary urban planning increasingly incorporates nature-based solutions. These include preserving natural topography, restoring vegetation communities, using permeable paving, establishing green corridors, and integrating water bodies into public-space networks. UN-Habitat publications identify such approaches as important tools for improving urban environmental resilience and the quality of the built environment [2; 3].

Therefore, the architectural and planning organization of waterfront areas should be based on a balance between ecological, urban-planning, social, and economic interests.

2. Urban Planning and Landscape Potential of the Chupan-Ata Area

Samarkand is one of Uzbekistan's most important historical and tourism centers. Its spatial development is closely associated with its historically established settlement structure, the natural conditions of the Samarkand oasis, and the use of water resources. Accordingly, the planning of riverfront areas around the city should be considered within the broader framework of urban and regional development.

Research on Samarkand's urban development highlights the importance of coordinating contemporary urban transformations with the city's historical structure, cultural heritage protection, and the rational management of natural resources [4]. These considerations are also relevant to the development of tourism and recreational areas.

The Chupan-Ata area is of particular interest because it offers an opportunity to examine the relationship between the river landscape, adjacent urban spaces, and potential recreational facilities. However, the precise boundaries of the study site, its area, existing land uses, and distance from the river must be established using cartographic materials, geodetic data, and field surveys. The potential of the area should be assessed in several key dimensions.

3. Methodology for the Comprehensive Assessment of Waterfront Areas

The development of scientifically grounded proposals for the architectural and planning organization of waterfront areas requires a combination of complementary research methods.

The first stage involves collecting baseline data. This includes analyzing topographic maps, Earth observation imagery, urban-planning documentation, land-use information, and available data on the river's hydrological regime. Existing restrictions on the use of waterfront land should also be examined.

The second stage is field investigation. It involves documenting existing access roads and pedestrian approaches, riverbank conditions, vegetation, landscaping elements, informal recreation areas, and potential sources of adverse environmental impacts. The findings should be recorded through photographs, site plans, and thematic maps.

The third stage is spatial analysis. Geographic information systems (GIS) can be used to integrate data on topography, land use, transport networks, vegetation, water bodies, and existing development. This makes it possible to identify areas most suitable for recreational use and locations where human activities should be restricted.

The fourth stage is the assessment of tourism and recreational suitability. The following criteria may be used to compare different parts of the study area:

-Environmental resilience.
-Accessibility for visitors.
-Safety of use.
-Landscape attractiveness.
-Connectivity with urban infrastructure.
-Opportunities for public functions.
-Costs of landscaping and subsequent maintenance.

A scoring system may be applied to organize the results. For example, each criterion can be assessed on a five-point scale, followed by the calculation of a composite indicator that accounts for the relative importance of each criterion. The weighting system should be justified through expert assessment, regulatory requirements, and field survey findings. A numerical score alone cannot replace engineering and environmental investigations.

The fifth stage involves developing planning scenarios. Based on the collected data, alternative development options can be prepared, including a primarily conservation-oriented scenario, a recreational scenario, and an integrated tourism and recreation scenario. Comparing these alternatives makes it possible to identify the most appropriate planning model in view of environmental constraints and the city's development prospects.

This sequence is consistent with contemporary approaches to integrating nature-based solutions into territorial planning, which emphasize baseline analysis, stakeholder identification, vulnerability assessment, and the selection of appropriate spatial interventions [2].

4. Key Principles of Architectural and Planning Organization

Based on the theoretical approaches examined above, a set of principles can be formulated for the architectural and planning organization of the Zarafshan River waterfront areas.

1. The principle of environmental priority. Tourism infrastructure should be developed with due regard to the ecological value of the site. Areas of high environmental significance should be preserved, while the construction of buildings and facilities should be permitted only after compliance with environmental and urban-planning requirements has been established.

2. The principle of functional zoning. The territory should be divided into functional zones according to its natural characteristics and the intensity of use. Preliminary zones may include a nature conservation zone, a pedestrian zone, a quiet recreation zone, an active recreation zone, and a visitor services zone. The final location and composition of these zones should be determined after a site assessment.

3. The principle of continuity of public spaces. Pedestrian routes should connect entrances, recreational areas, viewpoints, and existing public spaces. However, route continuity should not be achieved at the expense of ecologically sensitive natural areas.

4. The principle of accessibility and inclusiveness. The design should provide convenient approaches, clear wayfinding, safe surfaces, and opportunities for people of different ages and physical abilities to use the area. Where topography and conservation requirements permit, accessible routes without abrupt changes in elevation should be provided.

5. The principle of landscape integration. Buildings and landscaping elements should correspond to the scale and character of the surrounding landscape. Preference should be given to compact facilities that do not visually overwhelm the river valley or interfere with natural processes.

5. Development of Tourism and Recreational Infrastructure

The development of tourism and recreational infrastructure in the Chupan-Ata area should be considered as a coordinated system of spaces and facilities that supports visitors' leisure activities, appreciation of the natural landscape, and participation in cultural and educational activities.

The principal planning element could be a network of walking routes connecting access points, short-stay recreational areas, observation platforms, and visitor service facilities. These routes should be designed with regard to topography, soil conditions, existing paths, and the need to protect vegetation.

Depending on the findings of the site assessment, several functional directions may be considered.

Nature and ecotourism would involve preserving the natural landscape, developing ecological trails, installing interpretive information boards, and creating designated locations for observing nature. This approach can support educational tourism without an excessive concentration of permanent structures.

Recreational development would involve providing quiet resting areas, shaded spaces, and small areas for social interaction and walking. Landscaping should respond to local microclimatic conditions and avoid excessive water consumption.

Cultural and educational tourism could include information points presenting verified information about the natural characteristics of the Zarafshan River, the historical development of the Samarkand oasis, and the importance of water resources to the region.

Visitor services could include sanitary facilities, drinking-water points where technically feasible, wayfinding systems, and small visitor service facilities. Their location should be determined by the availability of utilities, sanitary requirements, and the acceptable level of environmental pressure.

It is important to avoid excessive concentrations of commercial facilities, large parking areas, and major entertainment structures. Such development could increase traffic, undermine the visual integrity of the landscape, and intensify human pressure on the riverfront ecosystem.

A preferable approach is to create compact, functionally justified, and environmentally compatible infrastructure that provides an appropriate level of comfort while minimizing intervention in the natural environment.

Transport accessibility is also important. The main entrances should connect to the existing street network, with safe pedestrian approaches and, where conditions permit, cycling routes. Parking areas should be located outside the most environmentally sensitive parts of the site and in compliance with applicable restrictions.

The waterfront should also be integrated into the city's network of green connections. This would allow it to function not only as an independent recreational area but also as part of a wider system of public spaces, natural areas, and tourism routes in Samarkand.

6. Scientific Novelty and Practical Significance of the Research

The scientific novelty of the research should be established by comparing existing scientific approaches with the findings of a site-specific investigation of the Chupan-Ata area. At this stage, several potential contributions can be identified for subsequent verification and substantiation.

The first concerns the development of a comprehensive methodology for assessing the suitability of waterfront areas for tourism and recreational use. This methodology could combine landscape, urban-planning, functional, social, and environmental criteria within a unified decision-making framework.

The second concerns the development of principles for differentiated functional zoning, in which the intensity of recreational use is determined by environmental resilience, accessibility, and the spatial characteristics of individual areas.

The third involves developing a model for integrating tourism infrastructure with the natural landscape. Such a model would coordinate walking routes, public spaces, recreational areas, and visitor service facilities.

The fourth concerns the adaptation of architectural and planning solutions to local climatic conditions, the hydrological regime of the river, and the landscape characteristics of the Samarkand oasis.

The practical significance of the study lies in the potential application of its recommendations in preparing landscape improvement concepts, designing recreational areas, updating urban-planning documentation, and planning tourism routes.

The proposed approach may also be applied to other underutilized waterfront areas in Uzbekistan. However, transferring the findings to other sites would require consideration of differences in natural conditions, land use, hydrology, and existing development.

To substantiate the scientific novelty, it is necessary to conduct a comparative review of national and international research, carry out field surveys, prepare cartographic materials, assess existing restrictions, and validate the proposed methodology using quantitative and qualitative indicators

List of Internet Resources:

1. UNESCO World Heritage Centre. Samarkand – Crossroad of Cultures. Available at: https://whc.unesco.org/en/list/603/

2. European Commission. Nature-Based Solutions. Available at: https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en

3. World Tourism Organization (UN Tourism). Official website. Available at: https://www.unwto.org/

4. Google Earth. Satellite imagery and spatial analysis of the study area. Available at: https://earth.google.com/

5. LexUZ. National database of legislation of the Republic of Uzbekistan. Available at: https://lex.uz/

Literature:

1. Marzio, S., Tosi, J., Poggi, F., & Amado, M. Nature-based solutions for urban waterfront regeneration: A systematic review of frameworks, strategies and applications. City and Environment Interactions. 2026, Vol. 29, Article 100281. DOI: https://doi.org/10.1016/j.cacint.2025.100281.
2. UN-Habitat. Integrating Nature-Based Solutions into Urban & Territorial Planning: Building Biodiverse & Resilient Cities. 2025. Available at: https://unhabitat.org/integrating-nature-based-solutions-into-urban-territorial-planning.
3. UN-Habitat. Nature-Based Solutions in Urban Regeneration. 2025. Available at: https://unhabitat.org/nature-based-solutions-in-urban-regeneration.
4. Biagioli, C. A Comprehensive Overview of the Urban Development of Samarkand (Zeravshan River Valley). Journal of Asian Civilizations. 2025, Vol. 48, No. 1/2, p. 161.
5. Sadikova, S. N., & Sadikov, J. R. Assessment of Eco Tourist Potential of Recreational Places of Samarkand Region. Indonesian Journal of Law and Economics Review. 2020, Vol. 7. DOI: https://doi.org/10.21070/ijler.2020.V7.488.
6. Bobobekov, B. K., Bobobekov, B. B. (2023). Issues of Architectural and Landscape Organization of Pedestrian Tourist Routes (PTM) in the Historical Cities of Uzbekistan.

7. Pulatovich, M. B. (2021). Energy Efficient Building Materials for External Walls of Residential Buildings Physical Properties of Heat. International Journal of Culture and Modernity, 9, 1-11.
8. Pulatovich, M. B. (2021). Analysis of underground projects of energy-efficient residential buildings. International Journal of Culture and Modernity, 9, 12-18.