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A CONCEPTUAL FRAMEWORK FOR THE PLANNING OF AGRO-INDUSTRIAL TERRITORIES IN URBAN SYSTEMS: THE CASE OF THE KHOREZM REGION

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Abstract: The integration of agro-industrial territories into urban systems represents a critical dimension of contemporary spatial planning, particularly in regions with strong agricultural economies. This study proposes a conceptual framework for the planning of agro-industrial territories within urban systems, using the Khorezm region as a case study. The research aims to identify spatial, functional, and infrastructural principles that ensure the efficient organization of agro-industrial zones while supporting sustainable urban development. A qualitative methodology is employed, combining theoretical analysis, literature review, and regional spatial assessment. The findings highlight the importance of functional zoning, transport connectivity, cluster-based organization, and environmental considerations in structuring agro-industrial territories. The proposed framework contributes to bridging the gap between agricultural production and urban planning, offering practical implications for regional development strategies in post-Soviet contexts.

Keywords: agro-industrial zones, urban planning, spatial organization, Khorezm region, conceptual framework

Аннотация

Интеграция агропромышленных территорий в городские системы является важным направлением современного пространственного планирования, особенно в регионах с развитой сельскохозяйственной экономикой. В данной статье предлагается концептуальная модель планирования агропромышленных территорий в структуре городских систем на примере Хорезмской области. Цель исследования — выявить пространственные, функциональные и инфраструктурные принципы эффективной организации агропромышленных зон с учетом устойчивого развития. Методология основана на теоретическом анализе, обзоре литературы и региональной пространственной оценке. Результаты подчеркивают значимость функционального зонирования, транспортной связанности, кластерного подхода и экологических факторов. Предложенная модель способствует интеграции сельскохозяйственного производства и градостроительного планирования.

Ключевые слова: *агропромышленные зоны, градостроительство, пространственная организация, Хорезмская область, концептуальная модель*

1. Introduction

Agro-industrial territories play a pivotal role in shaping regional economies, particularly in agrarian regions such as the Khorezm region of Uzbekistan. Traditionally, urban planning and agricultural production have been treated as separate domains. However, contemporary planning approaches emphasize their integration to ensure sustainable and efficient land use (FAO, 2017). In post-Soviet contexts, including Uzbekistan, agro-industrial development has undergone significant transformation due to economic restructuring, decentralization, and the emergence of market-oriented systems. These changes necessitate a rethinking of spatial planning strategies, particularly in regions where agriculture remains a dominant economic sector (World Bank, 2020). Despite the growing importance of agro-industrial zones, there remains a lack of comprehensive conceptual frameworks that guide their integration into urban systems. This study addresses this gap by proposing a structured approach to planning agro-industrial territories, with a focus on the Khorezm region as a representative case.

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2. Literature Review

The concept of agro-industrial integration has been widely discussed in the context of regional development and spatial planning. According to the Food and Agriculture Organization (FAO), agro-industrial development requires coordinated planning of production, processing, and distribution systems to enhance efficiency and sustainability (FAO, 2017). Urban planning scholars emphasize the importance of functional zoning and land-use optimization in organizing industrial and agricultural activities. As noted by Peter Hall, modern urban systems must accommodate diverse economic functions, including agriculture-related industries, within a coherent spatial structure (Hall, 2002). In transition economies, agro-industrial clusters have emerged as a key strategy for enhancing competitiveness and regional development. Research by World Bank highlights that cluster-based approaches facilitate the integration of production, processing, and logistics, thereby improving economic efficiency (World Bank, 2020). Furthermore, transport infrastructure plays a crucial role in the spatial organization of agro-industrial territories. Efficient connectivity between rural production areas and urban markets is essential for reducing costs and ensuring timely distribution (Rodrigue et al., 2020).

3. Methodology

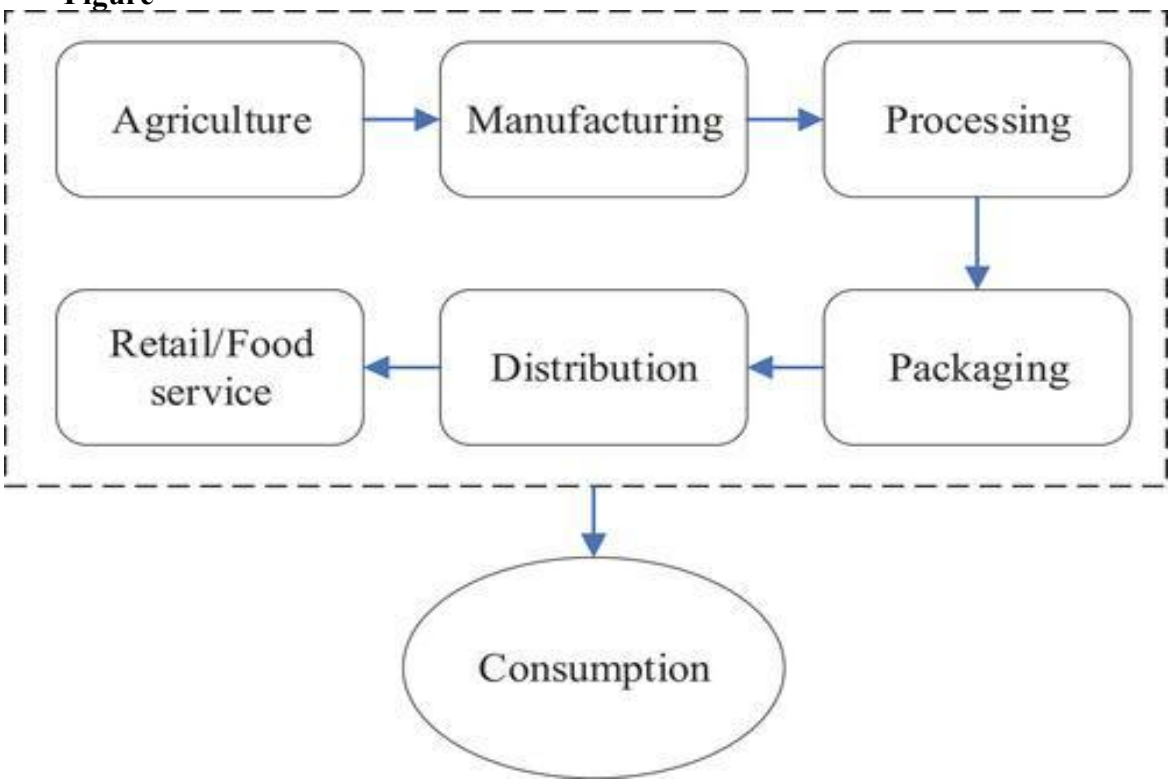
This study employs a qualitative research design based on: Theoretical analysis of urban planning and agro-industrial development concepts; Literature review of international studies and policy reports; Regional assessment of the Khorezm region's spatial structure

The methodological approach focuses on synthesizing existing knowledge to develop a conceptual framework applicable to real-world planning contexts.

4. Results and Discussion

The analysis of agro-industrial territories within the Khorezm region reveals a complex spatial structure shaped by historical agricultural practices, infrastructural limitations, and emerging economic transformations. Unlike highly industrialized regions, Khorezm demonstrates a predominantly agrarian spatial pattern, where agricultural production zones are often physically separated from processing and distribution facilities. This spatial disconnection leads to inefficiencies in the agro-industrial chain, including increased transportation costs, delays in processing, and post-harvest losses.

Figure 1



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As shown in Figure 1, the separation between production, processing, and distribution stages results in inefficiencies within the agro-industrial system.

Similar challenges have been identified in transitional agricultural economies, where the lack of integrated planning frameworks results in fragmented territorial organization (World Bank, 2020).

A detailed examination of land-use patterns indicates that agricultural lands dominate the regional structure, particularly in rural and peri-urban areas. However, agro-processing facilities are typically concentrated near urban centers such as Urgench, creating a monocentric pattern of industrial activity. This concentration leads to uneven spatial development, where peripheral districts remain underdeveloped in terms of infrastructure and economic diversification. As highlighted by FAO (2017), such imbalances reduce the overall efficiency of agro-industrial systems and limit regional competitiveness.

From a functional perspective, the absence of clearly defined zoning for agro-industrial activities contributes to overlapping land uses and operational conflicts. In many cases, storage facilities, small-scale processing units, and agricultural production areas coexist without a coherent spatial hierarchy. This lack of organization not only reduces productivity but also creates environmental and санитар challenges, particularly in densely populated areas. Urban planning theory emphasizes that effective functional zoning is essential for optimizing land use and ensuring compatibility between different economic activities (Hall, 2002). Transport infrastructure emerges as a critical factor influencing the spatial efficiency of agro-industrial territories. In the Khorezm region, road networks provide the primary means of connectivity between rural production areas and urban processing centers. However, the quality and capacity of these networks vary significantly, particularly in remote districts. Limited access to high-capacity transport corridors constrains the movement of agricultural goods, thereby affecting the timeliness and cost-efficiency of supply chains. According to Rodrigue et al. (2020), the integration of transport systems into spatial planning is a key determinant of regional economic performance, especially in agro-based economies.

The concept of clustering offers a potential solution to the identified spatial and functional inefficiencies. By co-locating agricultural production, processing facilities, storage units, and logistics hubs within a defined framework, agro-industrial clusters can enhance operational synergy and reduce transaction costs. In the context of Khorezm, the development of such clusters would allow for a more balanced spatial distribution of economic activities, particularly in peripheral districts. Empirical studies suggest that cluster-based development models significantly improve productivity and innovation in agro-industrial sectors (World Bank, 2020).

Environmental considerations also play a crucial role in the planning of agro-industrial territories. The intensive use of land and water resources in Khorezm, combined with the legacy of irrigation-based agriculture, raises concerns regarding soil degradation, water scarcity, and ecological sustainability. Without proper spatial planning, the expansion of agro-industrial activities may exacerbate these issues. Therefore, integrating environmental criteria into the planning framework is essential to ensure long-term sustainability. FAO (2017) emphasizes that sustainable agro-industrial development must balance economic growth with environmental protection and resource efficiency.

Based on the above analysis, the proposed conceptual framework for agro-industrial territory planning in urban systems is structured around three interdependent dimensions: spatial organization, functional integration, and infrastructural connectivity.

Figure 2

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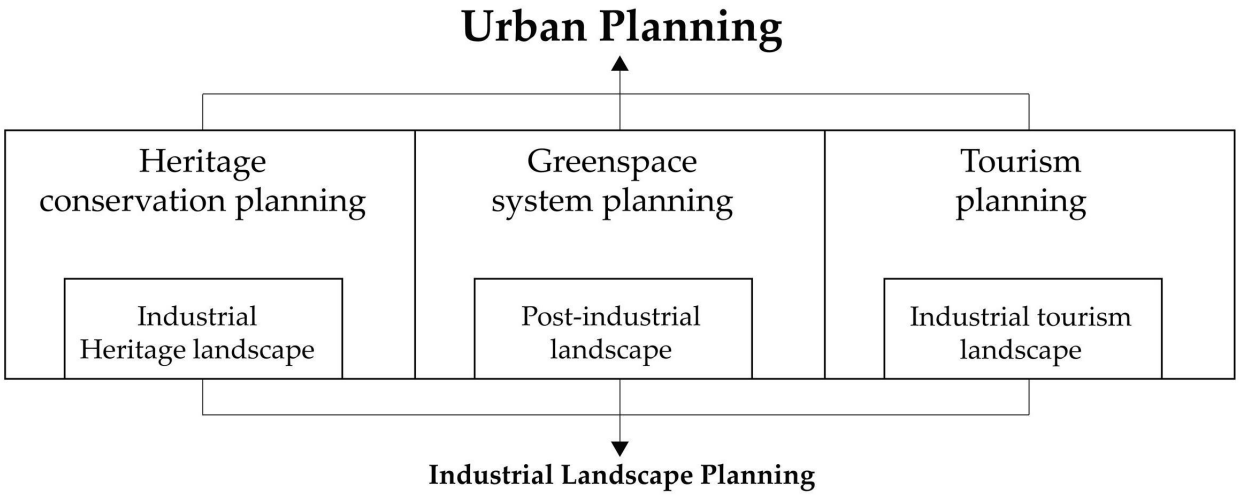

Figure 2 illustrates the interaction between spatial organization, functional integration, and infrastructural connectivity.

These dimensions are not isolated; rather, they interact dynamically to shape the overall performance of agro-industrial systems. For instance, improved transport infrastructure enhances functional integration by facilitating the movement of goods, while effective spatial zoning supports both infrastructure development and environmental management.

In applying this framework to the Khorezm region, it becomes evident that current planning practices require significant adaptation. A shift from fragmented and sector-based planning toward an integrated, system-oriented approach is necessary. This involves redefining land-use policies, investing in transport and logistics infrastructure, and promoting cluster-based development strategies. Such transformations would not only improve the efficiency of agro-industrial systems but also contribute to broader regional development objectives, including employment generation, economic diversification, and urban-rural integration. Overall, the results demonstrate that the spatial organization of agro-industrial territories is a decisive factor in determining the economic and environmental performance of the region. The discussion highlights the need for a holistic planning framework that aligns agricultural production with urban development processes, thereby creating a more resilient and sustainable regional system.

The proposed framework consists of three interconnected layers:

- Spatial Layer**:** land-use structure and zoning
- Functional Layer: production–processing–distribution chain
- Infrastructure Layer: transport and logistics systems

These layers interact dynamically to form an integrated agro-industrial system within the urban context.

Application to the Khorezm Region

The Khorezm region, characterized by intensive agriculture and limited industrial diversification, presents a suitable case for applying the proposed framework. Key observations include:

- Strong dependence on agricultural production
- Insufficient integration between rural and urban economic activities
- Need for improved logistics and infrastructure

The implementation of the conceptual framework can enhance regional efficiency, support economic diversification, and improve spatial organization.

5. Conclusion

This study develops a conceptual framework for the planning of agro-industrial territories within urban systems, emphasizing spatial, functional, and infrastructural integration. The case of the Khorezm region illustrates the relevance of the proposed approach in agrarian economies

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undergoing transformation. The findings suggest that effective agro-industrial planning requires a holistic perspective that integrates land use, economic activities, and infrastructure. The proposed framework offers a practical tool for planners and policymakers aiming to promote sustainable regional development. Future research may focus on quantitative modeling and GIS-based analysis to further refine and validate the framework.

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