TECHNOLOGY AND ORGANIZATION OF CONSTRUCTION

ТЕХНОЛОГИЯ И ОРГАНИЗАЦИЯ СТРОИТЕЛЬСТВА

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Methodological Foundations of a Project of Organizing Construction and Development of Territories in a System of Integrated Territorial Development

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Abstract

Introduction. This study is dedicated to development of methodological foundations of territorial development construction project (TDCP) as a tool for managing integrated territorial development (ITD). The existing approaches to construction organization based on the traditional object-by-object construction organization project (COP) fail to provide necessary coordination of resources and logistics. The aim of the study is to develop the theoretical foundations and structure of TDCP and structure of ITD, ensuring effective management of construction processes within the framework of ITD projects and master plans.

Materials and Methods. The research is based on the analysis of theoretical approaches to construction organization, systematization of experience in implementing integrated territorial development projects and identification of the drawbacks of the existing methodologies. Methods of system analysis, comparative analysis, structural and functional modeling and generalization of the theoretical provisions were used.

Research Results. The structure of TDCP has been developed, including the external contour (transport accessibility, engineering infrastructure, engineering protection of a territory, logistics links, natural and territorial conditions, institutional environment) and an internal contour (production facilities, temporary infrastructure, internal engineering networks, transport networks, labor resources, stages of construction). The mechanism of converting the constraints of the external contour into the internal one and compensatory measures ensuring the sustainability of the project is substantiated.

Discussion and Conclusion. The developed TDCP methodology serves as the theoretical foundation for organizing construction within integrated territorial development projects. The introduction of the concept of external and internal contours enables one to systematically account for the limitations and capabilities of a territory, ensuring efficient allocation of resources and coordination of construction processes.

Keywords: territorial development construction project, integrated territorial development, external contour, internal contour, construction organization, resource coordination, logistics, territorial planning

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Оригинальное эмпирическое исследование

Методологические основы проекта организации строительства развития территорий в системе комплексного развития территорий

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Аннотация

Введение. Настоящее исследование посвящено разработке методологических основ проекта организации строительства развития территорий (ПОСРТ) как инструмента управления комплексным развитием территорий (КРТ). В условиях масштабного территориального развития существующие подходы к организации строительства, основанные на традиционном пообъектном проекте организации строительства (ПОС), не обеспечивают необходимой координации ресурсов и логистических процессов. Цель работы — разработка теоретических основ и структуры ПОСРТ, обеспечивающих эффективное управление строительными процессами в рамках проектов КРТ и мастер-планов.

Материалы и методы. Исследование основано на анализе теоретических подходов к организации строительства, систематизации опыта реализации проектов комплексного развития территорий и выявлении недостатков существующих методологий. Использованы методы системного анализа, сравнительного анализа, структурно-функционального моделирования и обобщения теоретических положений.

Результаты исследования. Разработана структура ПОСРТ, включающая внешний контур (транспортная доступность, инженерная инфраструктура, инженерная защита территории, логистические связи, природно-территориальные условия, институциональная среда) и внутренний контур (производственные объекты, временная инфраструктура, внутренние инженерные сети, транспортные сети, трудовые ресурсы, этапность строительства). Обоснован механизм трансляции ограничений внешнего контура во внутренний и компенсационные меры, обеспечивающие устойчивость реализации проекта.

Обсуждение и заключение. Разработанная методология ПОСРТ формирует теоретическую основу для организации строительства в рамках проектов комплексного развития территорий. Введение концепции внешнего и внутреннего контуров позволяет системно учитывать ограничения и возможности территории, обеспечивая эффективное распределение ресурсов и координацию строительных процессов.

Ключевые слова: проект организации строительства развития территорий, комплексное развитие территорий, внешний контур, внутренний контур, организация строительства, ресурсная координация, логистика, территориальное планирование

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Introduction. Over the recent decades, the issues of integrated territorial development (ITD) have become of particular importance in the context of sustainable development of urban and rural areas [1]. The implementation of Federal Law No. 494-FZ "On Integrated Territorial Development" and national projects aimed at enhancing the quality of the urban environment calls for an improvement in the methodology of construction organization [2]. This is particularly the case for regions witnessing an active economic and demographic growth, such as the Chechen Republic, where a large-scale territorial development program is being implemented [3].

The existing approaches to construction organization based on the traditional on-site construction organization project (COP) developed in compliance with SP 48.13330.2019 "Construction Organization" [4] fail to provide the necessary coordination of resources and logistical processes in implementing ITD projects [5]. The traditional COP

developed in compliance with the requirements of the Urban Planning Code of the Russian Federation dated December 29, 2004, No. 190-FZ focuses on a separate building or structure and fails to account for the specific features of mass construction in an area with a set of interconnected objects.

Studies by Azari Abramovich Lapidus substantiated the need to develop a territorial organization project (TOP) as an element of integrated territorial development. The further development of the concept led to the idea of a territorial development construction project (TDCP), a comprehensive document integrating solutions for engineering training, logistics and management of construction flows at a territory level [1, 6].

An analysis of the scientific literature shows that the work of both domestic [5, 6] and foreign researchers [7–10] is dedicated to organizing construction within the framework of ITD. However, a comprehensive methodology combining the theoretical foundations and practical tools of construction organization for ITD projects calls for further development.

The aim of the study is to develop the methodological foundations of a territorial development construction project, ensuring effective management of construction processes within the framework of integrated territorial development projects.

To this end, the following tasks were addressed:

– theoretical approaches to construction organization were analyzed, the drawbacks of the existing methodologies in relation to ITD projects were identified;

– structure of the ITD was developed, including the external and internal contours of construction organization;

– mechanism of interrelation of contours and translation of constraints is substantiated;

– traditional TOP and TDCP were compared.

Materials and Methods. The study is based on an analysis of regulatory documentation, scientific literature and practice of implementing projects for integrated territorial development. The following methods were employed:

1. The method of system analysis is applied in order to identify the interrelationships between the elements of construction organization within the framework of ITD and formation of ITD structure. This method enabled us to regard construction organization as a complex system, including the constantly interacting external and internal elements.

2. A comparative analysis method is used in order to compare the traditional TOP and the proposed TDCP according to the major parameters: planning object, scale, logistics approach, engineering support, planning, coordination of participants, resource management, risks and the final result.

3. The method of structural and functional modeling is used in order to develop a conceptual model of the ITD that includes external and internal contours with details of their constituent elements and interaction mechanisms.

4. The method of generalization of theoretical provisions is employed in order to form the methodological foundations of the ITD based on an analysis of the existing approaches to construction organization and territorial planning.

Research Results. As a result of the study, the structure of a territorial development construction project has been developed, which is a comprehensive document combining territorial development planning and construction organization.

TDCP includes two major components: the external contour and internal contour (Fig. 1).

The external contour of ITD covers elements located outside a projected territory, but which have a major impact on construction organization. The external contour includes:

– transport accessibility includes access highways, their capacity, structure of traffic flows and restrictions on movement of freight transport. ITD projects are characterized by a high intensity of cargo transportation, which calls for special solutions for transport logistics organization;

– engineering infrastructure covers the main networks of electricity, water supply, sanitation, heat and gas supply, as well as resource provision sources. The parameters of the backbone networks are critical to the connectivity and call for the design of internal distribution systems;

– engineering protection of the territory includes measures for protection against flooding, landslides, mudslides and other natural impacts. For territories with a difficult terrain, this element is of particular significance;

– logistical connections are critical to the structure of suppliers of building materials, delivery routes, availability of production bases and warehouse complexes in a project implementation region;

– natural and territorial conditions include terrain, geological conditions, climatic factors, hydrological conditions, and environmental constraints;

– institutional environment covers regulatory framework, administrative procedures, system of government regulation, and a project's stakeholders.

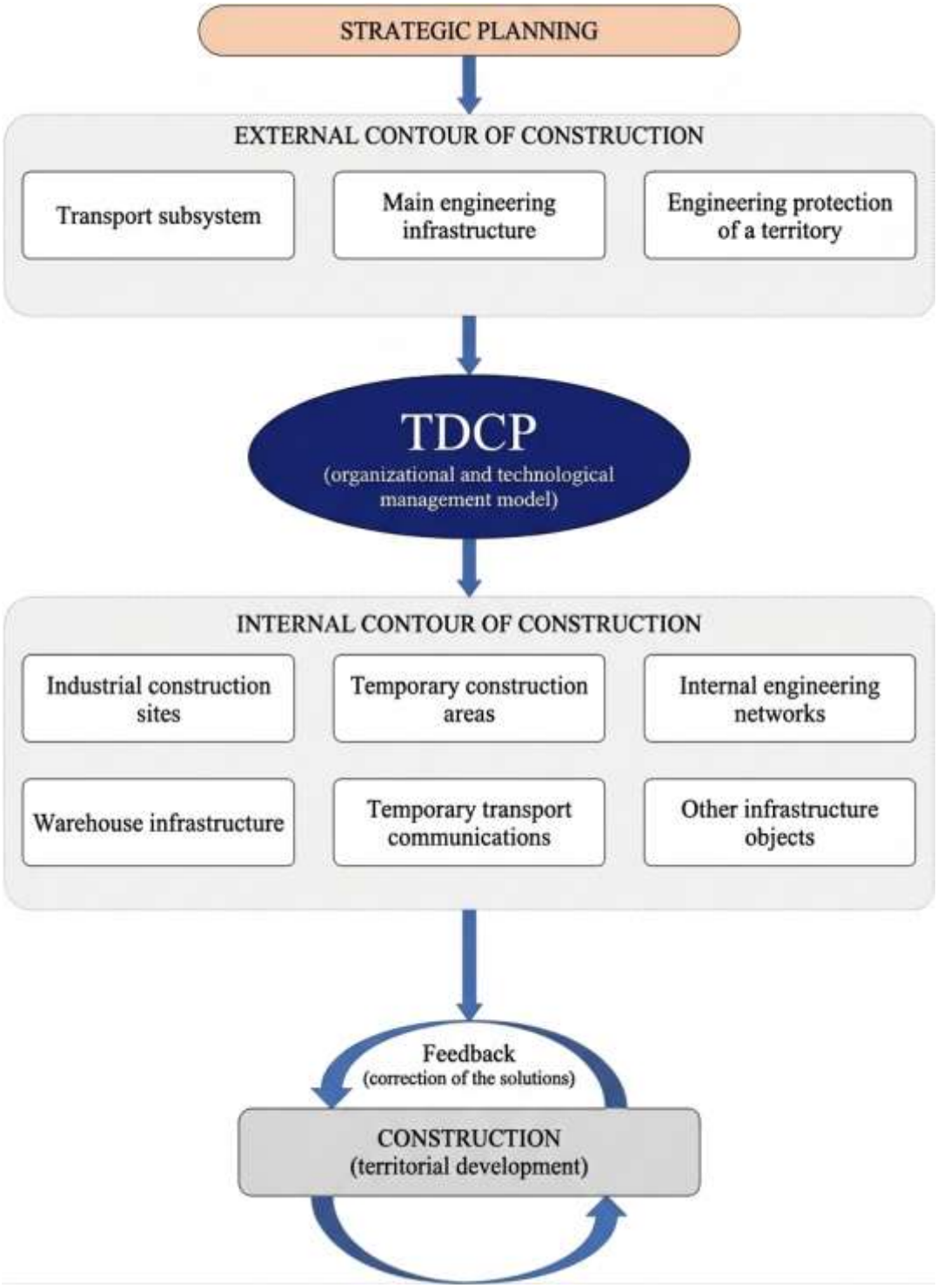

Fig. 1. Structural model of interaction of the external and internal contours in a project system for construction organization and territorial development

The internal contour of the TDCP includes elements located within a projected territory and ensuring implementation of construction processes:

– production facilities are concrete mixing units, reinforced concrete products factories, building materials warehouses, waste processing facilities;

– temporary infrastructure are residential towns, catering facilities, sanitary facilities, administrative areas for the staff;

– internal engineering networks are distribution networks of electricity, water supply, sanitation, heat supply, gas supply and communications;

– internal transport networks are road infrastructure for supporting construction processes, including permanent and temporary access roads;

– labour resources are a system of providing a project with the staff, labour organization, and household services for the employees;

– a construction stage is a sequence of commissioning facilities, synchronization of residential and social infrastructure, adaptive mechanisms for adjusting schedules.

The mechanism of a relationship between the external and internal contours is based on converting constraints. The parameters of the external contour form constraints and set the allowable solution space for the internal contour. The internal contour, in turn, implements compensatory measures aimed at leveling the deficits of the external contour.

Effectiveness of the interconnection of the contours is evaluated by means of the indicator of integral consistency:

$$K_c = \sum(w_i \times k_i), \quad (1)$$

where w_i is the weight factor of the i-th subsystem; k_i is the consistency indicator of the i-th subsystem defined as the ratio of the actual parameters to the required ones.

The value of $K_c \geq 1$ is indicative of sufficient consistency of the contours.

The comparison of traditional TOP and TDCP showed considerable differences in the approaches to construction organization (Table 1).

Table 1

Comparative analysis of traditional TOP and organization of territorial development construction project

Criterion	Traditional TOP	TDCP
Management object level	One object (building / structure)	Territory of ITD/ area (a system of objects)
Target result	Organization of work at an object	Coordination of territorial development and synchronization of flows between objects
Management contour	Mostly indoor (construction site)	Two contours: external (infrastructure/ constraints + internal (construction)
Connection with territorial planning	Indirect (via the original project data)	Direct integration with the master plan / master plan / ITD and development programs
Planning horizon	Construction period of an object	Multi-year development stages (queues of 4–10 years or longer)
Engineering infrastructure scale	On-site temporary/ permanent networks	Backbone networks + step-by-step connection and internal infrastructure of a territory
Transport and accessibility	Entrances to the site, a local layout	Territorial transport subsystem: capacity, nodes, external links
Material logistics	"On-site" delivery	Territorial logistics: sources–routes–nodes–acceptance points, inter-object coordination
Resource coordination	Resources within an object / contractor	Resource balance in a territory: preventing contractors from competing for capacity and supplies
Deficit management	Reactive (in case of faults)	Proactive: identification of the external contour deficiencies and their compensation by means of internal contour solutions
Risks and uncertainty	Object risk analysis	Risks of the life cycle of a territory: infrastructural, logistical, institutional, environmental
Institutional conditions	Typically outside a model (background)	Considered as a subsystem: approvals, regulations, participant interfaces, time limits
Modelling methods	Network / calendar object planning	System-technical model of a territory: indicators of security, deficits, scenarios, optimization of flows
Digital foundation	BIM-model of an object (partially)	BIM + CIM + GIS / digital platforms of a territory, data for monitoring and correction of solutions
Feasibility criterion	Feasibility of an object schedule	Feasibility of the stages of a life cycle of a territory adhering to the security thresholds of the external contour
Practical effect	Optimization of terms / resources of an object structure	Sustainability of ITD: reduction in stage disruptions, consistency of infrastructure and schedules, manageability of housing and communal services

Traditional TOP is focused on a separate building or structure, provides point-to-point construction and makes use of an object-by-object approach. Logistics is based on the principle of supplies to a construction point, engineering is based

on connection to the existing networks. Planning is characterized by tight deadlines and volumes, coordination is limited by interaction of the customer and contractor, and resource management is local. The risks remain high due to the lack of reserves causing a object to be isolated.

ITD is focused on a territory with a complex of objects, provides mass construction and makes use of a territorial approach. Logistics is based on an integrated supply chain, while engineering relies on the design of distribution networks. Planning is characterized by adaptive phasing, there is coordination on a multi-level basis with all participants, and resource management is territorial. Risks are reduced due to buffer mechanisms causing a territory to be comprehensively developed.

The practical implementation of TDCP allows the following effects to be attained:

– reducing transport and logistics costs by 15–25% by optimizing routes and creating buffer warehouses;

– reduction in construction time by 10–20 % due to coordinated staging and parallel work;

– increasing resilience of a project to external influences by reserving critical resources;

– integrated development of a territory with commissioning both residential and social infrastructure.

Discussion and Conclusion. The developed ITD methodology expands on the existing ideas on construction organization while introducing a territorial management level and combining logistical as well as resource aspects into a single model. The differentiation of external and internal contours provides an opportunity for a systematic analysis of interrelationships between infrastructural constraints, logistical flows and construction production organization.

The major difference between the ITD and raditional TOP is the territorial approach where a planning object is not a separate building, rather a territory with a set of interconnected objects. This calls for a fundamentally different approach to logistics, engineering, and resource management.

The mechanism of converting constraints of the external contour into the internal one and feedback by means of compensation measures ensures adaptability of a construction management system to changing conditions. The integrated circuit consistency indicator K_c allows one to quantify a degree of contour consistency and to identify system bottlenecks.

The practical significance of the research results is the possibility of applying the developed methodology in the implementation of ITD projects in the country's various regions. The ITD methodology can be integrated into regional development programs and employed by government authorities, design organizations and construction companies.

The prospects for further research are related to developing mathematical models for optimizing the parameters of the ITD, designing software to support decision-making in ITD formation, testing the methodology on specific ITD projects and developing standard solutions for various categories of territories. Hence the developed methodological foundations of ITD serve as a scientific foundation for improving construction organization within the framework of integrated territorial development projects and contribute to improving the effectiveness of urban planning activities.

References

1. Lapidus AA Territory Organization Project (TOP) as an Essential Element of Integrated Territorial Development (ITD). *Construction Production*. 2024;3(51):2–6. (In Russ.) https://doi.org/10.54950/26585340_2024_3_2

2. Lapidus AA, Safaryan GB Organizational and Technological Reliability of Production and Logistics Processes in Construction. *Science and Business: Development Ways.* 2019;3(93):121–125. (In Russ.) URL: http://globaljournals.ru/assets/files/journals/science-and-business/93/sb-3(93)-2019-main.pdf (accessed: 10.04.2026)

3. Lapidus AA, Oleynik PP Justification of the Process for Selecting Organizational and Technological Solutions. *Industrial and Civil Engineering.* 2024;4:70–74. (In Russ.) https://doi.org/10.33622/0869-7019.2024.04.70-74

4. Ageeva YaD, Ikonnikova AV, Lapidus AA Improvement of Material and Technical Supply Systems at the Construction Site. *News of Higher Educational Institutions. Construction.* 2023;4:58–74. (In Russ.) https://doi.org/10.32683/0536-1052-2023-772-4-58-74

5. Popkova AA, Konev YuM, Kanyukov MV Integrated Development of Territories: Current State and Problems of Implementation. *News of Higher Educational Institutions. Sociology. Economics. Politics.* 2023;16(2):38–53. (In Russ.) https://doi.org/10.31660/1993-1824-2023-2-38-53

6. Lapidus AA, Adamtsevich LA Digital Transformation of Life Cycle Management Processes for Residential and Engineering Infrastructure Facilities in Complex Development of Territories. *Real Estate: Economics, Management*. 2025;(2):6–12. https://doi.org/10.22337/2073-8412-2025-2-6-12

7. Muerza V, Guerlain C Sustainable Construction Logistics in Urban Areas: A Framework for Assessing the Suitability of the Implementation of Construction Consolidation Centres. *Sustainability*. 2021;13(13):7349. https://doi.org/10.3390/su13137349

8. Saif W, RazaviAlavi S, Kassem M Construction Digital Twin: a Taxonomy and Analysis of the Application-Technology-Data Triad. *Automation in Construction*. 2024;167:105715. https://doi.org/10.1016/j.autcon.2024.105715

9. Bibri SE, Krogstie J, Kärrholm M Compact City Planning and Development: Emerging Practices and Strategies for Achieving the Goals of Sustainability. *Developments in the Built Environment*. 2020;4:100021. https://doi.org/10.1016/j.dibe.2020.100021

10. Buzasi A, Palvolgyi T, Csete MS Assessment of Climate Change Performance of Urban Development Projects — Case of Budapest, Hungary. *Cities*. 2021;114:103215. https://doi.org/10.1016/j.cities.2021.103215

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