REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

EVALUATION OF THE OPTIMAL FORMATION OF INFRASTRUCTURE IN THE LIBERATED TERRITORIES

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Field of science:	Economic sciences
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GENERAL CHARACTERISTICS OF THE RESEARCH WORK

Relevance of the topic and degree of elaboration. In the territories liberated from occupation (TLFO), the construction of infrastructure for the implementation of restoration and reconstruction works, and its optimal formation with the aim of ensuring that the infrastructure to be built yields more efficient results, is important; at the same time, it can address the urgent needs of the population to be settled in the region, such as housing, healthcare, education, and transport. It is envisaged that, just as it is important to create modern infrastructure in the economic regions of Karabakh and East Zangezur, it is equally important to ensure the optimal formation of the infrastructure to be created. Stimulating investments to be made in the creation of infrastructure and developing the relevant sectors of the economy in the territories are priority issues. All this gives particular relevance not only to the quantitative formation of infrastructure, but more to its qualitative formation, as well as to the proper assessment of the impact of the infrastructure to be created on the economic restoration and development of the territories.

In the post-war years, among construction expenditures in the country, greater priority has been given to restoration in TLFO, and the main part of these funds has been directed to those territories. Thus, for 2024, the amount of funds allocated for these territories under economic activity amounted to 4.8 billion manats, while expenditures not assigned to the main sections amounted to 230 million manats. Overall, during 2020-2024, approximately 14 billion manats of investment were allocated from the state budget for the reconstruction and restoration of TLFO. This brings infrastructure construction in TLFO to the forefront as one of the most pressing issues in the country. For this reason, the assessment of the infrastructure to be built in TLFO is highly important.

The allocation of resources, the formation of infrastructure, and its development in TLFO may have a number of socio-economic consequences. From this point of view, within the framework of the reconstruction and restoration works to be carried out in TLFO, the study of the influence of the Azerbaijani state, international organizations, and

private investors on infrastructure decisions and on the process of implementing those decisions attracts greater attention.

There are several reasons why the optimal formation of infrastructure in TLFO is of topical relevance:

1. First of all, the views expressed by the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, in his address to the nation on November 10, 2020, render the issue of creating infrastructure in these territories relevant. President Mr. Ilham Aliyev stated that, *"The Azerbaijani state will, by renewing the infrastructure in all territories liberated from occupation, ensure the return of internally displaced persons to their native lands in the shortest possible time."*[1]

2. The formation of infrastructure serves the purpose of improving the quality of life of the local population that will return to these territories. The improvement and development of roads, water, energy, and communication networks, as well as the creation of healthcare, education, and other social infrastructure, will create more favorable conditions for enhancing the efficiency of people's daily lives.

3. At the same time, within the framework of the implementation of the document "Azerbaijan 2030: National Priorities for Socio-Economic Development" and the First State Program on the Great Return, the restoration of TLFO, the establishment of modern infrastructure, and the reintegration of these territories into the country's economic activity are identified as priorities.

Based on the above-mentioned directions, the topic of the dissertation is considered relevant within the framework of Azerbaijan's national priorities in terms of the optimal formation of modern infrastructure in TLFO and their reintegration into the country's economy.

The theoretical-methodological aspects of the formation of production, social, and market infrastructure, as well as infrastructure problems as a whole, have been studied in the works of Azerbaijani scholars such as N.M. Muzaffarli (Imanov), T.N. Aliyev, Sh.M. Muradov, Z.A. Samadzade, I.H. Ibrahimov, V.H. Abbasov, B.Kh.

[1] Əliyev, İ.H. Azərbaycan Respublikasının Prezidenti cənab İlham Əliyevin xalqa müraciəti. - 10 Noyabr 2020.

Atashov, R.M. Jabiyev, L.B. Babayev, E.M. Hajizade, Kh.M. Huseynova, Kh.I. Ganiyev, E.A. Guliyev, A.A. Nadirov, F.P. Rahmanov, T.A. Sardarov, T.S. Valiyev and others, and valuable ideas and a number of recommendations have been put forward. Among the foreign scholars conducting research in this field, it is possible to mention the works of O.V. Blagorazumova, A.Y. Bochkarev, I.V. Bykovskaya, T.Y. Veshutkina, N.M. Genova, A.A. Grabar, M.F. Drigo, O.B. Evreinov, A.G. Ivanchenko, Y.N. Kazakov, M.V. Kaymakova, S.V. Kelbakh, M.P. Komarov, M.V. Mokeev, R.B. Caro, M.F. Castells, J. Friedmann, P. Krugman, J. Stiglitz and others.

The purpose and objectives of the research. The main purpose of the research is to investigate the scientific-theoretical foundations of infrastructure formation, to analyze and assess the current state of infrastructure in TLFO, to identify the relevant reserve opportunities, and to determine the scientifically substantiated organizational-economic mechanisms and development directions for the optimal formation of infrastructure in the context of their efficient use. In order to achieve this purpose, the following objectives were set and accomplished:

- to determine the essence of infrastructure and the economic content of its optimal formation, and to clarify the types of infrastructure;
- to investigate the existing concepts in the field of infrastructure, as well as the characteristics of instruments and means;
- to determine the impact of the optimal formation of infrastructure in TLFO on the socio-economic development of the country;
- to study the regulatory and legal framework for the development of TLFO and its reintegration into the country's economy, and to analyze the investments directed to these territories;
- to identify the relevant opportunities for use on the basis of the analysis and assessment of the current state of production and social infrastructure complexes in TLFO;
- to assess the possibilities for the formation of innovative infrastructure complexes applied in TLFO;
- to develop scientifically substantiated proposals and recommendations for the efficient formation of infrastructure in TLFO;

- to form a more advanced organizational-economic mechanism with the aim of improving an efficient investment environment in connection with the restoration and reconstruction of infrastructure in TLFO;
- to develop scientifically substantiated proposals and recommendations regarding the implementation of innovative projects and the possibilities of using the existing potential for the purpose of the optimal formation of infrastructure in TLFO.

The object of the research. The strategically important social and production infrastructure formed and to be formed in Azerbaijan's TLFO has been selected.

The subject of the research. It consists of the economic relations arising in connection with the optimal formation of infrastructure in TLFO.

The theoretical-methodological foundations of the research. The relevant laws and normative-legal acts of the Republic of Azerbaijan, the decrees and orders of the President of the country, the decisions of the Cabinet of Ministers, scientific-theoretical studies reflecting the results of research conducted by local and foreign scholars in the field of infrastructure and regional economics, theoretical works in this field, materials of scientific-practical conferences, methodological works in this field, programs and materials on the implementation of the development of TLFO, periodical press, and Internet materials have constituted the theoretical and methodological foundations of the research.

The methods of the research. Statistical models, SWOT analysis, economic-mathematical modelling, and methods of analysis and comparison were used in the research work.

The main provisions submitted for defense:

- Infrastructure covers the sectors that ensure the flexible and efficient functioning of the economy, plays an important role in ensuring productivity and development, and for this reason its study is of particular importance;
- There is a need to investigate the formation of infrastructure on the basis of scientific-methodological foundations and to clarify the significance of production and social infrastructure sectors, which will

make it possible to strengthen the natural and economic potential of this region and to use it efficiently;

- As a result of the state programs and comprehensive measures implemented in TLFO, the formation of production and social infrastructure will provide an impetus to the sustainability of economic development; for this reason, the study of this field is of importance;
- In order to ensure the sustainable development of the economy in TLFO and regulate the Great Return to the region, a need has arisen for the formation of modern production and social infrastructure complexes, which will create conditions for the creation of new jobs, the increase of local employment, and the acceleration of the socio-economic revival of the region;
- There is a need to develop relevant regulatory mechanisms and to create the necessary conditions for the application of innovative technologies for the optimal formation of production and social infrastructure in TLFO, which will lead to an increase in the efficiency of economic activity and the enhancement of investment attractiveness;
- By making use of the opportunities presented by digital transformation, the formation of a strong digital industrial infrastructure in TLFO may play the role of an important component that creates conditions for attracting investments, making more efficient use of the economic potential of the territories, and ensuring favorable living conditions for the population.

The scientific novelty of the research work. In the context of the optimal formation of production and social infrastructure in TLFO, the scientific novelty of the research includes the following:

- the theoretical-methodological foundations and interrelationships of the concepts of "infrastructure" and its "optimal formation" have been studied, and a modern scientific view has been formed;
- its specific features have been put forward with the aim of ensuring the more efficient formation of infrastructure and its in-depth analysis;
- directions for the optimal formation of agricultural infrastructure in TLFO have been proposed with the aim of ensuring the comprehensive development of agricultural infrastructure, increasing the sources of

investment resources directed to these areas, and expanding the sources of allocated financial resources;

- directions for the optimal formation of tourism infrastructure in the economic regions have been determined with the aim of ensuring the efficient use of the geographical, historical, cultural, and economic potential of TLFO in accordance with modern socio-economic development criteria;
- in the research work, the "matrix form for network analysis" related to the optimal formation of transport and utility infrastructure has been evaluated, and practical proposals have been put forward regarding the application of that matrix to highway lines in the economic regions;
- for the purpose of the optimal formation of the green economy in TLFO, statistical indicators have been analyzed, and practical proposals have been substantiated regarding the "Smart Waste System" for the management of waste generated in fields considered necessary, as well as the incineration of waste in newly established special plants for conversion into energy.

The theoretical and practical significance of the research. The dissertation work is significant in terms of systematizing the scientific-theoretical foundations of the optimal formation of infrastructure in TLFO and generalizing the existing approaches in this field. The results of the research may be used for the planning of social and production infrastructure in TLFO, the assessment of the efficiency of infrastructure projects, and the determination of investment priorities. The obtained results and recommendations are of theoretical and practical significance for state institutions, investors, and scientific researchers.

Approbation and implementation. The main theoretical-methodological and practically significant provisions of the dissertation work, as well as the developed proposals and recommendations, have been presented in a number of countries and at internationally significant scientific conferences, have been published as theses and conference materials, and have been awarded relevant certificates and diplomas.

Regarding the topic of the dissertation work, 24 articles and theses, including 8 published abroad, have been published in scientific journals and conference materials recommended by the Higher Attestation

Commission.

The scientific-practical results and proposals obtained in the dissertation work were reviewed by the "Agrarian Research Center" operating under the Ministry of Agriculture of the Republic of Azerbaijan and the "Restoration, Construction and Management Service in Kalbajar District." The application of the main provisions of the research in terms of the phased formation of infrastructure in TLFO and the efficient organization of restoration and reconstruction measures was considered appropriate.

The name of the organization in which the dissertation work is performed. The dissertation work was carried out at Baku Business University.

The structure of the dissertation work and its total volume in characters. The dissertation work consists of an introduction, 3 chapters, a conclusion, and a list of 139 references used. For the purpose of analysis and assessment carried out in the work, 20 tables, 3 schemes, 4 figures, 6 diagrams, and 3 graphs have been used.

With the volume of the structural sections of the dissertation indicated separately, the total volume of the dissertation in characters is as follows: cover page and table of contents - 1,634 characters, introduction - 14,119 characters, Chapter I - 58,190 characters, Chapter II - 83,089 characters, Chapter III - 67,378 characters, conclusion - 9,985 characters, list of references used - 20,268 characters. The total volume of the dissertation is 218,214 characters (excluding tables, diagrams, graphs, schemes, and the list of references).

STRUCTURE OF THE DISSERTATION

INTRODUCTION

CHAPTER I. SCIENTIFIC-THEORETICAL FOUNDATIONS OF THE OPTIMAL FORMATION OF INFRASTRUCTURE.

1.1.Scientific-methodological foundations of infrastructure and its optimal formation.

1.2.Specific features of infrastructure formation.

1.3.Optimal formation of infrastructure in the territories liberated from occupation and its impact on sustainable socio-economic development.

CHAPTER II. ANALYSIS OF THE CURRENT STATE OF INFRASTRUCTURE IN THE TERRITORIES LIBERATED FROM OCCUPATION OF AZERBAIJAN AND THE POSSIBILITIES OF ITS OPTIMAL FORMATION.

2.1.Analysis of the regulatory-legal framework and investment directions in the formation of infrastructure in the territories liberated from occupation.

2.2.Analysis of the current state of infrastructure complexes by sectors in the territories liberated from occupation.

2.3.Assessment of the possibilities for the formation of innovative infrastructure complexes in the territories liberated from occupation.

CHAPTER III. MAIN DIRECTIONS OF THE OPTIMAL FORMATION OF INFRASTRUCTURE.

3.1.Prospects for the optimal formation of infrastructure in the territories liberated from occupation.

3.2.Directions for the optimal formation of infrastructure complexes in the territories liberated from occupation.

3.3.Directions for improving the organizational-economic mechanism of infrastructure in the territories liberated from occupation.

CONCLUSION

REFERENCES

THE MAIN CONTENT OF THE WORK

In the **"Introduction"** section of the dissertation work, the relevance of the topic and the degree of its elaboration were substantiated; the object and subject, the purpose and objectives, the research methods, and the main provisions submitted for defense were determined; and information was presented on its scientific novelty, theoretical and practical significance, approbation and implementation, the name of the organization where it was carried out, as well as its structure and volume.

In the first chapter of the dissertation, entitled **"Scientific-theoretical foundations of the optimal formation of infrastructure"**, the essence of infrastructure, its optimal formation, its specific features, and the impact of the creation of infrastructure in TLFO on socio-economic development were examined.

For the purpose of a deeper investigation of the research work, production, social, and market infrastructure were comprehensively analyzed, and as a result, the importance of the application of social and production infrastructure in TLFO at the initial stage was substantiated.

While examining the essence of infrastructure, the views of Azerbaijani professors and researchers were taken as a basis. As a result of these views, an opinion on the essence of infrastructure was put forward by the author.

Professor İ.H. İbrahimov notes that, *"the emergence, development, and improvement of new infrastructures for the solution of the tasks put forward with the aim of achieving social and economic development should be adapted to progress and market relations."*[2]

In our opinion, the formation and development of infrastructure should be carried out by taking into account not only economic necessities, but also social needs together.

Professor T.S. Vəliyev notes that, *"infrastructures are classified as social, production, public utility-household, and market infrastructures, and they themselves are directly divided into second and sometimes third components."*[3]

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[2] İbrahimov. İ.H. Aqrar sahənin iqtisadiyyatı . - Bakı: - 2016, - 655 s.

[3] Vəliyev. T.S. «İnfrastrukturlar: mahiyyəti, təsnifatı və əhəmiyyəti». - Bakı: Elm,

In our opinion, the role of infrastructure in ensuring sustainable socio-economic development is irreplaceable. In addition to responding to social demands, infrastructure serves as the main foundation for the efficient implementation of economic activities.

Professor F.P. Rəhmanov notes that, *"infrastructure serves social spheres to a greater extent and is directed toward meeting the specific needs of members of society, ensuring the intellectual development of the population and public activity."*[4]

Professor R.M. Cəbiyev notes that *"infrastructure is the aggregate of separate independent yet mutually interconnected markets and management structures that ensure the free movement of goods and services from producer to consumer."*[5]

In our opinion, infrastructure not only improves the quality of life of the population, but also increases the efficiency of economic activities. The development of infrastructure has a positive impact on both the social welfare of society and its economic potential.

Professor B.X. Ataşov notes that, *"the absence of any element of infrastructure, or its failure to be at an optimal level, may limit the reproduction process."*[6]

Based on the generalization of the theoretical approaches undertaken and the views of various researchers, it may be concluded that infrastructure consists of the main physical and organizational structures that support the implementation of the economic and social activities of a country or region.

Under market economy conditions, in addition to the construction of infrastructure, its optimal formation is also of great importance for achieving sustainable development. For this purpose, the scientific literature on the topic was studied, and generalized conclusions were obtained on the basis of relevant theoretical approaches. It is considered

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- 2000. - 169 s.

[4] Rəhmanov. F. P. Sosial infrastrukturun tənzimlənməsi problemləri. - Bakı: «Gənclik», - 2004. - 304 s.

[5] Cəbiyev. R.M. Azərbaycanda bazar infrastrukturunun formalaşması və inkişafı, - Bakı: AzTU, - 2000. - 236 s.

[6] Ataşov. B.X. Aqrar sahədə struktur və səmərəlilik problemləri (nəzəriyyə və praktika). - Bakı: "Kooperasiya", - 2017. - 536 s.

that *"the main factor for the optimal formation of urban infrastructure is the construction of infrastructure on the basis of the demands of the population."*[7]

In our opinion, by conducting surveys among population groups from the point of view of the construction of social and production infrastructure, it is possible to ensure the implementation of projects on the basis of their wishes (mainly social infrastructure), which may cause the population to show greater interest in the territories.

Castells drew attention to the effects of information technologies on urban infrastructure and, by analyzing the role of technology in the optimal formation of infrastructure, noted that *"optimal infrastructure can be formed through the integration of global networks and information technologies*."[8]

It is considered that *"for the optimal formation of infrastructure, the implementation of large-scale social projects such as broad roads, bridges, parks, etc. is important."*[9]

In our opinion, large infrastructure projects (buildings, roads, bridges, etc.) enhance the image of the city and demonstrate its modernity, which can increase investment attractiveness. The more modern and attractive the external appearance of the city is, the more foreign investors may devote attention to these territories.

K. Lynch conducted research on how cities are organized and how people perceive this space, and in his view, *"the main factor for the optimal formation of urban infrastructure is the legibility of space and people's ability to navigate this space easily."*[10][10]

In our opinion, the optimal formation of infrastructure means its establishment in accordance with the needs of the population, the best possible use of available resources, and the ensuring of long-term efficiency for the rapid and efficient development of cities.

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[7] Jacobs. J. "The Death and Life of Great American Cities". - New York: Random House Inc, - 1961. - 474 p.

[8] Castells. M.F. "The Rise of the Network Society". - Oxford: Blackwell Publishing Ltd, - 1996. - 596 p.

[9] Caro. R.B. "The Power Broker: Robert Moses and the Fall of New York". - New York: Knopf, - 1974. - 1162 p.

[10] Lynch. K.R. "The Image of the City". - Cambridge: M.I.T. Press, - 1960, - 194 p.

At the same time, in the dissertation work, innovation infrastructure has been distinguished from other subfields. During the research, after an in-depth study of infrastructure had been conducted, its modern classification was determined (Table 1).

Table 1

Classification of infrastructure

Social infrastructure	**Production infrastructure**	**Market infrastructure**	**Innovation infrastructure**
1. Education 2. Healthcare 3. Science and art 4. Housing and communal services 5. Passenger transport 6. Communications 7. Tourism 8. Sports 9. Culture	1. Industry 2. Agriculture 3. Processing 4. Freight transport 5. Trade 6. Sales 7. Scientific services 8. Supply 9. Procurement	1. Exchanges 2. Fairs 3. Banks 4. Advertising firms 5. Auction companies 6. Non-bank institutions 7. Insurance companies 8. Marketing firms	1. Information service firms 2. Personnel training and retraining centers 3. Technology transfer and its application in centers 4. Innovation centers

Source: *The table was compiled by the author on the basis of sources 2, 3, 4, and 5 cited in the abstract.*[11]

Also, in this chapter of the dissertation, the specific features of infrastructure were examined and are indicated in Scheme 1.

Collective consumption exists in infrastructure services.	In infrastructure services, a price lower than the production cost may be determined.	Infrastructure services have “network externalities”.
In infrastructure services, the value of the service is paid by users.		Infrastructure services possess the characteristic of joint property.
Infrastructure services are paid goods whose quality increases when used together with other users.	Factors such as population growth, urbanization, etc. increase the need for infrastructure services.	Infrastructure services require high fixed costs at the initial stage of investment.

Scheme 1. Specific features of infrastructure.

Source: *The scheme was compiled by the author on the basis of sources 2, 3, 4, 5, 11, and 12 cited in the abstract.*[12]

[11] Müzəffərli. N, İsmayılov. E. Azərbaycanın Post-Konflikt Ərazilərinin bərpası. Konseptual əsaslar. - Bakı: “Qafqaz”, - 2010. - 270 s.

[12] Səmədzadə. Z.Ə. Qarabağ iqtisadiyyatı 100 ildə. [7 cilddə]. - Bakı: “İqtisadi

In the second chapter of the dissertation, entitled **"Analysis of the current state of infrastructure in the territories liberated from occupation and the possibilities for its optimal formation"**, the current state of infrastructure projects established in TLFO in the post-conflict period was analyzed.

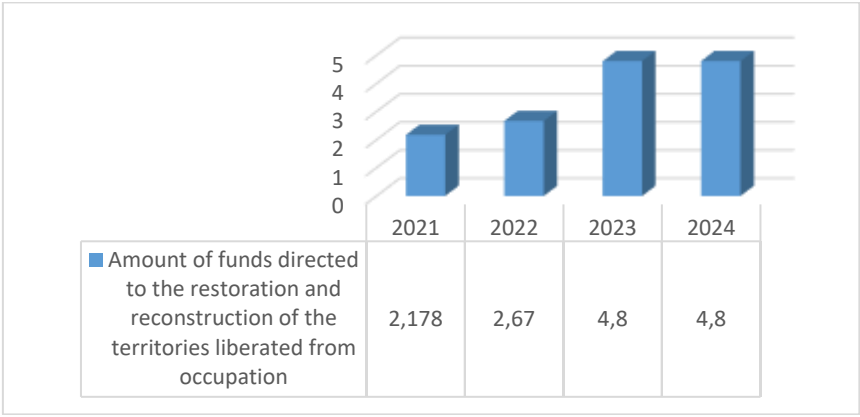


Diagram 1. Reconstruction and restoration expenditures of TLFO, in billion manats. ***Source:*** *The diagram was compiled on the basis of the data of the draft state budget of the Republic of Azerbaijan for 2024.*[13]

Based on the analysis, a total of approximately 14 billion manats was envisaged in the state budget for 2020-2024 for the reconstruction and restoration of TLFO. In 2021, the amount of funds allocated for the reconstruction and restoration of TLFO was 2.178 billion manats; this indicator increased by approximately 22% in 2022 compared to 2021, and by 80% in 2023 compared to 2022. The budget envisaged for 2024 remained stable.

Within the framework of the research, the role of investments directed to fixed capital in TLFO in the formation of the long-term economic potential of the region was assessed. For this purpose, on the basis of quarterly investment indicators covering the period 2022Q1-2025Q3, the capital accumulation approach was applied, and the

ensiklopediya evi", - c. 5. - 2022. - 856 s.

[13] Azərbaycan Respublikasının 2024-cü il dövlət büdcəsi haqqında, Azərbaycan Respublikasının qanunu. Bakı: Qanun, - 2024.

mechanism of transformation of investment flows into infrastructure capital stock was analyzed.

As a result of the assessment carried out, it was determined that investment allocations, while serving the formation of the production and social infrastructure base in the region, also create a material basis for sustained economic activity and future development.

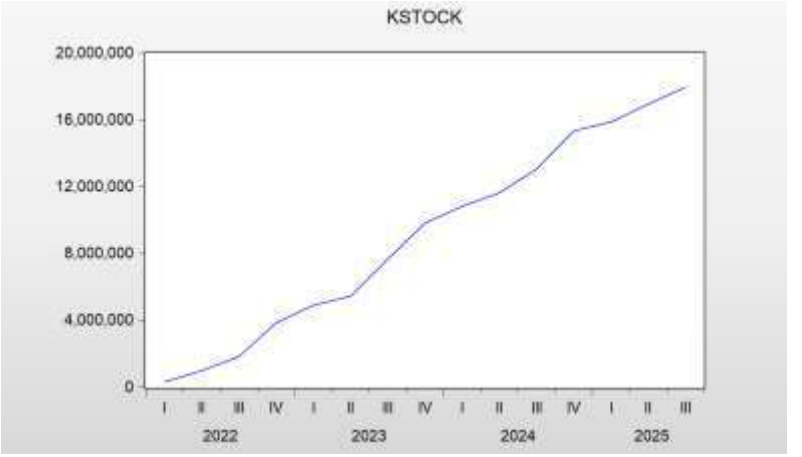


Figure 1. Capital accumulation model (KSTOCK) based on investments directed to fixed capital in TLFO, 2022Q1-2025Q3 (δ = 0.0125 quarterly).
Source: *The figure was compiled on the basis of the calculations carried out by the author in the EViews program based on the data of the State Statistical Committee of the Republic of Azerbaijan (SSCRA).*[14]

The capital accumulation indicator was calculated by a recursive equation on the basis of the "Perpetual inventory method". The formal representation of the model is as follows:

$$K\ STOCK_t = (1 - \delta)\ K\ STOCK_{t-1} + K_t$$

For the purpose of statistically substantiating the growth dynamics obtained under the capital accumulation model, an additional diagnostic analysis was carried out on the logarithmized investment series. Within

[14] Azərbaycan Respublikası Dövlət Statistika Komitəsi. "Əsas kapitala yönəldilmiş investisiyalar və tikintinin əsas göstəriciləri" statistik bülleten. - Bakı, - 2022-ci ilin I - 2025-ci ilin III rübləri üzrə.

the framework of the analysis, the stability properties of the series, the long-term growth trend, and the nature of short-term deviations were assessed by means of the ADF, KPSS, and HP filter. The main results obtained are presented in a systematized manner in Table 2.

Table 2

Results of diagnostic tests for the logarithmized investment series for TLFO

Test	Null hypothesis	Statistic / p-value	Decision	Explanation
ADF (C+T)	There is a unit root in the series	t = -5.727; p = 0.003	H_0 is rejected	The series is stationary around the trend (deterministic development)
KPSS (trend)	The series is trend-stationary	LM = 0.500	H_0 is rejected	It indicates the presence of a weak stochastic component
HP Filter ($\lambda = 1600$)	Separation of the trend and cyclical component	The trend is dominant	-	The long-term dynamics are mainly explained by the deterministic trend
Cyclical component	Temporary shocks	Std.Dev = 8.24E-07	Very small	The shocks are weak and short-term

Source: *compiled on the basis of the calculations carried out by the author in the EViews program based on the data of the SSCRA.*[15]

The additional analysis carried out showed that the investments directed to TLFO are not random in nature; on the contrary, they are formed on the basis of a long-term and consistent development trend. This result confirms that the investment policy implemented in the region has a systemic character in terms of sustainable capital accumulation and the creation of a stable economic foundation.

After the war, the application of modern technologies in TLFO, the

[15] Azərbaycan Respublikası Dövlət Statistika Komitəsi. "Əsas kapitala yönəldilmiş investisiyalar və tikintinin əsas göstəriciləri" statistik bülleten. - Bakı, - 2022-ci ilin I - 2025-ci ilin III rübləri üzrə.

expansion of "smart city" and "smart village" projects, as well as the increase in green economy-oriented infrastructure initiatives, made a separate assessment of this field necessary.

For this reason, in Chapter II of the research work, generalizations were made and a SWOT analysis was carried out during the assessment of innovative infrastructure in TLFO (Table 3).

Table 3

SWOT analysis on the assessment of innovative infrastructure in TLFO

<table>
<tr><th>Strengths</th><th>Weaknesses</th><th>Opportunities</th><th>Threats</th></tr>
<tr><td>Development of infrastructure through the wide application of digital technologies (application of Smart City and Smart Village projects).</td><td rowspan="2">The digital infrastructure has not yet been fully established, and there is a shortage of personnel in this field.</td><td>Implementation of larger technological projects through the attraction of foreign investments.</td><td>The impact of political tensions and conflict risks on projects.</td></tr>
<tr><td>Creation of industrial parks and logistics centers through the application of high technologies.</td><td>Smart city and village projects serving as a model for high-tech development in the region.</td><td>The impact of climate change and environmental risks on infrastructure.</td></tr>
<tr><td>Increasing energy efficiency through the use of green energy sources.</td><td rowspan="2">Difficulties related to the return process of the population and the incomplete establishment of social infrastructure for settlement.</td><td>Transformation into a transit transport hub through the enhancement of the logistics potential of the region.</td><td rowspan="2">The impact of international economic uncertainties on the ability to attract investment.</td></tr>
<tr><td>The existence of strong financial and political support of the state for infrastructure projects.</td><td>Agrotechnological development through the application of digital solutions in agriculture.</td></tr>
</table>

Source: *The table was compiled by the author on the basis of sources 12, 16, 17, 18, 20, 21 and 22 cited in the abstract.*

In the third chapter of the research, entitled **"Organizational-economic mechanisms of the optimal formation of infrastructure and its development directions"** the main attention was focused on the prospects for the optimal formation of infrastructure in TLFO, the directions for the optimal formation of infrastructure complexes, and the directions for improving the organizational-economic mechanism of infrastructure.

Within this framework, the use of the "territorial graph and network analysis" method may be significant for the optimal formation of transport and utility infrastructure in TLFO.

$$A = \{a_{ij}\}$$

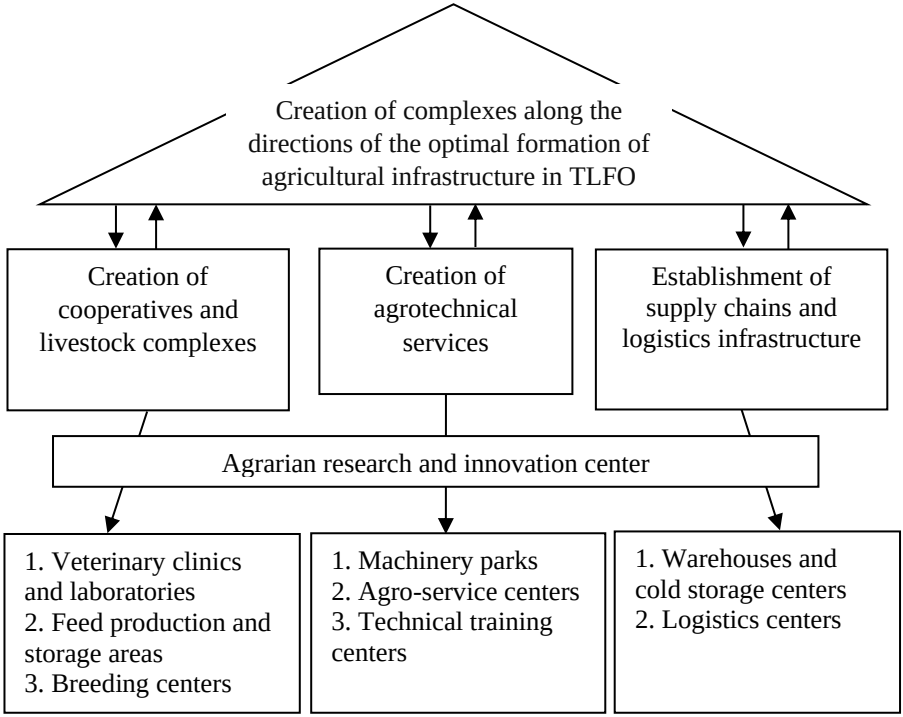
Here: A: Connection matrix, $\{a_{ij}\}$: is the element showing the existence of the connection between the i-th and j-th territories (1 if it exists, 0 if not).

The stated connection matrix-based approach may make it possible to optimize interterritorial transport links and to determine the priority directions of new road lines. In the dissertation work, this method was applied to highways in TLFO, and a number of scientific-practical results were obtained.

In our opinion, the implementation of comprehensive measures is necessary in order to ensure the efficient development of innovative activity in the agrarian sector. From this point of view, the presence of several main infrastructure complexes for the reconstruction and optimal use of agricultural infrastructure in TLFO is considered efficient.

For the efficient organization of agrarian infrastructure in TLFO, cooperatives and livestock farms, agrotechnical services, and warehouse-logistics infrastructure should be formed within the framework of a unified agro-industrial complex. This approach may create conditions for increasing productivity, reducing losses, and ensuring the continuity of sales by combining production, technical support, storage, and market access processes within a single chain. In our opinion, the creation of such a complex may require an investment of approximately 160-190 million manats, while in the

medium and long term it may create the potential to generate an annual total turnover of 34-50 million manats.



Scheme 2. Creation of complexes along the directions of the optimal formation of agricultural infrastructure in TLFO.

Source: *The scheme was compiled by the author on the basis of sources 2, 12, and 16 cited in the abstract.*[16]

In the dissertation work, it was determined in which areas the formation of various infrastructure complexes in TLFO is necessary, and it was also substantiated in which sequence the creation of those complexes is more appropriate, and in order to support this approach, a SWOT analysis was carried out in Table 4 for the proper direction of investments in infrastructure projects toward priority areas.

[16] İbrahimov. İ.H. Regionların və işğaldan azad edilmiş ərazilərin inkişaf istiqamətləri. - Bakı: "Kooperasiya", - 2022. - 240 s.

Table 4
SWOT analysis of infrastructure in TLFO

Strengths	Weaknesses	Opportunities	Threats
TLFO is located in a strategic region, plays the role of a gateway between Europe and Asia, and offers trade routes to both Europe and Asia. This location has high potential for attracting foreign investments.	The production and social infrastructure in these territories suffered serious damage during the years of occupation. Roads, bridges, and utility services require extensive repair and reconstruction.	There are opportunities in these territories for the development of the non-oil sector for the purpose of economic diversification in Azerbaijan. Agriculture, tourism, and the production sector in these territories may attract a large inflow of money to the country.	Ongoing clashes or tensions may affect reconstruction works and may discourage potential investors.
There are extensive resources for the application of innovations in the field of environmental protection and for the restoration of infrastructure.		The existence of renewable energy sources and smart city technologies creates opportunities for the application of modern infrastructure practices.	The direction of the major part of the investment inflow by the state for nearly 4 years may create a budget problem for future years.
The region is rich in abundant natural resources, including fertile lands, mineral resources, and water reserves for agriculture, mining, and energy production.		In the event of the full completion of infrastructure works in the Zangezur corridor, regional cooperation, trade, and economic integration may benefit Azerbaijan and neighboring countries.	

The cultural heritage sites and historical attractions of the region may have a significant impact on the development of the tourism sector.	The lack of flexibility of the existing organizational-economic mechanism in Azerbaijan negatively affects the development of TLFO.	The territories have high renewable energy potential, and as a result of the small population, there is an opportunity for the easy implementation of ecological projects.	The strategic importance of the region and geopolitical tension may complicate the reconstruction process.

Source: *The table was compiled by the author on the basis of sources 12, 16, 17, 18, 19, 20, 21 and 22 cited in the abstract.* [17,18,19]

The SWOT analysis carried out shows that the investments directed to the infrastructure sector in TLFO create conditions for the formation of positive economic results across the country. At the same time, there is also a possibility of the emergence of certain risks and limitations in the investment process. From this point of view, it is considered necessary to take into account a number of important factors when directing investments to the mentioned territories, and these issues were substantiated by the author within the framework of the dissertation.

It should be noted that the efficiency of state regulation is determined by its functioning both as a regulatory institution and as a market participant. The simultaneous implementation of these two functions requires the efficient coordination of economic processes. From this point of view, the improvement of the organizational-economic mechanism is necessary for the efficient functioning of infrastructure complexes in TLFO, and the main directions are summarized in Table 5.

[17] "Ağıllı şəhər" (Smart City) və "Ağıllı kənd" (Smart Village) konsepsiyasının hazırlanması haqqında Azərbaycan Respublikası Prezidentinin Sərəncamı. Bakı: Qanun, - 2021.

[18] "Azərbaycan Respublikasının işğaldan azad edilmiş ərazilərində "yaşıl enerji" zonasının yaradılması ilə bağlı tədbirlər haqqında" Azərbaycan Respublikası Prezidentinin Sərəncamı. Bakı: Qanun, - 2021.

[19] "Azərbaycan Respublikasının işğaldan azad edilmiş ərazilərində kənd təsərrüfatı təyinatlı torpaqların idarə edilməsi ilə bağlı bəzi məsələlər haqqında" Azərbaycan Respublikası Prezidentinin Fərmanı. Bakı: Qanun, - 2021.

Table 5
Proposed action plan for the improvement of the organizational-economic mechanism in TLFO

Direction	Description
1. Comprehensive assessment of infrastructure demand	Carrying out a comprehensive analysis by population and territory in order to determine the demand for infrastructure in TLFO.
2. Optimal planning and forecasting of investments	Carrying out forecasting and analysis for the purpose of determining the optimal distribution of investments by time period and sector.
3. Development of investment mechanisms on the basis of public-private partnership	Development of public-private partnership mechanisms and the formation of a favorable investment environment in the direction of attracting private sector investments for the efficient formation of infrastructure.
4. Development of entrepreneurship and innovation potential	Creation of innovation and entrepreneurship centers and provision of advisory support to them in order to ensure the efficient use of infrastructure opportunities by local entrepreneurs.
5. Improvement of sustainable infrastructure management and operation mechanisms	The implementation of infrastructure projects on the basis of high-quality construction and systematic maintenance principles is considered one of the main factors ensuring their long-term sustainability.

Source: *The table was compiled by the author on the basis of sources 11, 12, 16, 20, 21 and 22 cited in the abstract.*[20,21,22]

At the same time, it should be noted that, in a broad sense, the organizational-economic mechanism acts as a system regulating the management of resources, the adoption of economic decisions, and the implementation of projects. The action plan presented in Table 5 reflects precisely the broad aspects of this mechanism.

[20] "Azərbaycan Respublikasının işğaldan azad edilmiş ərazilərinə Böyük Qayıdışa dair I Dövlət Proqramı"nın təsdiq edilməsi haqqında" Azərbaycan Respublikası Prezidentinin Sərəncamı. Bakı: Qanun, - 2022.

[21] "Azərbaycan 2030: sosial-iqtisadi inkişafa dair Milli Prioritetlər"in təsdiq edilməsi haqqında Azərbaycan Respublikası Prezidentinin Sərəncamı. Bakı: Qanun, - 2021.

[22] "Azərbaycan Respublikasının 2022-2026-cı illərdə sosial-iqtisadi inkişaf Strategiyasının təsdiq edilməsi haqqında" Azərbaycan Respublikasının Prezidentinin Sərəncamı. Bakı: Qanun, - 2022.

It should be especially emphasized that the improvement of the organizational-economic mechanism in TLFO may serve the formation of a more favorable entrepreneurial environment in the region. This, in turn, may stimulate the participation of the private sector in infrastructure projects and investment initiatives.

Conclusion

As a result of studying the theoretical-methodological foundations of infrastructure, examining the role and importance of infrastructure in ensuring socio-economic development in TLFO, analyzing the infrastructure sectors created and to be created in TLFO, and investigating their problems, a number of conclusions were obtained as the outcome of the dissertation work:

1. The study of the theoretical foundations of infrastructure shows that, under modern conditions, "infrastructure" is the aggregate of the main physical and organizational structures supporting the implementation of the economic and social activities of a country or region.

2. In the conducted research work, it was concluded that the "optimal formation of infrastructure" is the process of establishing infrastructure in accordance with the demands of the population for the rapid development of the territories, ensuring the best use of available resources, and providing long-term efficiency.

3. As a result of the conducted research, it was concluded that infrastructure is classified into four main types according to the direction of services it provides and its formation characteristics: production, social, market, and innovative.

4. The most important functions performed by infrastructure in the modern period were identified, and it was concluded that it has 3 main functions:

- intermediation function;
- regulation function;
- function of ensuring the uninterrupted operation of the mutual economic relations and interactions of the subjects of the market

economy.

5. As a result of the analysis of the specific features of infrastructure services, it was determined that they are characterized by eight main features.

6. As a result of the extensive and comprehensive research carried out, the measures implemented by the state in the field of infrastructure construction in TLFO were comprehensively analyzed and evaluated. The research results show that the works carried out by the state in the direction of the restoration and reconstruction of production, utility, and social facilities are being implemented efficiently and purposefully.

7. It was determined that the infrastructure projects being formed and to be formed in TLFO, alongside the development of the region, will have a positive impact on the sustainable socio-economic development of the country's economy.

8. In the research work, it was determined that, in order to form infrastructure optimally, alongside the construction of social and production infrastructure, attention should also be paid to the protection of the environment and natural resources, because the development of industry and production sectors may lead to the exploitation of natural resources and environmental pollution.

9. The creation of industrial parks in Aghdam and Jabrayil ensures the production of high-value products through the application of modern technologies and that the number of products produced is at an optimal level.

10. Based on the analyses carried out, it was concluded that, at the initial stage, it is important to form infrastructure in TLFO in the fields of agriculture, transport-warehousing, education, culture, tourism, healthcare, and environmental protection.

11. As a result of the research carried out, it was determined that the creation and development of innovative infrastructure in TLFO may create favorable conditions for the country's formation as a transit-logistics center from the point of view of its geographical position. From this point of view, it was concluded that the expansion of logistics centers in the territories may ensure the country's closer integration into international trade networks.

12. It has been scientifically substantiated that the expansion of

infrastructure for the development of agriculture in TLFO is of particular importance from the point of view of ensuring food security in the country.

13. As a result of the research carried out, it was determined that, in the development of industrial infrastructure in TLFO, environmental protection and the ensuring of ecological safety may act as one of the main priorities. From this point of view, the incineration of waste in special plants for conversion into energy is evaluated as an innovative approach, and its phased application is considered significant from the point of view of reducing ecological problems in the region, expanding energy production, and forming new employment opportunities.

Proposals and recommendations

The consideration of certain sectors in TLFO on a priority basis makes it possible to implement infrastructure projects with relatively less expenditure of resources and time, thereby allowing the formation of more efficient revenues for the state budget and the provision of employment for the local population, for which reason the implementation of the following proposals and recommendations put forward in this direction is considered necessary:

1. The formation of cultural infrastructure in TLFO may serve as an important source of economic income for the country in the modern period. This may stimulate the development of tourism in parallel with this sector and may increase investment attractiveness. It should be particularly noted that this direction may create favorable conditions for the implementation of investments within the framework of public-private partnership and for the development of tourism infrastructure around cultural facilities with the participation of foreign companies. The continuation of these processes mainly by the private sector may create conditions for reducing the burden on state investments.

2. The “campus” model acts as an efficient approach for the optimal formation of infrastructure in TLFO. Here, at the initial stage, the state ensures a stable flow of students and socio-economic demand by forming base educational and engineering-utility infrastructure, while at the subsequent stage, on the basis of this foundation, social, service, trade,

and innovation-oriented infrastructures are developed mainly by the private sector. As a result, with relatively low state investment, a multifunctional space is formed and conditions are created for the emergence of a sustainable economic ecosystem.

3. Along with the increase in the number of infrastructure projects in TLFO, ensuring their quality and efficiency acts as a main priority. From this point of view, the implementation of innovative infrastructure projects and the application of innovations in the production and service sectors have been considered efficient in terms of accelerating economic development and increasing the employment of the local population. From this point of view, proposals have been put forward in 3 main directions:

- creation of agricultural product processing enterprises in TLFO;
- creation of industrial logistics centers (such as the warehouses used in various countries by enterprises such as Amazon, AliExpress, etc.);
- creation of entrepreneurship and innovation centers.

4. For the purpose of the optimal planning and efficient management of infrastructure in TLFO, it is considered appropriate to create a unified digital data exchange platform similar to Estonia's "X-Road" model, but adapted to local characteristics.

5. For the efficient formation of infrastructure in TLFO and the improvement of management processes, the application of "Digital Twin" technology is considered appropriate. This approach, by making it possible to create a digital twin of the territories, may ensure the prior scenario-based assessment of projects, the optimization of resource allocation, and the more accurate substantiation of management decisions.

6. For the purpose of the optimal formation of production and utility infrastructure in TLFO, it is considered appropriate to apply a methodological approach based on an integrated indicator system for the comprehensive assessment of the current state of these sectors. Within this framework, a more objective assessment of the level of development of infrastructure facilities and their role in economic activity may be ensured.

The main provisions of the dissertation work are reflected in the following publications of the author:

1. Zəkizadə, S.S. Zəngəzur dəhlizində infrastrukturun yaradılmasının regional inkişafa təsiri //"Davamlı inkişaf strategiyası: qlobal trendlər, milli təcrübələr və yeni hədəflər" mövzusunda I Beynəlxalq elmi konfransı, - Mingəçevir: MİQ, 10-11 dekabr, - 2021, - s. 371-373.
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