

REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Science

**PROBLEMS OF FORMATION AND SUSTAINABLE
DEVELOPMENT OF A NEW TRANSPORTATION SYSTEM IN
THE REPUBLIC OF AZERBAIJAN**

Speciality: 5312.01 – Field economy

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THE WORK'S GENERAL CHARACTERISTICS

Relevance and development of the topic: The acceleration of globalization and integration processes in the twenty-first century has had an impact on the growth of the national economy and its many sectors. Global socioeconomic processes pose specific challenges to the national economy as a whole, as well as to specific sectors, and successful handling of these challenges is impossible to envision without the involvement of transportation.

Taking this into account, the Azerbaijani government is taking a number of efforts to strengthen our country's transportation system and services, and appropriate programs and projects have been developed and implemented successfully. Presidential decree #1992 of February 22, 2007 "on initiatives to improve the management of the Republic of Azerbaijan's transportation and road complex", the order # 1572 of July 7, 2006 "on improving the transport system in Baku", the order # 1002 of July 6, 2010 on the approval of the "State Program for the Development of the Railway Transport System in the Republic of Azerbaijan for 2010-2014" and other strategic documents include the legal framework for nationalizing transportation management and services in our country, adapting them to international standards, and integrating the national transportation system with the global transportation system in general.

As a result of successful decisions and directives, completed projects and programs have created a new transportation system in the Republic of Azerbaijan, positioning it as an important transport and transit centre. In the words of Mr. Ilham Aliyev, President of the Republic of Azerbaijan has emphasized that the transportation system must match current requirements: *According to Davos, Azerbaijan's transportation infrastructure is ranked 31st in the world.. In terms of road quality, we are ranked 27th in the globe. In terms of railway transport efficiency, we rank 11th, and in terms of air transport efficiency, we rank 12th... There has been a significant development in this direction since the commissioning of the Baku-Tbilisi-Kars railway. Cargo is moved not only from East to West, but also from Russia to Azerbaijan and Turkey to Europe, and the volume of this cargo is growing year after year. As a result, despite its lack of access to the high seas, Azerbaijan has become one of the*

international Eurasian transit hubs (Khalq newspaper, 16.01.2020). As can be seen from these perspectives, our country is developing a new transportation system, and transportation and transit services are one of the sectors where our country has a competitive advantage and vast prospects, making scientific study in this field very important.

Despite the fact that Azerbaijan has several transit options and that the transportation industry received the highest funding from 2005 to 2019, there is a mismatch between the cash raised and the sector's financial performance. Thus, between 2005 and 2014, the transport sector's fixed asset investment climbed from 515 million manat to 2440.6 million manat, but the sector's profit declined by more than three times to 128 million manat. In 2020, investments totalled 2091.6 million manat, profit amounted to 793.9 million manat, and losses totalled 566.8 million manat, or 71.4 percent of profits. Changes in the manat's exchange rate are recognized as one of the primary reasons in profit growth.

In addition to this, a diverse range of problems exist including non-compliance of used vehicles with European norms, a small number of national carriers (particularly private carriers) and limited access to international markets, existing transportation logistical issues, a lack of activity to attract cargo, mismatch of corporate interests of diverse means of transportation (rail, sea, air, etc.), existing problems in transportation process coordination, incompatibility of the national transportation system's competitiveness with modern world requirements.

One of the "Sustainable Development Goals" aims to achieve socioeconomic development while also considering environmental requirements, environmental conservation, and ecosystem protection, all of which are connected with transportation. When we consider that transportation is responsible for 60-65 percent of environmental damage, it is important to note that it takes roughly 15 kg of oxygen to fully ignite 1 litre of fuel. As the number of vehicles on the road grows every year, it becomes clear what challenges transportation faces in terms of long-term growth. In this context, doing relevant research and developing scientifically sound proposals on these topics is extremely important.

In general, the "Azerbaijan 2030: National Priorities for Socio-Economic Development" and the "National Security Concept of the Republic of Azerbaijan" both emphasize the importance of developing a

sustainable transportation infrastructure in our nation. As a result, the above-mentioned documents declare that the government's economic policy is based on the country's long-term economic development. Of course, overall sustainable growth demands individual sustainable development, including the transportation system. To this end, the issues including the formation and improvement of an efficient transport system related to "Azerbaijan 2030: National Priorities for Socio-Economic Development," the improvement of transport services to the population, ensuring the efficient use of international transport corridors, development of the transportation system of the capital and regions, noise reduction in high-traffic areas, and so on reflect the relevance of the chosen research topic.

On the other hand, one of the key goals of the Republic of Azerbaijan's "National Security Concept" is to achieve sustainable economic development and environmental conservation. The main tasks ahead, according to the Concept's "Transport Safety" item, are ensuring the reliability of the transportation infrastructure, strengthening control over the operation of vehicles and infrastructure, and preventing damage to the social and environmental issues during the construction and operation of transportation including transportation facilities. Conducting appropriate scientific study, developing proposals, and making recommendations are all required for proper completion of these responsibilities.

The construction of a sustainable transportation infrastructure in the Republic of Azerbaijan is also mandated by the National Platform for Action produced under the Azerbaijan-EU Neighbourhood Policy (ENP). As a result, ten priority areas within the ENP have been identified. The Action Platform's aims include supporting sustainable development and strengthening transit linkages between Azerbaijan and the European Union. Harmonizing the national transportation system with the European transport system, as well as developing scientifically informed proposals and recommendations for the research and adoption of applicable best practices, are all critical in this regard.

All of this means that identifying the potential for the construction of a new transportation system and conducting research to assure the

system's effective functioning in general, as well as developing relevant proposals and recommendations is critical.

It is worth noting that figures reveal that 56.4 percent of freight and 87.2 percent of passenger traffic is transported by road. Road transport, on the other hand, is a mode of transportation that begins and ends the transportation process due to the potential of door-to-door delivery. In this context, the research focuses on road transport, the infrastructure involved in the organization of road transport services, and the entire road transport complex.

Many local and international scientists have conducted extensive research in the areas including development of the national economy, ensuring sustainable development, sustainable human development, transportation sector development, enhancement of transportation services, environmental problem prevention etc.

The Azerbaijan scholars including A.A.Aliyev, A.A.Nadirov, Z.A.Samadzada, A.K.Alasgarov, U.K.Alakbarov, A.Kh.Nuriyev, A.M.Musayev, I.H.Aliyev, S.Q.Cumshudov, Z.S.Mammadov, A.Sh.Shakaraliyev, M.A.Ahmadov, A.Q.Alirzayev, G.A.Ganciyev, M.C.Huseynov, M.R.Taghiyev, N.A.Qasimov, I.A.Aslanov, R.P.Sultanova, F.P.Rahmanov, S.Y.Huseynov, D.A.Valiyev, A.B.Aliyev, E.A.Aliyev, K.B.Taghiyev, T.A.Khalilov many others have devoted a significant amount of time to the study of various theoretical, methodological, and practical aspects of the subject in their publications.

We can mention the following foreign scholars such as Голубев И.Р., Луканин В.Н., Гудцов В.Н., Бочаров Н.Ф., Аксёнов И.Я., Лукинский В.С., Бегма И.В., Кисляков В.М., Шаповалов А.Л., Якубовский Ю., Дергачов А.Ф., Миротин Л.Б., Афанасев Л.Л., Бакланов П.И., Бабков В.Ф., Бронштейн Л.А., Шайкин В.И., Малов Р.В., Кононова Г.А., Галабурда В.Г., Новиков Ю.В., Аксёнов В.А., Пеньшин Н.В., Донченко В.В., Абалонин С.М., И.В.Спирин, Крыжановский Г.А., Ивуть Р.Б.

The above-mentioned foreign and local scientists have conducted research on topics such as sustainable development, international transportation projects and their strategic importance, transportation enterprise planning, the impact of the transportation system on regional development, transportation safety, and others.

After 1991, about 8 doctoral dissertations (authors: E.F. Gasimov, E.B. Hasanov, Y.H. Yusifov, A.Y. Rzayev, F. Mirzayev, A.R. Rzayev, etc.) were written on the integration of the transport sector into the global space, reforms in this area, research on transportation statistics, competitiveness of transportation services, improvement of service areas in the regions (Lankaran-Astara, transportation services), and other topics. However, our country's transportation system, and the subject of insuring its long-term development, has not been chosen as independent research topics.

Not special attention has been given to scientific research works in the case of Azerbaijan on matters such as transportation sector development, creation of a new transportation system, systematic study of the organization of transportation services in accordance with the requirements of sustainable development, scientific analysis, increased efficiency in these areas, logistics organization of transportation, coordination of corporate interests of different modes of transportation and competition of transport entities capacity building.

Organization and management of the transportation system in modern times in accordance with the requirements of sustainable development, improved the use of transportation and transit potential, organization of transportation services in accordance with "Azerbaijan 2030: National Priorities for Socio-Economic Development," analysis and generalization of best practices in this field make it vital to offer recommendations aimed at maximizing the potential that already exist.

It should be emphasized that the operation of the Republic of Azerbaijan's transportation system has not been picked as an object of investigation in doctoral dissertations in economic sciences since 1972, encompassing the last 50 years. This dissertation is the first doctoral dissertation on the transportation system in the last 50 years, including after the Republic of Azerbaijan regained independence in 1991.

Goals and objectives of the study: The study's major goal is to investigate the issues surrounding the formation and long-term development of a new transportation system in the Republic of Azerbaijan, as well as to generate substantiated solutions and recommendations to address these issues:

- Research of features of formation of new-independent transport system;
- Clarify the concepts of long-term transportation system development and the role of financial resources in this effort;
- Study modern organizational and economic management forms, as well as research into scientific management foundations in the transportation system;
- Research and generalization of relevant worldwide experience on the establishment and management of a self-contained transportation system;
- Analysis of the dynamics of the road-transport complex's development in the Republic of Azerbaijan, as well as explanation of future opportunities;
- Azerbaijan 2030: Analysis of National Priorities on socio-economic development from the perspective of the transport system;
- Research into ways to improve the management of the transportation system;
- Looking into the possibilities of using economic-mathematical approaches to manage the transportation system;
- Finding out ways to improve the competitiveness of transportation subjects;
- Identify strategies to increase intellectual relationships between regional transportation hubs and modes of transportation logistics organization;
- Develop scientifically justified plans and recommendations for the formation and sustainable development of a new transport system in the Republic of Azerbaijan;
- Substantiate the need for the formation and development of a green transport system in Azerbaijan;

Research methods: Various methodologies were employed depending on the research object, task, and objectives. Economic-mathematical methodologies were employed in the study, including statistical observation, induction, deduction, systematic and comparative analysis, Simplex method, and potential method.

The main provisions of the defence:

1. As a result of the acceptance of the Concept of Sustainable Development and the transition of national economies to sustainable development, it is now vital to ensure that the transportation system is also sustainable. Demand, technical advancement, and social life are all key aspects in sustainable development;

2. For those who utilize the transportation system, high speed, low cost, and consistency, as well as for society as a whole, meeting environmental protection regulations can be considered criteria for transportation service efficiency. Under these circumstances, transportation revenue can be a source of funding for the system's long-term development;

3. The Republic of Azerbaijan is positioned along the East-West and North-South transportation routes, which means that our country has a lot of potential for transit services. It is vital to coordinate the national transportation system with international initiatives in order to make efficient use of transit services and international transport projects;

4. Profits from investments in the Republic of Azerbaijan's road and transportation complex during the independence years are incompatible. Despite the fact that field investments have increased multiple times, profits have decreased and losses have increased. The major causes for this are weak fleet of trucks, inadequate cargo transportation work, and limited access to international markets, as well as a lack of incentives, actions to attract cargo, a lack of coordination across modes of transportation, and a lack of multimodal transportation.

5. The transportation system is a critical component of achieving the "Azerbaijan 2030: National Priorities for Socio-Economic Development" and "Sustainable Development Goals";

6. In today's world, the need for a flexible, logistical transportation organization necessitates the use of multi-modal transportation. In this regard, it is vital to improve the regulatory framework for the organization of transportation services and harmonize the basis for various forms of transportation by utilizing ICT opportunities;

7. Passenger transportation in megacities can be more efficiently organized using statistical observation, timekeeping, and working day observation approaches. Simultaneously, the use of current economic and mathematical methods to decide the mode of transport in accordance with

passenger flow will assure passenger transportation services' flexibility and efficiency;

8. Improving the competitiveness of transportation services is necessary for ensuring sustainable development. Market share changes can be used as a measure of competitiveness;

9. The development of a sustainable transportation system necessitates the enhancement of regional transportation hubs and the strengthening of inter-hub links. It is critical to build intelligent management between transportation hubs for this reason;

10. Formation of a green transport system in Azerbaijan 2030 is a necessity arising from the National Priorities for Socio-Economic Development and the Sustainable Development Goals;

Scientific originality of the research: During the research, the scientific conceptual underpinning for the establishment of a new transportation system was produced, as well as the system's long-term development directions. The applicant's own scientific findings, as well as the proposed advancements, include:

- The national transportation system's socio-economic essence has been clarified, and the characteristics of the construction of a new independent system have been identified;

- Factors affecting the transportation system's long-term economic development have been recognized, and the creation and role of financial resources in assuring long-term development have been elucidated;

- The transportation systems of developed nations have been analyzed, plans and recommendations for improving the management of the Republic of Azerbaijan's transportation system have been produced, and an effective management scheme has been offered;

- It was established that transit services in the Republic of Azerbaijan are one of the potential sources of revenue for the state budget, and it was proposed how to more efficiently realize transit potential;

- Azerbaijan's road and transportation development opportunities have been recognized, and related plans and recommendations have been made to put these prospects into action;

- Based on “Azerbaijan 2030: National Priorities for Socio-Economic Development,” the primary challenges facing the sustainable transportation system have been highlighted;

- The necessity for economic-mathematical methods to promote management flexibility and transportation efficiency is justified, and an economic-mathematical method of optimal bus route selection in the context of public transportation in major cities is proposed;

- A method for evaluating the competitiveness of economic organizations that provide transportation services has been created, and a mathematical formula for calculating this indicator has been proposed;

- The logistics organization of services in the transport system has been clarified; methods for establishing suitable representatives in international cargo centres and the implementation of new management systems in regional transport junctions have been offered for this purpose;

- The environmental damage caused by transport has been identified, and solutions to mitigate the negative consequences have been presented;

- The need for our country to construct a green transport system has been proven, and a “Comprehensive Program of Measures for Transport, Environment, and Health” has been created;

- At this time, when a new transport system is being built and effective use of transport and transit capacity is required, the necessity to coordinate the country’s socioeconomic, environmental, and cultural development measures is justified;

Theoretical and practical significance of the research: During the study, the results, developed proposals and recommendations on sustainable development of transport, formation of a new competitive “Green Transport System” in the context of sustainable development of the country, improvement of management in the national transport system has been presented to the general public in the published monographs entitled “transport infrastructure development directions (using road transport as an example)” (Baku, “TI-MEDIA” NPM, 2008, 152 pages), “Development of the transport and tourism sectors in Azerbaijan: problems and prospects” (Baku, “Europe” edition, 2011, 238 pages), “Formation and sustainable development of the new transport system in

the Republic of Azerbaijan: scientific-theoretical foundations and perspectives” (Baku, “Europe” publishing house, 2013, 400 pages).

The study’s core provisions, practical results, and recommendations are all based on the national economy, including transportation, industry, and so on. It enables the transportation system to be improved and the efficiency of transportation services to be increased in the context of globalization and the open economy. The prepared proposals and recommendations can be used in legislation as well as by relevant executive authorities in their day-to-day operations.

The object of research is the transport system of the Republic of Azerbaijan.

The subject of the research is a comprehensive study of theoretical, methodological, scientific and practical issues of formation, development and improvement of the transport system.

Approval of research results: The study’s findings, as well as ideas and recommendations, were forwarded to the appropriate authorities. On the feasibility of using the results, the Ministry of Transport of the Republic of Azerbaijan issued opinion # **A12 / 02 - 08/25** on January 08, 2015, and the Azerbaijan University issued opinion # **069** on April 25, 2014.

The findings of the study process were published in monographs, textbooks, essays, and theses, all of which received excellent response from relevant specialists. The author published in Azerbaijan, America, Germany, Turkey, Russia, Ukraine, Kazakhstan, and Georgia. Many articles and theses have been evaluated at worldwide, national, and local scientific conferences at the same time. In a volume of 189.1 printed pages, 164 papers and theses, 5 monographs, 3 textbooks, and 1 textbook were published.

Name of the organization where the dissertation work has been carried out: Institute of Economics of the Azerbaijan National Academy of Sciences

Structure and scope of the dissertation: The study is 281 pages long and has 481.492 symbols. It includes an introduction (20519 symbols), five chapters (I chapter – 63938 symbols, II chapter – 92411 symbols, III chapter – 107448 symbols, IV chapter – 89117 symbols, V chapter – 91308 symbols), conclusions (16616), as well as a bibliography.

There were 41 tables, 7 diagrams, 3 diagrams, 4 figures, and 302 references in the work, which had 5 chapters and 15 paragraphs.

The structure of the dissertation

Introduction

Chapter I. Theoretical and methodological foundations of formation and sustainable development of the transport system

1.1. Socio-economic meaning of the transport system and features of the formation of a new-independent system

1.2. Theoretical foundations and main principles of sustainable development of the transport system

1.3. Formation of financial support for sustainable development of the transport system

Chapter II. Organizational and economic bases of the formation of the transport system and management principles

2.1. Scientific foundations and management principles for transportation systems

2.2. Management of transportation systems using modern organizational and economic methods

2.3. International experience and its impact on the formation and management of the transportation system

Chapter III. Analysis and assessment of the formation and development of the transport system in the Republic of Azerbaijan

3.1. Stages of formation of modern transport system in the Republic of Azerbaijan

3.2. Analysis and assessment of the development dynamics of the road transport complex

3.3. Analysis and assessment of technical and economic indicators of the transport system

Chapter IV. Directions for improving the management of the transport system of the Republic of Azerbaijan

4.1. “Azerbaijan 2030: National Priorities for Socio-Economic Development” and organization of transport system management

4.2. Current state of management in the transport system and directions for improvement

4.3. Economic-mathematical method of improving the management of the transport system

Chapter V. Ways to solve the problems of ensuring the sustainable development of the transport system in the Republic of Azerbaijan

5.1. Directions for improving the competitiveness of economic entities providing transportation services

5.2. Establishment of intelligent management between transport hubs and directions of logistics organization of transportation

5.3. Problems of formation and development of "Green transport system" in Azerbaijan

The result

Bibliography

MAIN PROVISIONS PROVIDED FOR DEFENSE

1. As a result of the adoption of the Concept of Sustainable Development and the transition of national economies to sustainable development, it is now vital to ensure that the transport system is also sustainable. Demand, technical advancement, and social life are all key aspects in sustainable development.

By the close of the twentieth century, the globe was confronted with a new model of development that prioritized both quantitative and qualitative metrics, posing new challenges for the transport system. The development of science-economic interaction, the quick application of scientific and technological advances to the economy, and the efficient and maximum utilization of natural and economic resources are all part of this paradigm. As a result of this approach, the modern notion of economy and the concept of sustainable development have emerged. Sustainable development and modernization are, in fact, complementary processes with similar characteristics. Because the basic essence of both concepts is the efficient use of resources, technical and technological innovation, personnel training, transportation procedures, and so on, it arranges improvements at all levels. All of this is linked to the transport system.

According to S.G. Jumshudov, Z.S. Mammadov, and other scientists, it serves to meet the needs of society and industry of passengers and cargo transportation as a transport infrastructure sector of the national

economy¹. It also plays an important role in the creation of inter-sectoral and interregional interactions. “Transport is a criterion for interaction,” says Ulman, an American geographer who has examined the growth of the transport sector and its increasing significance in economic development.² The transport of transport links is also a critical aspect in the optimal deployment of productive forces, which cannot be accomplished without them.

However, everything in sustainable development must only ensure human progress and lay the groundwork for it. This suggests that J. Keynes’ 19th-century economic growth theory had a significant influence on the development of the notion of sustainable development. The development and realization of human qualities and skills, as well as the extension of his personal possibilities and choices, are the main qualitative precondition of economic progress, according to this theory³.

The quality of life, which is connected with the name of one of the world’s best scientists, Y. Tinbergen, is one of the concerns that play a significant role as a theoretical basis for the sustainable development of transport. The essential essence of quality of life in the sustainable development of transport, as in general sustainable economic development, is to ensure a normal existence from a socioeconomic and ecological standpoint⁴.

As a result, it is evident that the notion of sustainable development, including sustainable transport system development, is a fundamentally new approach to existing challenges. The concept of sustainable development appears in a number of international texts as well as in the writings of individual researchers. For example, some academics (R. Kostansa, K. Folke, and others) highlight three interconnected concerns related to sustainable development:

- Bringing the ecological system and economic progress together;

¹ Cümşüədov S.Q. “Nəqliyyat infrastrukturunun inkişaf istiqamətləri (avtomobil nəqliyyatı təmsalında)” / “TI-MEDIA” NPM, Bakı, 2008, 152s.

² Məmmədov, Z.S. “İqtisadi inkişafın nəqliyyat faktoru” / Z.S.Məmmədov. Bakı: Elm, 2003, 380 s.

³ Əsgərov, Ə. “Davamlı insan inkişafı” / Ə.Əsgərov və b. “İqtisad universiteti” nəşriyyatı, 2009, 600 s

⁴ Aliyev, İ.H. “Milli iqtisadiyyat: modernləşmə və davamlı inkişaf”. Bakı: “Avropa” nəşriyyatı, 2012, 419 s.

- Equitable sharing of natural and economic resources among current and future generations, as well as among all living things;
- Optimal resource usage time distribution, including capital distribution⁵.

The work on sustainable development has been discussed at conferences in the past, including

“Environment and Development” in Rio de Janeiro (1992), “Population and Development” in Cairo (1994), “Social Development” in Copenhagen (1995), Sustainable Housing in Istanbul (1996), and “Sustainable Development” in Johannesburg (2002), and it was argued that sustainable development of the transport system is related to demand, technological development and environmental factors.

2. For those who utilize the transportation system, high speed, low cost, and consistency, as well as for society as a whole, meeting environmental protection regulations can be considered criteria for transportation service efficiency. Under these circumstances, transportation revenue can be a source of funding for the system’s long-term development;

Poverty and natural resource depletion are two important concerns confronting the modern world, as well as future generations. The environment and natural resources must be protected in order to solve both challenges. The purpose of long-term transportation system development is to ensure an equitable allocation of resources between current and future generations by combining the economy and ecological into a unified system that appears to be at odds.

Revenues from the transportation sector, in this view, must meet socioeconomic and environmental objectives. More specifically, the efficiency of transportation services is examined as a whole, rather than as a single economic category. Efficiency is measured in terms of social, economic, and environmental factors. Only under these conditions will the funds be a viable source of capital for the industry's long-term development.

⁵Hüseynov S.Y. “Davamlı insan inkişafının strateji istiqamətləri”. Bakı: Adiloğlu, 2003, 264s.

Table 1. The share of transport in the country's economy, in percent

Göstəricilər	İ L L Ə R								
	2010	2012	2013	2014	2015	2017	2018	2019	2020
Value added	5.6	2,5	4,4	4,5	5,4	6,7	6,2	6,0	7,1
Gross profit	6.0	5,6	4,3	4,4	5,0	7,4	6,7	7,0	8,5
Net profit,	5.2	4,8	3,6	3,6	3,8	6,5	5,8	6,0	7,7
Average annual number of employees, thousand people	8.1	7,9	8,1	7,9	8,5	8,2	8,1	8,0	8,3
Average monthly nominal salary	119.2	128,4	126,2	119,3	128,8	138,9	148,2	134,8	125,2
Fixed assets,	8.6	9,3	9,4	8,2	8,3	6,8	6,7	7,4	6,8
Fixed capital investments	24.6	16,9	19,9	13,8	13,8	10,2	11,2	11,8	12,1

Source: "Transport of Azerbaijan" statistical summary, SSC, 2020, p.9;
 "Transport of Azerbaijan", statistical summary, SSC, 2021, p.9.

As shown in the table, transportation accounted for an average of 5.5 percent of the country's value added, 6.0 percent of gross profit, 4.9 percent of net profit, 7.7% of the average yearly number of employees, and 8.3 percent of fixed assets in recent years. In 2010, 2.44 billion manats was invested, followed by 2.51 billion manats in 2011, 1.92 billion manats in 2018, and 2.19 billion manats in 2019. This means that in 2010, 24.6 percent of investments in the country's transportation sector were made, compared to 19.6 percent in 2011. Furthermore, this figure was 16, 9% in 2012, 19, 9% in 2013, 13, 8% between 2014 and 2015, 10, 2 and 11, 2 between 2017 and 2018, 11, 8% in 2019, 12, 1% in 2020 which is approximately 2, 0 billion manats. Of course, all of this is critical for the long-term development of the transportation system and can help to generate financial resources. The following is a statistical snapshot of the national transportation system for the time after 2008.

Table 2. Key macroeconomic indicators for the transport sector

	2008	2010	2014	2017	2018	2019	2020
Value added million manats.	2060	2369	2653	4719	5033	4940	5144
Gross profit, million manats	1659	1961	1963	3860	4078	3997	3993
Net profit, million manats.	1270	1576	1386	2935	3071	3165	3229
Average annual number of employees, thousand people	109.1	112.2	120.2	126.1	126.8	130,8	140,7
Average monthly nominal salary, manats	314	395	530	734	807	856	886
Fixed assets, million manat.	4204	5700	9124	12404	12944	15541	15839
Fixed capital investments, million.	1992	2435	2432	1774	1923	2189	2092

Source: "Transport of Azerbaijan". Baku, SSC, 2020, 9 pages;
 "Transport of Azerbaijan", Baku, SSC, 2021, pages.9;

As can be observed, improvement in the transportation industry began to be felt after the Baku Conference on the Restoration of the Silk Road in 1998. As a result, in 2008-2014, the value added in the transport sector increased by 20.8%, gross profit 24.2%, net profit 9.1%, average monthly salary 42.4%, fixed assets 55.5%, and fixed capital -investments by 26.0%. All this, of course, has created conditions for the growth of the share of transport in the country's economy.

All this, of course, has created conditions for the growth of the share of transport in the country's economy. Based provided dynamics, value-added created in the transport sector, general profit as well as main capital investments made up 4.9 percent, 6.0 percent, and 19.6 percent of the country's total indicators in 2014, 8.7 percent, 11.8 percent, 14.3 percent in 2017, and 6.0 percent, 7.0 percent, and 11.8 percent in 2019.

The transportation system, in general, must be efficient for both users and society. While service customers value speed, reliability, and low-cost transportation, it is also important for society as a whole to safeguard the environment, conserve natural resources, foster a healthy atmosphere, and meet the requirements of people from all walks of life. Naturally, when the population's income is high, better and more expensive services are required, and vice versa. The arrangement of competitive services is one of the key aims of successful management in the context of sustainable economic development, which necessitates a scientific approach, marketing research.

The management mechanism and system of relations are clearly constructed on the basis of management principles, laws, goals, functions, and procedures. The ways the structural elements of this system interact with one another, as well as the approach to the overall management process as a system, are critical to the construction of an effective management mechanism and its successful deployment.

It may be necessary to take steps to park automobiles in specific places, restrict access through administrative measures, and charge a fee for them. Similar procedures are typical in industrialized countries, although the limits are usually far more lenient. Paid entrance to downtown London, for example, reduced traffic by 20% in restricted zones while increasing traffic speeds by 14%.

Experimentation has demonstrated that enforcing such restrictions not only generates additional revenue, but also contributes to a more proportional distribution of vehicles on streets and in neighbourhoods, reducing the negative consequences of traffic congestion in many circumstances. A suitable method for regulating vehicle mobility has been devised for this purpose (Appendix 1).

3. The Republic of Azerbaijan is positioned along the East-West and North-South transportation routes, which means that our country has a lot of potential for transit services. For effective utilization of transit services and international transport projects, coordination of the national transportation system with international initiatives is required.

During the research, the researchers looked at developments in the global transportation system, the passenger transportation systems of ten major cities across the world (Seoul, London, Tokyo, Munich, Paris, Berlin, New York, and so on), and the usage of alternative fuels, among other things. The significance of East-West, North-South, Baku-Tbilisi-Ceyhan, and other projects in the construction of a new transportation system was highlighted in particular, and the impact areas were assessed using precise statistics.

When examining passenger travel along the Great Silk Road (GSR), it is obvious that between 2014 and 2018, passenger traffic rose by 43.4 million persons. This resulted in a 32.9 million manats increase in passenger transportation revenue in 2018 compared to 2014. In general, freight traffic along the corridor increased by 399.2 million manats and passenger traffic increased by 46.4 million manats between 2000 and 2020, with freight turnover of 849 million ton-km and passenger turnover of 86 million passenger-km. Revenue from freight and passenger transportation increased by 399.2 million manats and 46.4 million manats, respectively. Only vehicle transport showed continuous traffic dynamics along the line. As a result, all road transport indices increased in 2020 compared to 2000. For example, between 2000 and 2020, rail freight traffic declined by 2,380,000 tons and freight turnover decreased by 633 million ton-km, yet freight transportation income climbed by 137.9 million manats. This indicates that exchange rates and price rises will benefit the sector.

Table 3:
Activity of Europe-Caucasus-Asia transport corridor
(on the part of Azerbaijan)

	2000	2010	2014	2015	2017	2018	2020
The cargo was transported, thousand ton	29091	51688	58191	52240	52733	52674	38491
Railway	15200	20578	19890	15521	13074	12564	12820
Sea	5779	9370	9302	6067	7423	6875	5015
Automobile	8112	21740	28999	30652	32236	33235	20656
Freight turnover, million ton-km	8405	13222	13216	10956	11427	11489	9254
Railway	5240	6874	5676	4557	4158	4305	4607
Sea	2098	3672	3717	2354	3020	2799	1873
Automobile	1067	2676	3823	4045	4249	4385	2774
Passengers were transported, a thousand passengers	152149	223175	307281	331119	345175	350640	158411
Railway	3731	4011	1890	1609	2346	2670	1047
Sea	7	12	15	9	17	16	20
Automobile	148411	219152	305376	329501	342812	347954	157344
Passenger turnover, million passengers-km	3049	4674	6 164	6628	6865	6965	3135
Railway	310	621	375	326	297	294	73
Sea	3	4	5	3	8	7	9
Automobile	2736	4049	5 784	6299	6560	6664	3053
Income from cargo transportation, in thousand manats	113936	322276	531003	545265	651783	633608	513141
Railway	73369	131635	204807	187966	221567	211657	211299
Sea	28801	75778	86170	76948	136834	121528	130913
Automobile	11766	114863	240026	280351	293382	300423	170929
Income from passenger transportation, in thousand manats	19313	61542	120365	137188	143276	153225	65741
Railway	1028	1651	2721	3341	3530	3912	951
Sea	308	1158	1051	814	932	1615	1128
Automobile	17978	58733	116593	133033	138814	147698	63662

Source: Statistical collection, "Transport of Azerbaijan". Baku, SSC, 2019, p.29;
Statistical collection, "Transport of Azerbaijan". Baku, SSC, 2021, p.26.

The study identified ways to accelerate the integration of transportation systems into the global space, flexible adaptation to the global transport system, proposals to attract cargo to benefit more effectively from international projects, and effective transport system management as one of the main requirements of the new transportation system.

4. Profits from investments in the Republic of Azerbaijan’s road and transportation complex during the independence years are incompatible. Despite the fact that field investments have increased multiple times, profits have decreased and losses have increased. The major causes for this are a lacklustre truck fleet, inadequate cargo transportation work, and limited access to international markets, as well as a lack of incentives, actions to attract cargo, a lack of coordination across modes of transportation, and a lack of multimodal transportation.

To clarify all of this, the dynamics of the construction of a modern transportation system were studied in depth, and research in the direction of analysis and assessment of the dynamics of development of the road-transport complex in Azerbaijan was carried out. Simultaneously, the technical and economic indicators of the transportation system were examined using extensive data, and the annual economic loss caused by traffic accidents for various reasons was estimated. In general, the third chapter, which focuses on the current situation, analyzes existing flaws, potential solutions, and other research fields, summarizes the state of roads, road armaments, and vehicle road conformance.

Table 4.

Cargo transportation in the transport sector, thousand tons

	YEARS						
	2008	2010	2012	2014	2017	2018	2020
Total	1893	196452	210862	221990	226419	230144	188629
Railway	27432	22349	23116	21795	14558	13954	14631
Sea	11898	11714	12371	9934	8344	8236	5982
The weather	43	40	82	124	173	208	458
Pipeline	55731	62458	57170	61534	58490	58402	56040
Automobile	87989	99891	118123	128603	144854	149344	111518

Source: *“Transport of Azerbaijan”*. Baku, SSC, 2019, page.10;

“Transport of Azerbaijan”, Baku, SSC, 2021, page.10;

As can be seen from the table, during the period 2008-2014, cargo transportation volume increased by 11.2 percent in the transport sector, 5.1 percent in maritime transport, 18.6 percent in air transport, 6.0 percent in pipelines, and 24.8 percent in road transportation, and declined by 19.1 percent in railway transport. There was a total increase of 4.0 percent from 2014 to 2018, but a decrease of 18.0 percent from 2018 to 2020. Since 2014, the dynamics of marine and rail transportation have been deteriorating.

Table 5

Passenger transportation in the transport sector, thousand passengers

	YEARS						
	2008	2010	2012	2014	2017	2018	2020
Total, mln. pass.	1242,2	1387,3	1617,3	1828,3	1973,4	2002,8	1177,6
Railway	6394	4803	2668	2517	2490	2841	2124
Sea	14	12	17	15	17	16	20
The weather	1396	1017	1599	1788	2359	2399	578
Metro	200412	181146	195642	215472	228848	231016	74709
Automobile, mln. pass.	1033,9	1200,3	1417,4	1608,5	1739,7	1766,6	1100,2

Source: <https://www.stat.gov.az/source/transport/>.
 “Transport of Azerbaijan”, Baku, SSC, 2021, p.12;

Except for COVID-19 regulations, passenger transportation had good dynamics in 2020. Passenger traffic increased across all means of transportation from 2014 to 2018. The most significant increases were seen in air transportation (34.2%) and rail (12.9%). At the same time, in 2020, the subway will account for 6.3 percent of passenger traffic, 93.4 percent for cars, and 0.3 percent for other forms of transportation.

As previously stated, due to the pandemic, a drop in transportation was recorded between 2019 and 2020, which did not go unnoticed by the sector’s revenues.

Table 6

Revenues from transportation in the transport sector, thousand manats

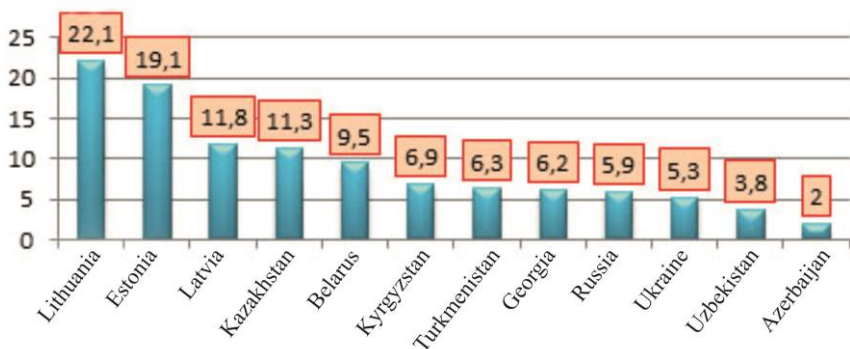
	2008	2010	2012	2014	2018	2020
Total	2524876	3065804	3341800	3678120	6231943	7006367
Railway	205828	158382	201855	236303	270841	274827
Sea	116 056	107221	114580	102339	170567	168987
The weather	372003	388870	617870	837820	2066918	3035229
Pipeline	1393854	1712629	1535006	1439109	2272532	2323741
Automobile	426785	669927	831682	1020030	1396899	1181960

Source: <https://www.stat.gov.az/source/transport/>.
 “Transport of Azerbaijan”. Baku, SSC, 2021, p.16.

Transportation revenues are also expanding dynamically, as seen by the figures. Although there were minor changes in specific modes of transportation at different times, the overall growth was significant. Thus, revenues in the transportation sector climbed by 89.3% percent between 2008 and 2014, with 125.0 percent in air transport, 3.0 percent in pipelines, 139.0 percent in road transport, 3.1 times in metro transit, and 15.0% railways. Maritime transportation fell by 12.0%. In specifically, between 2014 and 2018, a total of 69.4% growth was accomplished, with favourable dynamics for all forms of transportation. Revenues from marine, road, and metro transportation declined from 2018 to 2020. In general, whereas revenues climbed by 12.4% from 2018 to 2020, revenues from railways fell by 0.9 percent, road transport fell by 15.4%, and the subway fell by 60.1 percent. As previously stated, this is mostly owing to the pandemic's limits.

The provision of territory and people is clearly one of the most important measures of roadways. According to data from 2019, the world has an average of 180 km of paved roads per 1,000 km². Despite the completion of large-scale and numerous road-development projects in our nation since the late 1990s, Azerbaijan continues to trail behind Georgia, Belarus, Ukraine, Moldova, and other former USSR countries in terms of paved road indicators per 1,000 square kilometres. As a result, efforts to develop and improve Azerbaijan's road infrastructure will continue to be important in the coming years. When we consider that the liberation of our lands from occupation will result in increased road construction, the necessity for and opportunities for the growth of Azerbaijan's road transport complex, which is positioned at the crossroads of international transport corridors, become evident.

According to research, one of the characteristics that explain a country's level of development is the relationship between the country's road network and its population. Paved roads per 1,000 persons are a common measure of this. The following is a statistical representation of the provision of roads to the population in various countries:



Picture 1: A paved road for every 1,000 people in different countries, 2020, with km

Source: Compiled by the author based on research

The Republic of Azerbaijan falls behind several former Soviet countries in terms of road infrastructure. This statistic also highlights the importance of continuing to build new roads and enhance existing ones in our country. In general, our country has 19.2 thousand kilometres of roadways, or around 2 kilometres of road per 1,000 inhabitants.

Despite the fact that fixed asset investments in the transportation sector increased 7.8 times between 2005 and 2015 and 17.0 times between 2005 and 2018, research shows that the transport sector's earnings declined 2.2 times between 2005 and 2015. At the same time, investments in the transportation sector fell by 814 million manats from 2015 to 2020, but profits climbed by 4.3 times.

Table 7

Profits of enterprises and organizations (at current prices, million manats)

	YEARS				
	2005	2015	2017	2019	2020
Total	2133,1	16713,80	27373,20	37351,1	27576,8
Industry	1183,40	14508,90	22494.40	29465,60	18868,30
Agriculture	7,00	23,0	53,900	155.9	217.1
Transport	401,20	186,80	530.200	578.3	793.9
Communication	180,10	364,30	416.100	542.2	591.5
Construction	127,90	786,70	1034.300	1692.4	1905.2
Trade	140,90	202,90	919.400	2507.8	2916.4
Other	92,60	641,20	1924.900	2408.9	2284.4

Source: "Statistical indicators of Azerbaijan – 2021". SSC, Sada, p.375-376;

According to statistics, although the country's total losses amounted to 8.0 percent of earnings in 2014, the transport sector lost 88.2 percent of profits in 2014, 72.3 percent in 2015, and 23.0 percent in 2017. The data findings imply that money produced in the transportation sector are not being utilised efficiently or allocated properly.

Table 8
Financial results of enterprises and organizations
between 2017 and 2020 (million manats)

	2017			2020		
	Mənfəət	Zərər	Zərərin xüsusi çəkisi, %-lə	Mənfəət	Zərər	Zərərin xüsusi çəkisi, %-lə
Cəmi	27373,2	2078,7	8,0	27576,8	2644,7	9,6
Industry	22494,4	1171,2	5,0	18868,8	1062,9	5,6
Agriculture	53,9	39,0	72,0	217,1	77,8	35,8
Transport	530,2	123,5	23,0	793,9	566,8	71,4
Communication	416,1	38,3	9,0	591,5	50,1	8,5
Construction	1034,3	251,5	24,0	1905,2	194,4	10,2
Trade	919,4	94,6	10,0	2916,4	104,1	3,6
Other	1924,9	350,7	18,0	2345,7	754,2	32,1

Source: "Statistical indicators of Azerbaijan – 2018". SSC, Sada, p.403

Simultaneously, it is probable that there are some issues with the structure of current economic entities' activity in this area, and it is important to take actions to improve in this area.

Table 9.
Investments in the transport sector, million manats

	2010	2015	2017	2018	2019	2020
Total	2434.8	2195.3	1774.3	1922.8	2189.2	2091.6
Rail transport	3.4	1.6	2.1	7.1	1.2	1.2
Other road transport	162.9	237.6	38.5	129.8	235.8	266.8
Pipeline	344.8	313.9	86.5	168.3	140.5	121.8
Water transport	13.2	112.7	112.2	115.4	98.4	53.3
Air transport	214.1	397.2	402.2	39.4	33.7	109.7
Warehouse and ancillary transport activities	1696.4	1132.3	1132.8	1462.8	1679.6	1538.8

Source: "Transport of Azerbaijan" statistical summary. Baku, SSC, 2019, p.28;

Thus, 70, 0% of investments in 2010, 52, 0% in 2015, 64, 0% and 76,0% in 2017 and 2018 have been oriented to the development of infrastructure. This trend continued in succeeding years, with 76.7 percent in 2019 and 73.6 percent in 2020 devoted to infrastructure improvements.

5. The transportation system is a critical component of achieving the “Azerbaijan 2030: National Priorities for Socio-Economic Development” and the “Sustainable Development Goals”.

On the basis of “Azerbaijan 2030: National Priorities for Socio-Economic Development,” the study’s management priorities for the transportation system were clarified. As a result of the “Azerbaijan 2030 - National Priorities for Socio-Economic Development” and the international texts published by the UN on sustainable development, the establishment of a modern transportation system necessitates the implementation of a carefully coordinated unified transport policy.

In this regard:

- Creating a basic regulatory framework for the organization of the transportation system, transportation technology, and technical standards;
- The elimination of all forms of economic discrimination, as well as the establishment of a fair environment for the competition;
- Establishing broad principles of tariff and tax policy in the transportation sector. Harmonization of tariff policies for diverse modes of transportation in transit, in particular;
- Insurance conditions are being standardized, simplified, and improved;
- In order to assure the integration of transportation and production processes, as well as to expand the use of multimodal transportation, logistics management centres and terminals must be established.

6. In today’s world, the need for a flexible, logistical transportation organization necessitates the use of multi-modal transportation. In this regard, it is vital to improve the regulatory framework for the organization of transportation services and harmonize the basis for various forms of transportation by utilizing ICT opportunities;

The development of the transportation system, as well as the improvement of the use of economic mechanisms such as insurance, taxation, and others, has been investigated, and economic mechanisms are

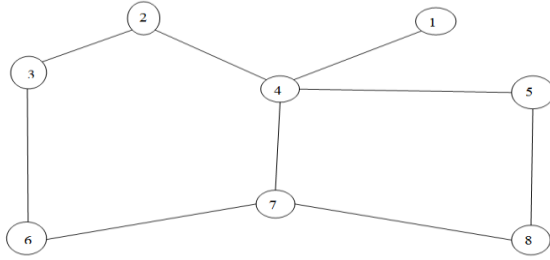
offered as a way to encourage the formation of transport entities with worldwide access. This chapter also looks at the normative-legal framework that governs transportation system activity. The statutes “On Transportation”, “On Motor Transportation”, important regulations, and other normative-legal documents were analyzed during the research, and proposals were made to strengthen the normative-legal base.

Simplifying the border-crossing process, facilitating transit transportation, coordinating local and international transportation, and further clarifying the responsibilities and rights of each entity in the effective organization of transportation operations would be beneficial in normative-legal documents.

The logistics of transportation is one of the most essential issues facing the new transportation system. The logistical planning of transportation necessitates the acceleration of current communication between process participants, as well as the establishment of mutually acceptable and advantageous relationships for all parties. Only by adopting such a broad perspective can the required efficiency and effectiveness be achieved;

7. Passenger transportation in megacities can be more efficiently organized using statistical observation, timing, and working day observation approaches. Simultaneously, the use of current economic-mathematical methods to decide the mode of transport in accordance with passenger flow can ensure passenger transportation services' flexibility and efficiency.

The research looked at the directions of management modelling in the transportation system, as well as the issue of effective organization of public transportation services - bus transportation in an arbitrarily chosen micro-district. The research created an economic-mathematical method of optimal route selection to improve the efficiency of bus transportation. That is, the primary goal of using the economic-mathematical method to organize a bus route layout is to minimize passenger waiting, departure, arrival, and departure times. In other words, $\sum_{n=0}^{n-1} T_{ij} \rightarrow \min$. can be regarded as the most important criterion for the efficient operation of traditional bus service.



Schematic description of the selected bus network as an example

The following results are generated as a consequence of the calculations performed on the example of a randomly selected micro-district, indicating which route is most efficient and fits the stated parameters.

Table 10
Interval of movement in different directions, minutes

Routes	Movement interval, min.	Result
1-2	$T_{1-2} = 42 \cdot 60 / 320 = 7.9$	uyğundur
1-3	$T_{1-3} = 42 \cdot 60 / 400 = 6.3$	uyğundur
1-6	$T_{1-6} = 42 \cdot 60 / 280 = 9.0$	uyğundur
2-7	$T_{2-7} = 42 \cdot 60 / 200 = 12.6$	uyğun deyil
3-1	$T_{3-1} = 42 \cdot 60 / 280 = 9.0$	uyğundur
3-4	$T_{3-4} = 42 \cdot 60 / 220 = 11.5$	uyğun deyil
3-6	$T_{3-6} = 42 \cdot 60 / 240 = 10.5$	uyğun deyil
3-7	$T_{3-7} = 42 \cdot 60 / 240 = 10.5$	uyğun deyil
4-2	$T_{4-2} = 42 \cdot 60 / 210 = 12.0$	uyğun deyil
4-3	$T_{4-3} = 42 \cdot 60 / 220 = 11.5$	uyğun deyil
4-6	$T_{4-6} = 42 \cdot 60 / 320 = 7.9$	uyğundur
5-1	$T_{5-1} = 42 \cdot 60 / 210 = 12.0$	uyğun deyil
5-2	$T_{5-2} = 42 \cdot 60 / 0 = 8.4$	uyğundur
5-7	$T_{5-7} = 42 \cdot 60 / 280 = 9.0$	uyğundur
5-8	$T_{5-8} = 42 \cdot 60 / 220 = 11.5$	uyğun deyil
6-7	$T_{6-7} = 42 \cdot 60 / 200 = 12.6$	uyğun deyil
7-4	$T_{7-4} = 42 \cdot 60 / 220 = 11.5$	uyğun deyil
7-6	$T_{7-6} = 42 \cdot 60 / 350 = 7.2$	uyğundur
7-8	$T_{7-8} = 42 \cdot 60 / 285 = 8.8$	uyğundur
8-5	$T_{8-5} = 42 \cdot 60 / 220 = 11.5$	uyğun deyil
8-7	$T_{8-7} = 42 \cdot 60 / 340 = 7.4$	uyğundur

Note: The table is based on the author's personal calculations.

On the other side, passing both points 4 and 8 allows you to get from point 5 to point 7. Movement on 5-4-7 line $T_h = 18+5+15=38$ minutes, and on 5-8-7 line $T_h = 36+5+31.5= 72.5$ minutes. It means that, movement on 5-4-7 lines is efficient. At the same time, it is possible to go to the point 2 from point 8 with line 8-5-4-2 and 8-7-4-2. On 8-5-4-2 line $T_h = 36+5+18+5+13.5=77.5$ minutes, while in the direction of 8-7-4-2 $T_h = 31.5+3+15+5+13.5 = 68.0$ minutes. It means that 8-7-4-2 route is more efficient from a time point of view.

Modes of transportation were studied during the study, priorities for effective management were identified, and an acceptable system to improve management efficiency was developed (**Appendix 2**).

8. Improving the competitiveness of transportation services is necessary for ensuring sustainable development. Market share changes can be used as a measure of competitiveness.

The study offered a technique for analyzing the competitiveness of transportation companies, citing increased competitiveness as one of the primary prerequisites for the system’s long-term development. The services must be profitable and have a particular level of profitability to ensure the carrier’s long-term success. Liquidity, in a wide sense, is a measure of a consumer’s overall freedom of choice, not just in terms of money from service sales, but also in terms of service consumption. The willingness of the company to ensure that its services are returned to the customer in cash is referred to as the liquidity of the service. A seller who provides a competitive service should expect to earn more money for each unit of service provided than a seller who provides a less competitive service. The revenue-to-price ratio is used to calculate the service's profitability ratio. In a competitive environment, the cost of revenue is formed and can be computed using the following formula:

$$G_{r\text{a}q.} = Q_{a\text{l.}} + Q_{i\text{s}t.}$$

Here, $G_{r\text{a}q.}$ — price formed in a competitive environment; $Q_{a\text{l.}}$ — purchase price of the service, cost; $Q_{i\text{s}t.}$ — the share of the consumer in the income generated in a competitive environment.

Efficiency is clearly defined in a market economy by the profitability of the service, which is determined as the ratio of revenue to the expenditures required to obtain it. One of the competitiveness criteria should be the ratio of the enterprise’s present market share to the change

in market share compared to the prior period. The marketing approach is characterized by the way of analyzing the competitiveness of the road transport firm described above. We can represent the competitiveness of the road transport firm as follows, using a mathematical language and a marketing technique, based on the above:

$$R_{rd} = R_g * R_b R_g = \frac{N}{n} R_{rd} = \frac{N}{n} * R_b$$

Here, R_{rd} – an indicator of the competitiveness of the enterprise; R_g – an indicator of the competitiveness of the enterprise in terms of profitability; R_b – is an indicator of the competitiveness of the enterprise in terms of market share dynamics; N – profitability ratio of the enterprise product; n – is the average profitability of the sample product.

9. The development of a sustainable transportation system necessitates the enhancement of regional transportation hubs and the strengthening of inter-hub links. It is critical to develop intellectual management between transportation hubs for this reason.

The volume of freight traffic on the Europe-Caucasus-Asia or East-West transit corridor surged 2.5 times, or 32,753,000 tons, from 1998 to 2011, when the restoration of the Silk Road began, reaching 53,913,000 tons. In particular, the volume of transportation rose by 1.4 times, or 7931 thousand tons, in 1998-2000, 1.8 times, or 22597 thousand tons, in 2000-2010, 1.8 times, or 22597 thousand tons, and 1.1 times, or 4278 thousand tons, in 2011-2014. A similar increase was observed in transit traffic.

Table 11

Transit traffic on the Europe-Caucasus-Asia transport corridor

	1998	2000	2010	2016	2018	2019	2020
The total cargo was transported, a thousand tons	21160	29091	51688	50302	52674	52762	38491
Transit cargo was transported, thousand tons	4383	8572	15971	7997	9345	8077	8382
The share of transit cargo in the total volume, in%	20,7	29,5	30,9	16,0	18,0	15,3	21,8
Total cargo turnover, million ton km	6009	8405	13222	9917	11489	11158	9254
Turnover of transit cargo, million. ton-km	1622	3626	7120	3588	4185	3698	3731
Share of transit cargo turnover in total, %	27,0	43,1	53,8	36,0	36,0	33,1	40,3

Source: “Transport of Azerbaijan” statistical collection. Baku, SSC, 2020, pages. 29-30. “Statistical indicators of Azerbaijan” statistical collection. Baku, SSC, 2021, p.560.

Thus, the volume of transit traffic along the corridor increased by 3.7 times or by 11,851,000 tons between 1998 and 2011. During the years 1998-2000 and 2000-2010, transit cargo transportation increased by 2.0 times, or 4189 thousand tons, and 1.9 times, or 7662 thousand tons, respectively. Similarly, in 1998, transit freight transportation in the Europe-Caucasus-Asia transport corridor accounted for 20.7 percent of global cargo transportation, 29.5 percent in 2000, and 30.9 percent in 2010. At the same time, with a share of 46.0 percent in total traffic throughout the reporting period, 2003 delivered the largest share of transit traffic in overall traffic. Later, in 2010, this percentage rose to 30.9 percent, but it has since fallen to 15.3 percent in 2019. The highest percentage of transit freight turnover in overall turnover was 50% in 2010, fell to 33.1 percent in 2019, and then rose to 40.3 percent in 2020. In example, freight transportation decreased by 14.3 million tons in 2020 compared to the previous year, although transit cargo transportation climbed by 305,000 tons.

In addition to this, the drop in transit traffic on the Europe-Caucasus-Asia transport corridor in recent years might be positively judged if we consider that millions of manats have been invested in this area for more than ten years. As a result, the fall in transit traffic and turnover, particularly in recent years, has been accompanied by a lack of activity in regional transportation hubs. In this regard, the resuscitation of regional hubs, particularly the development of inter-hub linkages will have a favourable impact on the expansion of local and transit traffic along the corridor, which will play a key role in its revitalization.

Table 12

Transit transportation by rail and sea

	2000	2010	2012	2014	2016	2017	2018	2019	2020
Railway									
Cargo transport. Million. T.	15.9	20.6	21.3	19.9	13.8	13.1	12.6	13.3	12.8
Also., transit	3.5	8.3	7.4	4.5	3.9	3.4	3.1	3,8	4,1
Transit shipments. Special weight, in %	22.0	37.2	34.7	22.6	28.0	26.0	25.0	28,6	32,0
Cargo transit, million. t-km	5240	6874	6719	5676	3773	4158	4305	4890	4607
Also, transit	1757	4040	3633	2330	1975	1758	1615	2104	2121
Special weight of transit cargo turnover, in %	30.5	49.0	54.1	41.1	52.0	42.0	38.0	43,0	46,0

Sea transport									
Cargo shipments. Million t. Also., transit	5.7 5.0	9.4 7.7	10.4 8.3	9.3 8.3	5.0 4.2	7.4 6.8	6.9 6.3	4,8 4,3	5,0 4,3
Transit shipments. Special weight, in%	56.8	65.8	79.8	89.2	84.0	92.0	91,3	89,6	86,0
Cargo turnover, million. t.-km also, transit	2098 1869	3672 80	4057 35	3717 3317	1990 1613	3020 2808	2799 2570	1801 1594	1873 1610
Transit shipments. Special weight, in%	89.1	83.9	81.5	89.2	81.0	93.0	92.0	88,5	86,0

Source: *“the transport of Azerbaijan” statistical collection. Baku, SSC, 2020, p.29-30; “Statistical indicators of Azerbaijan”, Baku, SSC, 2021, p.560.*

As can be observed from the table, traffic volume is quite low, particularly in railway transport, whereas transit traffic is generally low. Although there were positive dynamics from 2000 to 2012, there was a downward trend from 2012 to 2020. In general, the corridor’s indicators do not meet its potential, notwithstanding a modest growth in 2020 compared to 2019. To put it another way, at a time when the state has recently prioritized railway transportation, as well as at the level of international projects, the lack of general and transit rail transportation is a severe worry. Simultaneously, rail transit in the republic’s transport centres, with the exception of Nakhchivan AR, must be boosted. In general, enhancing the efficiency of transportation hubs is critical for economic, environmental, and regional development, and it should be a top priority in today’s world.

10. Azerbaijan is working on a green transportation system, which is a requirement of Azerbaijan 2030: National Priorities for Socioeconomic Development and the “Sustainable Development Goals”.

The formation of a “Green Transport System” in Azerbaijan, the logistics organization of services in accordance with the requirements of sustainable development, and increasing the competitiveness of transport entities have all been investigated as key areas for the transportation system’s long-term development.

Transportation is one of the most significant causes of pollution in the environment, accounting for 60-65 percent of all stationary pollutants. Vehicles consume more than 2.0 billion tons of the world’s oil per year. When we consider that a regular and clean combustion of 1 litre of fuel

requires around 15 kg of oxygen, the amount of oxygen needed by world transportation alone for fuel combustion becomes evident.

In Baku, there are around 473 cars per 1 kilometre of road, which is extremely detrimental to the ecology. If we consider that one car consumes an average of 4.0 tons of oxygen per year, releases 800 kg of hazardous gas, 40 kg of nitrogen oxides, 200 kg of different hydrocarbons, and requires 15 kg of oxygen to completely burn 1 litre of fuel, we can see that one car consumes 4.0 tons of oxygen each year. Accordingly, it is possible to calculate the environmental damage of vehicles. These calculations can be done both for the country as a whole and for particular cities and regions at the same time.

As can be seen, if we set the entire annual environmental damage of a car engine running on gasoline or diesel fuel at 1040 kg, 2.8 kg per day, merely the above-mentioned streets and avenues' environmental landscape will look like this:

Table 13
On a daily basis, harmful pollutants from cars passing through Baku's principal streets and avenues

Streets and avenues	Number of vehicles, units	Harmful waste from vehicles, tons
Heydar Aliyev ave. To the direction of the city	91217	255,4
Heydar Aliyev ave. To the direction of Koroghlu metro station	90142	252,4
Baku-Sumqayit	85617	239,7
Sumqayit – Baku	85348	239,0
Neftchilar ave. - Nobel ave.	82112	230,0
Nobel ave.- to the direction of Neftchilar Azneft	61845	173,2
Babek ave. To the direction of city	80413	225,2
Babek ave. To the direction of X/ dostlughu metro station direction	81175	227,3
Z.Bunyadov ave. To the direction of 20 January	80216	224,6
Z.Bunyadov ave. To the direction of Koroghlu metro	81814	229,1
Uzeyir Hajibeyov ave.	61796	173,0
Y. Safarov street. To the direction of H. Aliyev ave.	71132	199,2
Tbilisi ave. To the direction of 20 January	54618	152,9
Tbilisi ave. To the direction of the city	50214	140,6
Total:	1 057 659	2961,0

Source: The table is based on the author's calculations.

All of this, as well as discrepancies in urban and transportation planning, as well as relevant foreign experience, point to the need for the establishment of a “green transportation” system.

According to the indications for the year 2020, around 0.5 billion manats (497 million manats) was spent on environmental preservation and damage elimination. Damage prevention accounts for about 400 million manats of these funds. When we consider that the transportation system is the leading stationary source of environmental pollution, it is apparent that the majority of funds are spent on pollution prevention in this sector.

The study identified the variables that influence the construction of the “Green Transportation” system, transportation efficiency, and explained the causes that affect the level of congestion on the road network as one of the primary factors. An adequate system has been presented to alleviate traffic congestion on the road network in order to improve service efficiency (**Appendix 3**). “Transport, environment, and health in the Republic of Azerbaijan” is a schematic explanation of the green transport system development plan in the context of sustainable development. A comprehensive action plan has been created (**Appendix 4**).

As a result of a thorough examination of the present issues surrounding the formation and long-term development of a new transportation system in the Republic of Azerbaijan, the following **scientific and theoretical conclusions** and recommendations have been made:

1. International initiatives play a critical role in the development of Azerbaijan’s modern transportation infrastructure. As a result of our country’s participation in the TRACECA Program, steps taken to restore the historic Silk Road, and measures to implement the North-South corridor, our country’s transportation system has become a leading transport and transit hub in the Euro-Atlantic space, bolstering economic ties with Europe. Economic growth, as well as integration into the global economy, provides excellent potential for active participation in international transportation. This should be the primary goal in the building of a new, self-contained transportation system that is responsive to market forces;

2. The creation of a modern transportation system, which is necessitated by the “Azerbaijan 2030 - National Priorities for Socio-

Economic Development” and UN-adopted international agreements on sustainable development necessitates the implementation of a well-coordinated transportation policy. To that end, the regulatory framework, transportation technologies, and technical standards should all be improved and generalized, all discrimination between economic entities should be eliminated, and a fair competitive environment should be established, as well as general tariff and tax policy principles, particularly in transit transportation. To boost the use of multimodal transportation, it is required to harmonize tariff policies for various modes of transportation, as well as to construct logistics control centres and terminals;

3. The pace of change of socio-economic processes around the world is accelerated as a result of the rapid development of ICT in modern times, with the expansion of innovation activities to a qualitatively new level, the rapid spread of innovative innovations, and their application in various industries and services. The use of innovations in the regions necessitates the organization of improved quality, safe, and efficient services in the system, as well as minimal environmental and ecological repercussions. This should also be reflected in the new transportation system;

4. The rapid growth of cars in modern times, along with the fact that environmental pollution has reached deadly levels for wildlife necessitates the development of a “green transportation system”. The “Azerbaijan 2030 - National Priorities for Socio-Economic Development” and the “Sustainable Development Concept” both call for this;

5. The launch of international projects of national and regional importance, as well as an increase in the number of countries participating in the project, has increased the Republic of Azerbaijan’s secular importance as a transit country, making transit one of the primary sources of state budget revenue. However, transportation investments are not entirely justified. The profit from the sector, the sector’s proportion of employment, and so on does not expand much, despite the fact that the amount of funds is growing at a rapid pace. As a result, technical and technological development, infrastructure provision, staff training, and

other issues must be examined, as well as steps done to entice freight along the corridor;

6. The existence of an appropriate regulatory framework is one of the most essential variables in the construction of a new transportation system. In this regard, the development of a new transportation system that is continually evolving necessitates the upgrading of the legislative framework for the organization of transportation services. Simplifying border crossing procedures, facilitating transit transportation, coordinating local and international transportation, and better clarifying the obligations and rights of each entity in the effective coordination of transportation operations would all be beneficial;

7. The international documents, to which our country is a party, as well as the recommendations of the United Nations and other powerful international organizations, make the establishment and sustainable development of a new transportation system a requirement. Sustainable development clearly necessitates a holistic approach to social, economic, and environmental challenges. The effectiveness of transportation processes and the transportation system can be measured as a result of a combination of social, economic, and environmental issues, according to the UN Rio Declaration's third principle. In this context, environmental considerations must be balanced alongside socio-economic reforms aiming at achieving sustainable development and poverty eradication. In other words, transportation's negative environmental impact should be minimized, the employment of environmentally friendly modes of transportation should gradually increase, and a "green transportation system" with the least negative environmental and ecological impact should be developed;

8. An automobile consumes 4.0 tons of oxygen each year on average, releases 800 kg of hazardous gas, 40 kg of nitrogen oxides, 200 kg of different hydrocarbons, and requires 15 kg of oxygen to completely burn 1 litre of fuel. At the same time, noise levels in large cities with 2-3 thousand vehicles per hour are higher than 90-95 dB on the streets and avenues. Noise-related disorders are now the third greatest cause of death in the United States. All of these factors, as well as global warming, desertification, severe air pollution, and other difficulties such as electric

buses, trams, trolleybuses, and metro buses, make expanding the use of electric transportation vital and inevitable.

9. The responsibility for the protection of natural resources and the improvement of living standards for future generations, which is one of the main requirements of the concept of sustainable development, necessitates the development of an efficient transportation system based on sustainable development principles. As a result, the transportation strategy is based on the division of state responsibilities in sector management and the fulfilment of economic activities by entrepreneurs. To achieve the required efficiency in this area, it is necessary to coordinate the development of individual elements of the transportation system, to create a fair competitive environment in the transport services market, to create a single information space in the transportation system, and coordinate state interests in the development of various modes of transportation;

10. The national transportation system is made up of transit hubs located throughout the country. The majority of Azerbaijan's transportation hubs are unable to operate at full capacity because they do not meet contemporary requirements. At the same time, the instability of the inter-node interaction has a negative impact. In this regard, the regeneration of nodes is one of the necessary prerequisites for the improvement of our country's transportation system and the formation of a new transportation system. Individual nodes must be rebuilt to meet modern needs, inter-node connections must be strengthened using ICT equipment, and transportation operations and orders must be coordinated amongst all nodes;

11. It is self-evident that every manat spent on a vehicle results in more trips. In this way, depending on the cost of repairs and maintenance, the car may be able to go further. However, in this case, this is not the case in practice. As a result, the entity providing automobile service bears no responsibility to the service recipient, and this responsibility is not governed by any normative text. As a result, a regulatory framework for transitioning to guaranteed services in car service businesses should be designed and implemented;

12. Transportation logistics is one of the most essential issues facing the modern transportation system. The logistical planning of

transportation necessitates the rapidity with which the participants in the process communicate, as well as the establishment of mutually acceptable and beneficial relationships for all parties. Only by taking such a broad approach can the requisite efficiency and effectiveness be ensured;

13. It is widely acknowledged that one of the most pressing challenges facing modern society is the creation of a cheap, flexible, and sustainable transportation system. The transportation system's long-term viability is influenced by factors such as safety, environmental friendliness, flexibility, defence needs protection, efficiency, competitiveness, operational qualities, regularity, convenience, transmission and transportation capacity, cost-cutting, and so on. The following can be considered the key priorities of the new transportation system based on the above:

- Improving transportation infrastructure throughout the board. It contains all of the promises pertaining to the road-transport system. As a result, along with enhancing the operational quality of roads, road signs, directional signs, and other infrastructure down to the smallest level;

- Nationalization of state regulatory activities in the road-transport complex, structural reforms, and antitrust enforcement strengthened;

- The use of new equipment and technologies in the management of the road-transport complex, as well as the establishment of a flexible information exchange network will reduce human labour;

- Implement a set of consistent actions to boost the competitiveness of transportation services on both the domestic and international markets;

- For this goal, develop and implement a large-scale action plan to fully meet society's transportation needs, effectively meet the transportation needs of producers and consumers, and eliminate inter-regional transport discrimination in the country;

- In the road transportation complex, ensuring safety, environmental protection, and addressing defence demands. Expand and strengthen awareness-raising operations to this purpose;

- The road transportation system is one of society's inextricable conditions of normal and daily existence. As a result, ensuring civil society's active participation in these issues is essential.

14. It is obvious that the railway is one of the most significant forms of transportation for adapting the transportation system to the principles of sustainable development. With the help of this field, we can deliver sustainable and efficient transportation services.

- Adaptation and enhancement of the transportation system's sectoral management structure to market relations;

- Using contemporary ICT equipment, further accelerate the organization of transportation services;

- With the construction of variable manoeuvring capabilities, assistance for all types of transportation orders is provided.

- On international transportation corridors, sophisticated container and multimodal transit are being developed.

15.In the context of current economic development, the following development directions for road transport, which accounts for the vast bulk of domestic and international transportation, might be considered:

- Boost the number of contemporary vehicles with significant carrying capacity and meet environmental criteria in order to increase the proportion of national freight carriers in international road transport;

- Establishment of modern maintenance areas to improve the quality and cost-effectiveness of road transportation services;

- In the private sector, supporting the activities of national carriers capable of carrying out transportation in local and worldwide markets;

16. It is required to improve the road culture of drivers who provide transportation services in the public transportation system, as well as the control of driving qualities and vehicle sanitation. Drivers should be enrolled in relevant courses and trainings, as well as instructed in driver-passenger relations, road culture, and other topics;

17. In order to improve cargo transportation efficiency, it is required to make the most of the carrying capacity of vehicles currently in use. It is feasible to build specific centres (HUBs) equipped with current equipment for this purpose, where orders can be received and information transferred to the proper directions using computer technology. It would be more practical to establish such centres on the basis of a single gateway that covered nodes in various regions;

18. As previously said, one of the most pressing challenges in the transportation system is environmental harm, which is frequently linked to vehicle service life and technical condition. As a result, it would be prudent to impose some limitations on vehicle service life and set maintenance costs in relation to the service life (years);

19. It is required to collect cash payments in transportation operations, particularly in the public transportation system, and to increase the quality of the intelligent management system, using modern equipment and technologies;

20. According to studies, Baku's road transportation system accounts for 8-9 percent of the city's entire area. In recent years, the increase in automobile registrations (2.3 times) has outpaced natural population growth (11.2 percent). As a result, the compliance of imported automotive engines with European toxicity requirements, as well as the transition to EURO-4 and EURO-5 standards, must be ensured;

21. Studies suggest that noise levels in large cities with 2-3 thousand vehicles per hour are higher than 90-95 decibels in the streets and avenues. As a result, a variety of diseases spread and production suffers. The planning of streets, the capacity of the road, the state of the road, the quality of the road surface, traffic speed, and other factors all influence the level of noise. In any case, the noise factor in the new transportation system must be considered, and the noise level must be kept within acceptable limit;

22. Increasing options for effective transportation service organization should be one of the key outcomes of the creation of a new transportation system. It is hard to properly organize services in today's market without doing large-scale marketing research, creating insurance relationships, and carefully integrating the transportation system's actions with the applicable urban planning plan. In this regard, it is vital to carefully connect the transportation system's activities with urban development;

23. Transportation services provide financial support for the long-term growth of the transportation system. Transportation services must also have a particular level of liquidity in this regard. Liquidity is a measure of a consumer's overall freedom of choice, not just in terms of revenue from service sales, but also in terms of service consumption

outcomes. The willingness of the organization to refund the service to the buyer in cash is referred to as the service's liquidity. At the same time, the service's liquidity is a barometer of its quality and competitiveness. Profitability (liquidity) based on competition is more reliable in general. Based on studies, we can use the method below to calculate the worth of income generated in a competitive economy:

$$G_{rdq} = Q_{al} + Q_{ist}.$$

Here, G_{rdq} – price formed in the competitive environment; Q_{al} – purchase price of the service, cost; Q_{ist} – the share of the consumer in the income generated in a competitive environment.

24. It goes without saying that profitability is one of the most important criteria for service efficiency, and it is calculated as the ratio of income to the cost of acquiring it. At the same time, it enables us to determine profitability competitiveness. On the other hand, one of the criteria for competitiveness can be the ratio of the enterprise's present market share to the change in market share during the prior period. We can mathematically express the competitiveness of the transportation company based on the aforementioned:

$$R_{rd} = R_g * R_b ; \quad R_g = \frac{N}{n} ; \quad R_{rd} = \frac{N}{n} * R_b$$

Here, R_{rd} – an indicator of the competitiveness of the enterprise; R_g – an indicator of the competitiveness of the enterprise in terms of profitability; R_b – is an indicator of the competitiveness of the enterprise in terms of market share dynamics; N – profitability ratio of the enterprise product; n – is the average profitability of the sample product;

25. In current times, the ability to transport large commodities over long distances in a short amount of time is the cornerstone of transportation system rivalry. According to studies, the effectiveness of a transport fleet's transportation is closely related to its level of specialization, with quality transportation only achievable when the level of specialization is 70% or above. When the park's speciality is less than 50%, the park's competitiveness suffers. As a result, specialization must be considered as a significant aspect in the formation and long-term growth of the new transportation system;

26. The level of competitiveness of individual carriers determines the transport system's competitiveness. Transportation schedules, which define the ability to deliver goods on time, are one of the primary

indicators used to assess competitiveness. According to studies, the more planned shipments a transportation firm has, the more competitive it is. If the percentage of cargo transported according to schedule is less than 40%, the transport firm will be unable to deliver timely and high-quality service to the customer;

27. The need for particular megacities transportation plans that restrict access to core streets is necessitated by environmental difficulties caused by the transportation system, excessive noise, and a lack of conditions for all road users in megacities, as well as the necessity to build them.

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