

Economic and environmental aspects of the transportation sector

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Abstract. The article explains the factors taken into account when creating transport infrastructure. It discusses multi-stage investments in the transport sector and the method for calculating operating costs that change over the years. In addition, global sales of electric vehicles, a study by American scientists on electric vehicle sales, the global impact of air pollution caused by the transport sector on health, and the UN Climate Change Conference or COP29, which will be held in November 2024 in Azerbaijan are discussed. The article provides effective proposals for the formation of economically, environmentally and socially responsible consciousness among people.

Keywords: transportation sector, investment, climate change.

1 Introduction

Since the beginning of the 21st century, the growth of economic stability, productivity, business income and purchasing power worldwide has led to a rapid expansion of global relations. This expansion has not only increased international trade in goods but also international trade in services. In international trade relations, the transport sector occupies a prominent place in trade in services [1].

The development of foreign trade relations depends on the state of the transport sector. Transport, being a fundamental element, is a significant factor in industrialization due to its economic role and occupies a special position in the development and use of production resources, as well as in the expansion of international relations.

As the earnings derived from labor and services within the transportation sector impact GDP growth similarly to the other economic sectors, it is crucial to analyse the factors influencing income growth in this sector and forecast its future development [22]. The rise in revenue from transportation services is influenced by various factors, such as nationwide investments in fixed assets, the expenses associated with fixed assets in the transportation sector, the volume of freight transportation, trade volume, GDP, and the income level of the population. Below are tables presenting the levels of fixed capital investments in the Republic

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of Azerbaijan from 2000 to 2022, along with statistical data indicating the value of fixed assets in the transportation sector.

Table 1. The volume of fixed capital investments in the Republic of Azerbaijan, the value of fixed assets in the transport sector and the dynamics of income from freight transportation (million Azerbaijani manats) [24].

Years	Basic funds in the transport sector (at the end of the year), (X1)	Investments in fixed assets in the transport sector, (X2)	Revenue from freight in the transport sector, (Y)
2000	2063.88	43.98	241
2001	2156.02	58.7	262.4
2002	2102.34	89.14	285.5
2003	2254.4	338.7	359.8
2004	2526	324.06	383.5
2005	3050	516	430.1
2006	3350	629	571.2
2007	4016	748	1746.2
2008	4475	1986	2068.2
2009	5087	1706	2409.7
2010	5699.6	2435	2543.1
2011	6581	2509	2645.7
2012	8155.8	2610	2638.6
2013	8958	3559.7	2728.4
2014	9124	2432	2811.2
2015	10301	2195	3089.4
2016	11582	1391	3775.4
2017	12404	1774	4452.9
2018	15174.5	1923	4871.2
2019	15541	2189	5125.6
2020	15705	2092	6093.6
2021	17261	2857	7390.6
2022	17363	4613	8633.9

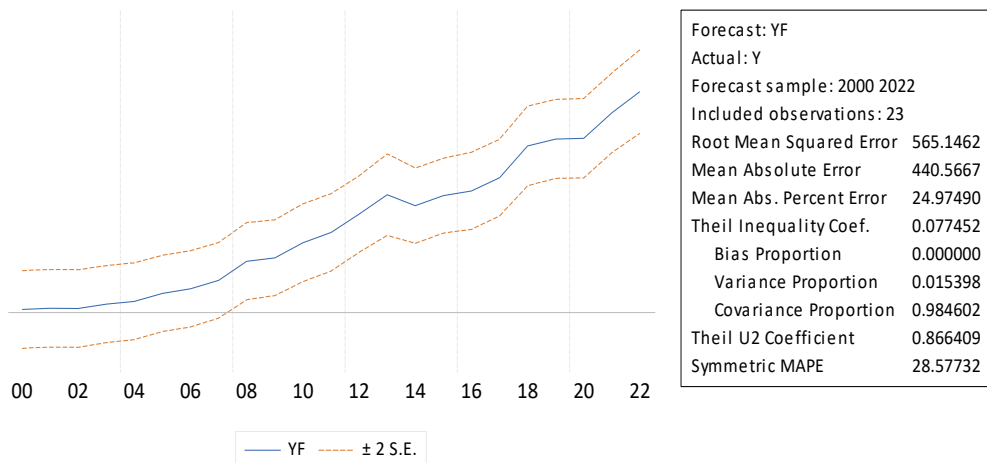


Fig. 1. Caption of the Figure 1. Below the figure. Source: Developed by the author based on the reviews software. Revenue from freight in the transport sector, (Y) Source: Developed by the author based on the MS Excel software.

Table 1 constructed using data from the State Statistics Committee of Azerbaijan, provides a basis for conducting regression analysis to examine the relationship between various factors influencing income from labor and services in the transport sector of Azerbaijan from 2000 to 2022. Software such as Eviews, MatLab, MS Excel, MathCad, etc. are suitable for this analysis [7].

As illustrated, the forecast characteristics of the model prove the predictive ability of the model.

For this purpose, using the Eviews-12 software package, the following result based on the data in Table 1 is formulated.

It should be noted that using the graph, it is also possible to determine the forecast values of the income from freight transportation in the transport sector in Azerbaijan.

2 Analysis of the results

As depicted in Fig. 2, the revenue from cargo transportation in the transport sector of Azerbaijan is projected to increase to 14,400.5 thousand mantas by 2030.

The research conducted using the Eviews application software determined the prices and standard errors of the revenue derived from freight transportation in the transportation sector of Azerbaijan by year. Additionally, several characteristics and risks associated with using the equation for forecasting purposes were identified. The forecasts suggest that the revenue from cargo transportation in the abovementioned segment of the economy will increase by 2030.

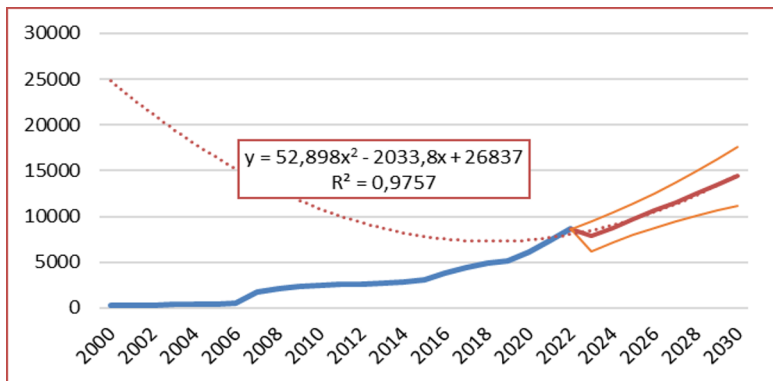


Fig. 2. Revenue from freight in the transport sector, (Y) Source: Developed by the author based on the MS Excel software.

When transportation firms want to increase their reserves, they invest in stocks. The most crucial aspect of investing in goods and materials is that it consists of expected and unexpected investments. Investment in reserves can be high in volume in two cases. The first case is that, if conveyance decreases unexpectedly, the volume of unfulfilled cargo and passenger transportation will increase, which will result in an unexpected investment in reserves. Second, if the company plans to recover depleted resources, investment in resources can increase, which, in nature, is an expected or desired investment [2].

During cyclical economic activity, investments in stocks of goods and materials for the production, repair, and maintenance of vehicles vary more than other components of aggregate demand. Each recession in the national economy is characterized by a decrease in investment in goods and materials resources at the upper and lower points of the economic cycle. As the economic recession deepens, demand decreases and enterprises involuntarily

increase stock of goods and materials. Accordingly, the reserve-service ratio increases. As a result, production stops, and enterprises meet demand by selling goods in stock. At the end of each recession, enterprises reduce their reserves. This means that stock investments enter negative territory at the final step of each downturn. In the current situation, increasing the efficiency of investments directed towards the transport sector is possible by bringing in technologies applied in developed countries, subsequently enhancing the quality of technical specialist training, and thus ensuring the widespread commercialization of knowledge in the future [27].

Freight Transport by Percentage in 2022

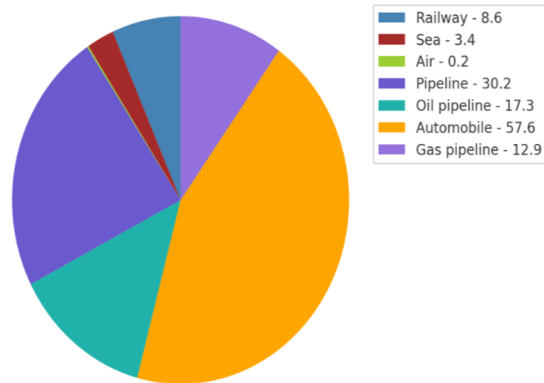


Fig. 3. Source: Prepared by the author based on data from the State Statistical Committee of the Republic of Azerbaijan [24]

As shown in Figure 2, which reflects the structure of freight transport by modes of transport as a percentage of the total in 2022, the volume of freight transported by pipeline and automobile in the country is significantly higher compared to other modes of transport. Among the modes of transport such as railway, air, and sea, there has been an increase in railway freight transport in recent years following the commissioning of the Baku-Tbilisi-Kars railway line.

Substantial projects in the transport sector are implemented at the expense of investments. Investment is a monetary indicator of the set of material and technical, information, labor, and financial resources, and it also encompasses funds directed to the construction of new funds, reconstruction of existing basic funds, and innovative technologies [3]. Investments should be aimed at increasing operational activity and economic efficiency, elevating the productivity of transportation enterprises as well as improving the financial well-being of entrepreneurs, juridical and natural persons, and employees working in enterprises. In addition, some aspects of investment should be directed to the reduction of the cost of work related to transportation, fund, and material capacity, as well as to the quality of the transport product [4]. The variance between investments in the transport sector and investments in other areas is not only that they are more financially intensive, but also that it takes more time to return the spent funds. It is for this reason that the active participation of the state in investing in transport is more necessary compared to the private sector. In recent times, investments in environmental protection measures have become a necessary criterion. The main reason for this is to prevent regional and global ecological crises and diseases [5].

One of the difficulties currently encountered in the field of automobile transportation is related to the usage of individual vehicles [10]. The number of vehicles used for the transportation of passengers and goods is increasing day by day in car transport [11]. The

impact of this increase is particularly noticeable in developing countries [17]. The observed result of this economic growth is found in the increase in the standard of living and safety of people. However, the intensification of urban transportation also has negative effects such as the pollution of the surrounding area [9]. So, this necessitates conducting scientific technical research not solely based on economic efficiency. Thus, if social and ecological factors are not taken into consideration, economic profitability decreases over time.

Global electric vehicle sales reached approximately 10.2 million units in 2022. Despite the decline in conventional car sales due to the Coronavirus pandemic, the market share of electric cars increased by 5% in 2020 and continues to grow as of now. China was the world's largest battery-electric vehicle market in 2022. The number of electric cars in this country reached nearly 11 million. By 2022, China had accounted for 42% of the 25.9 million electric cars in use worldwide. There are three main reasons for this. First, the large population, second, the establishment of global multinational companies in this country, and third, the competitive production of electric cars by Chinese experts trained in foreign firms.

In 2021, domestic manufacturer BYD rose to the top of the Chinese electric car market. The company is known for its innovations in smart transportation technology. In addition, BYD has started producing cars in other countries since 2015. The Chinese state-owned SAIC Motor Company is also one of the leading domestic automobile manufacturers. Global manufacturers are also showing interest in the Chinese market as the world's largest passenger car market. They are interested in establishing joint ventures with Chinese companies. Volkswagen and SAIC are two of the traditional partnerships in the automobile industry. GM has a joint venture with SAIC [20].

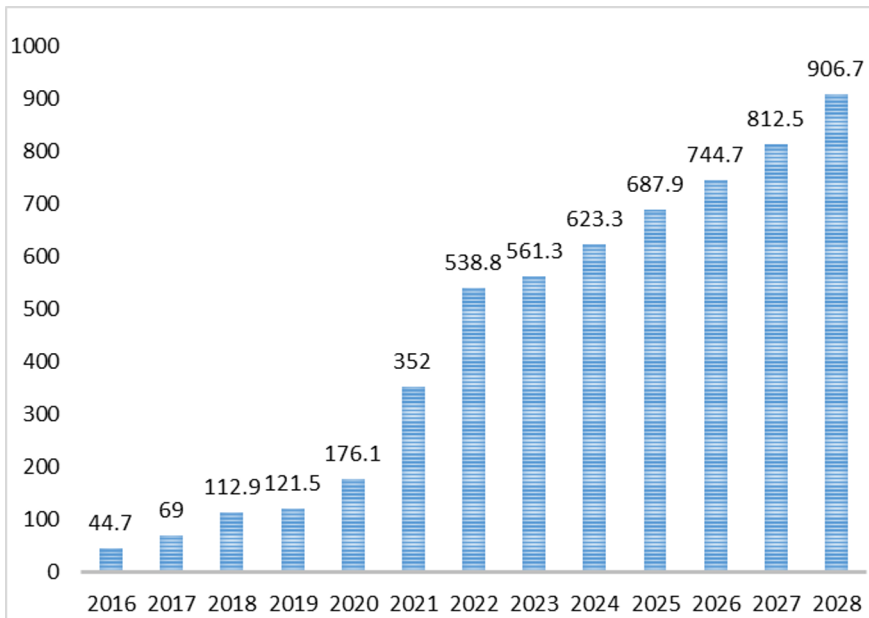


Fig. 4. Global electric vehicle revenue forecast (USD Billion) 2016-2028 [19].

US scientists (APA, Chicago, Harvard, MLA, and Bluebook) made a forecast in September 2023, taking into account the worldwide revenues of electric vehicles in the period 2016-2028 and the economic impact of the Russia-Ukraine war in Eastern Europe. According to the study, the electric vehicles segment includes information on electric cars in countries where public electric vehicle energy supply infrastructure is available. In this regard, the concept of "public" means that drivers can easily use the energy supply infrastructure. In the

study, a vehicle can be defined as an electric vehicle if it is equipped with a battery energy supply or is classified as a hybrid (having both an electric motor and a gasoline engine). All figures shown reflect new car sales and their basic configurations in the relevant year [16]. These figures do not include sales of second-hand cars and car spare parts. The prices and revenues in question are compiled based on real data [18]. The result of the study, done on November 14, 2023, by US scientists, from 2016 to 2028 dedicated to electric car revenues concluded that during the years 2022 and 2028, the global electric car market is expected to reach about \$906,7 billion from \$538.8 billion for the worldwide market scale [19].

A report was prepared on the global health impacts of air pollution from the transport sector between the years 2010 and 2015. The study found that 361,000 and 385,000 people died prematurely due to air pollution and ozone depletion from the transport sector in 2010 and 2015, respectively. This covers 11.7% of the total number of deaths due to environmental pollution in 2010. In 2015, 84% of deaths attributed to the transport sector occurred in G20 countries. And 70% of this occurred in the four highest automobile-utilizing countries (China, India, Europe, and the United States). Diesel vehicles in the transport sector are responsible for almost half of the harmful effects – 181,000 premature deaths which are attributed to India, France, Germany, and Italy – worldwide. In general, in 2015, 7.8 million people worldwide became ill and lost their lives prematurely due to environmental pollution caused by the transportation sector, and the amount of damage to health was approximately \$1 trillion (2015 US dollars) [12]. Thus, international organizations have focused on climate change and its effects.

It has been announced that the UN Climate Change Conference 29 or COP 29 will be held in Azerbaijan in November 2024. COP stands for “Conference of Parties” and the number 29 in the name reflects that the event is the 29th in number. Dubai, United Arab Emirates had been a venue for the previous event – COP 28. World leaders, government representatives, scientists, NGOs, and other stakeholders are to come together for the historic COP 29 conference to debate and negotiate a variety of climate change-related issues. It has become customary up to this point for prominent figures and officials from many nations involved in climate change to convene in Berlin before the annual COP event to decide on the agenda of this event, and priorities are defined here for the upcoming COP event. In December 2015 during the 21st Summit of the United Nations Framework Convention on Climate Change, the Paris Agreement was signed by representatives of 171 nations. This document was signed by Huseyn Bagirov, the former Minister of Ecology and Natural Resources, on behalf of the Government of the Republic of Azerbaijan at the United Nations Housing Headquarters in New York in April 2016. The COP 29 Conference is an opportunity for participating countries to make new commitments and take concrete steps to address the climate crisis. 2024 was proclaimed in Azerbaijan as the “Year of Solidarity for the Green World” by the decree of the President of Azerbaijan, Ilham Aliyev. The voluntary commitment of SOCAR, an oil and gas cooperation of Azerbaijan, to achieve zero methane emission at the COP 28 event in Dubai is evidence of how sensitive the nation is to problems of climate change. Azerbaijan has aimed to reduce the amount of greenhouse gases by 35 percent by 2030, and by 40 percent by 2050, compared to 1990. “The liberated regions were declared a “Green Energy” zone by the President of the Republic of Azerbaijan, who also authorized the action plan for 2022-2026 that aims to turn these areas into a “Net Zero Emission” zone by 2050.” Long-term investment and increased tourism revenue are probable to result from hosting a COP event [19].

3 Conclusion

- Economic growth benefits both urban and remote populations, largely due to the significant role of transport.

- The main objectives of investments in the transport sector are to maximize sector revenues, meet demand for high-quality freight and passenger transportation, prevent environmental harm, focus on legal and professional standards of employees, and prevent monopolization. Both public and private institutions in the transport sector must not only comply with applicable laws but also be mindful of their ethical responsibilities to society.
- In many cases, the lack of public sector funding makes the promotion of public-private partnerships a promising approach for green transport.
- Research conducted using Reviews application software determined prices and standard errors of revenues earned from freight transportation in the transport sector of Azerbaijan by year. In addition, some characteristics and risks associated with using the equation for forecasting purposes were identified. The forecasts assume that revenues from freight transportation in the above segment of the economy will increase by 2030.

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