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ECONOMIC AND GEOGRAPHICAL RESEARCH OF TRANSPORT INFRASTRUCTURE PLANNING IN SHAKI REGION

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Abstract: *The article studies the territorial organization of transport infrastructure in the Sheki region and its economic and social significance. Analysis of freight and passenger transportation in the region. The inclination of the areas crossed by roads and railways was determined through the Model Builder in the ArcGis program. Within the framework of the State Program on Socio-Economic Development of the Regions of the Republic of Azerbaijan, during the design, construction, repair, and reconstruction of roads, the issues of promoting the use of environmentally friendly vehicles and the implementation of environmental and biodiversity protection requirements have been considered in the Shaki region. Areas in the region that are poorly served by transport have also been identified. Finally, relevant proposals were made.*

Keywords: *transport infrastructure, spatial planning, highways, GİS, model builder*

INTRODUCTION

Transport is one of the leading elements in the field of material production and has a clear influence on the cost of production by creating interactions between the extractive and processing industries, agriculture, producers, and consumers [Sh.H. Hasanov, 2018]. The maintenance and improvement of the technical level and operational condition of roads in accordance with traffic is the ultimate goal of the road service. The ultimate goal of the road service is to maintain and increase the technical level and operational condition of roads in accordance with the traffic, with an ever-increasing intensity of traffic. This, in turn, means increasing the productivity and efficiency of vehicles, reducing the cost of transport [Piriyev Y.M, 1999]. Transport infrastructure consists of fixed facilities, including terminals such as roads, railways, airways, canals, waterways, pipelines, canals and pipelines and airports, railway warehouses, and transport stations, bus stations, warehouses, freight terminals. Sheki's transport infrastructure has recently begun to take shape, transport infrastructure facilities have been registered, and a single register (including streets, avenues, highways, bridges) has been established within the area. The main goal of the study is to reduce the destructive impact of natural disasters in the region, especially with frequent floods and mudslides, resulting in the destruction of roads (especially more pronounced on rural roads), leading to delays in passenger transportation and production.

It should be noted that during the planning of transport infrastructure in the study area, sanitary junctions, gas lines, and water pipes are not laid in parallel. As a result, landslides on newly built roads, closures for repairs, and the allocation of additional funds should be noted. Also, the fact that rural roads are not included in the planning, the bridges used in most areas are unusable, makes it necessary not only to build roads, but also to create infrastructure.

Despite the mountainous terrain, transport is one of the key factors in the settlement of the population, the formation of urban and rural settlements. Most of the passenger and cargo transportation operations are carried out by road. Transport infrastructure plays an important role not only in the transportation of passengers and goods, but also in the establishment of links between settlements and industries. Road and rail transport is mainly developed in the region. The main indicators of both modes of transport are the provision by area and population.

Key issues in the transport sector include modernization of road operation and asset management, improved road protection and heavy truck control, improved financial sustainability of the road sector, application of national technical and design standards based on international best practices, road safety standards and road user information systems. Road safety is also a major issue facing the transport sector in Azerbaijan. These road safety issues have been resolved in the "State

Program on Road Safety of the Republic of Azerbaijan for 2019-2023".

For this purpose, it has made investments in relevant areas in Sheki region are continuation of construction, reconstruction, overhaul and repair of bridges of local importance, including construction of Ashagi Goynuk-Bash Goynuk-Bash Shabalid highway and reconstruction of Sheki-Kish highway, and continuation of asphalting of city roads

MATERIALS AND METHODS

The program aims to improve road safety, reduce the number of accidents and, in turn, reduce the socio-economic damage caused by preventable road accidents. One of the main directions of the "State Programs for Socio-Economic Development of the Regions of the Republic of Azerbaijan" (2004-2008, 2009-2013, 2014-2018, 2019-2025) is to ensure the sustainable development of economic sectors in the regions of the country, including transport infrastructure.

The program pays special attention to environmental aspects by promoting the use of environmentally friendly vehicles in the design, construction, repair and reconstruction of roads and ensuring the implementation of environmental and biodiversity protection requirements. The program includes measures to create the appropriate infrastructure to promote the use of electric vehicles as well. A number of measures and programs related to transport are planned to be implemented. Continuation of construction, reconstruction and overhaul of local roads, as well as access roads to villages and inter-village highways, including the reconstruction of the Gokhmug-Baltali-Babaratma-Garadagli-Gudula-Dashuz highways.

RESULTS AND DISCUSSION

Motor Roads

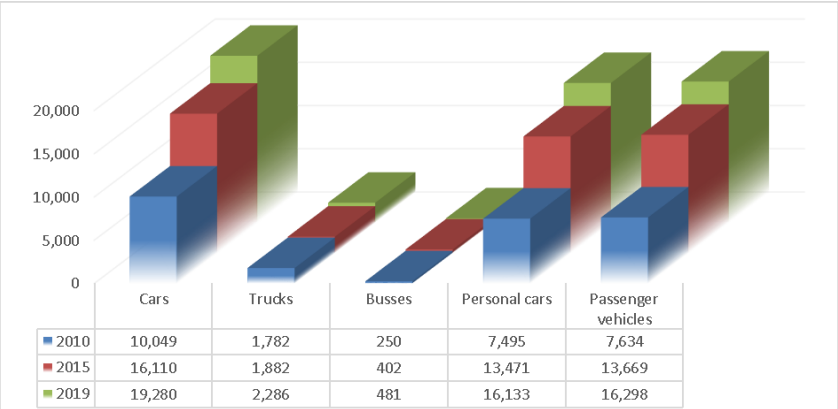
Modern highways are a complex engineering device that will ensure the uninterrupted movement of cars at the average annual optimal speed, and trucks with the calculated loads in any weather conditions during the day or all year round [Piriyev Y. M 1994]. With the development of the economy, other sectors, including transport infrastructure, have also developed. This development is carried out through the commissioning of new roads and railways, construction of bridges, repair of unusable roads.

The following measures have been implemented within the state program.. Overhaul of the Sheki-Gakh-Zagatala section of the Sheki-Gakh highway is planned. At present, 62 km of the Yevlakh-Zagatala M5 (164 km) international highway in the part of the republic with Georgia passes through the region, and 46 km (74.2%) of this road has been rebuilt. There are 18 villages in the area where the M5 highway passes.

The Sheki-Gakh-Zagatala highway has been overhauled. The total length of the road is 35 km and it is a 3rd class road. The starting point is the Kish River Bridge, 26 km of the road falls on the territory of Sheki region and 9 km on the territory of Gakh region. Repairs began in 2011, which in turn allowed the existing 77 km to be shortened by 42 km. It covers 22 villages and 39,000 people between the two districts. The width of the road is 12 m, the width of the carriageway is 7 m, and the number of lanes is two. 21 bridges have been built on the road Of these, 20 were implemented in 2007-2015. 16 bridges over the Shin River alone have been put into operation.

The total length of the highway in use in the region is 462 kilometers, and according to the new classification, it is divided into 5 categories because of technical characteristics: the data of 2019 is shown, the road belonging to the 1st category is not registered, 33 km to the 2nd category, 119 km to the 3rd category, 275 to the 4th category and 35 km to the last category. [Transport in Azerbaijan, p. 64] These quantitative and qualitative indicators of the transport sector characterize the economic development of the region.

Figure 1. General characteristics of road transport in Sheki region

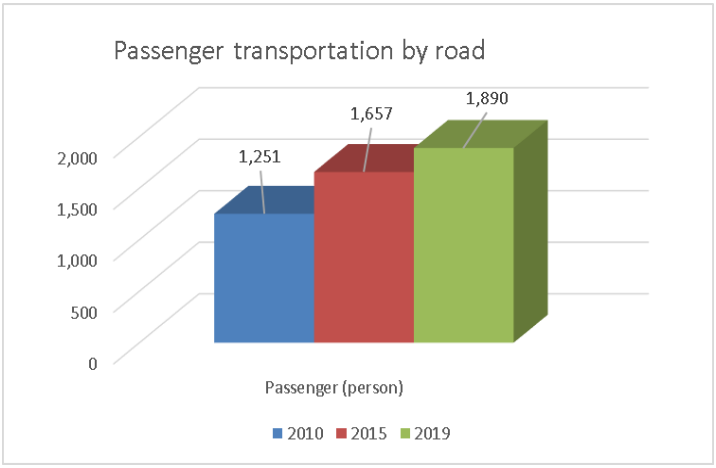


	Cars	Trucks	Busses	Personal cars	Passenger vehicles
2010	10,049	1,782	250	7,495	7,634
2015	16,110	1,882	402	13,471	13,669
2019	19,280	2,286	481	16,133	16,298

Source: Transport in Azerbaijan, 2020

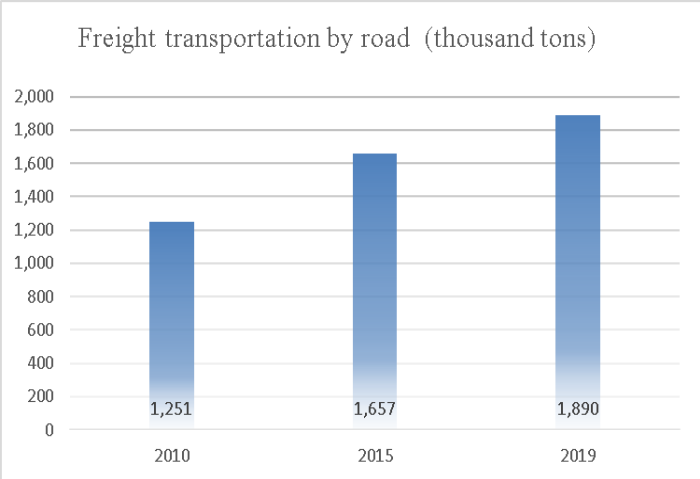
Figure 1. shows the general statistical indicators of road transport in Sheki region. It is based on indicators obtained every five years for 3 years over a period of 10 years. The highest changes were recorded in the number of cars, passenger cars and passenger cars in 3 categories. Thus, the total number of cars per 10,000 in 2010 increased by 60% to 16,110 (2015), and over the next five years increased by another 20% to 19,280. This means an increase of 92% or 9231 units over the last ten years. Similarly, the number of private and passenger cars in other categories was 7,495 and 7,634 in 2010, but increased by approximately 80% and 79% in 2015 to 13,471 and 13,669, respectively, and continued in 2019 compared to the previous year, an increase of 20% and 19.2% was observed in both categories. This means that the number of personal and stunned cars has more than doubled in 10 years (transport in Azerbaijan, 2010,2020).

Figure 2. Passenger transportation by road in Sheki region, ARDSK



Sheki region is considered to be the economic and political center of Sheki-Zagatala economic-geographical region and the main part of passenger and cargo transportation in the region is carried out through the territory of the region. Passenger traffic in the region in 2010 was 16,104 people, this Figure 2. increased by 42% in 2015 to 23,000 people and in 2019 increased by another 16% to 26,720 people. Passenger transportation increased by 65% or 10,616 people between 2010 and 2019. Saki region accounts for only 37% of the total traffic in the economic and geographical region and ranks first in the region (Transport in Azerbaijan, 2020).

Figure 3. Cargo transportation by road in Sheki region, ARDSK, 2020



Cargo transportation in Sheki region in 2010 was 1251 tons, in 2015 it increased by 32.4% to 1657 tons (Figure 3.). In 2019, it increased by 14% compared to the previous year and reached 1,890 tons. During 2010-2019, an increase of 51.1% or 639 tons was observed in the volume of cargo turnover in the region. İAccording to this indicator, it ranks second after Zagatala region in terms of economic and geographical region (transport in Azerbaijan, 2010,2020). Food and light industry products are the basis of cargo transportation The food industry includes confectionery, fruit and vegetable products, and the light industry includes furniture, cocoons and construction materials (including sand, gravel, concrete structures).

Railways

The importance of railways is not only in the transportation of passengers and cargo, but also plays an important role in the socio-economic development of the area and the development of natural resources. In order to implement the necessary measures for the reconstruction of railway infrastructure in the country in accordance with modern requirements, the President of the Republic of Azerbaijan approved the "State Program for the development of the railway transport system in the Republic of Azerbaijan in 2010-2014." The program includes further development of the railway transport system, meeting the needs of the population and the economy in railway transport services, safety of transportation, modernization of its infrastructure, increasing the competitiveness of transport corridors through the country, increasing transit traffic, training of railway personnel, etc. issues were noted.

Currently, the region's rail freight is mainly gravel, oil and petroleum products (including: gasoline, diesel, fuel oil), but previously agricultural products, especially grain, fruits and vegetables, have declined over the past 10 years. . This is due to the increase in transportation costs and tariffs, and the fact that it is cheaper with road transport. Passenger traffic was suspended due to the global pandemic. This process has been going on for more than 2 years.

According to Z.S. Mammadov (2002), to determine the transport supply of the area, it is necessary to divide the total length of the railway by the area and multiply by a thousand. In this case, we can determine the railway for every 1000 square kilometers. The total length of the railway in the region is 72.8 km, and there are 29.9 km of railway lines per 1,000 square kilometers. This is a very good indicator compared to other economic districts in the region. There have been no recent changes in the railway transport infrastructure or the laying of new lines, only the occasional renewal of old lines.

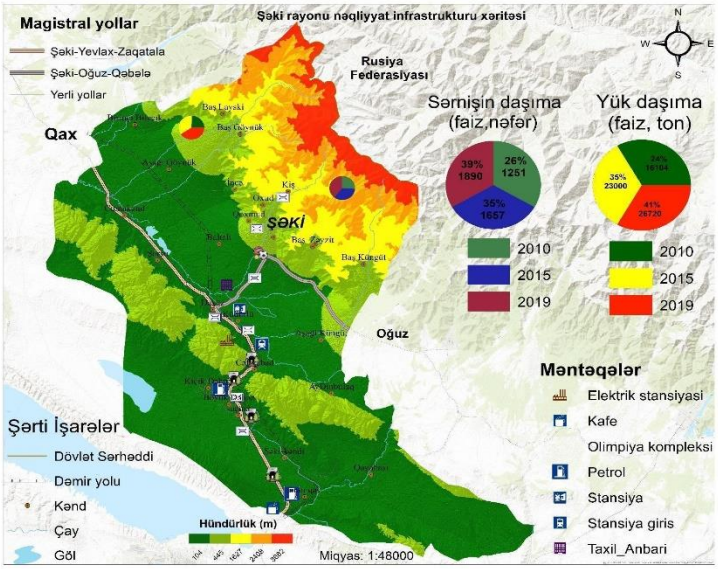


Figure 4. Trasport infrastructure map of Shaki region

Figure 4. above shows the above-ground stationary sources (cafes and restaurants, gas stations) located near the highways in the Sheki region, bridges on the newly built Sheki-Yevlakh-Zagatala road, and underground passages.. The map was prepared based on the data of the State Statistics Committee of Azerbaijan, Esri OSM, and DEM files. A site model has also been developed to study the inclination of highways and railways in the area as well. The MODEL builder method was used in Arcgis for this purpose.

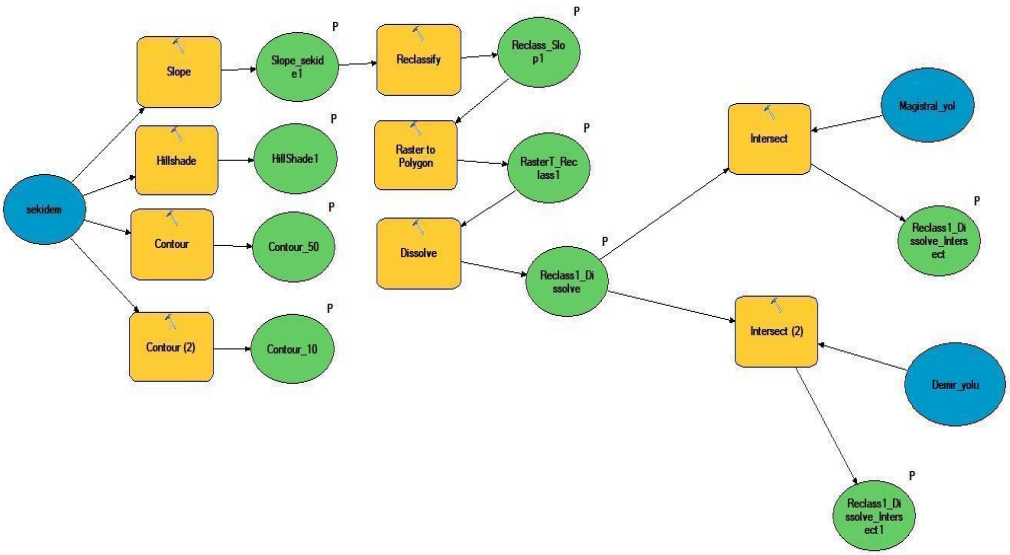
Model Builder

The planning methods and instruments may vary considerably depending on the planning goals and objectives, time frame and scale, availability of data, political support, public participation, and main driving issues, but some approaches and technologies are often used, such as Geographic Information Systems (GIS) and models(MAGUIRE ET AL., 2005) . The planning methods and instruments may vary considerably depending on the planning goals and objectives, time frame and scale, availability of data, political support, public participation, and main driving issues, but some approaches and technologies are often used, such as Geographic Information Systems (GIS) and models (Buhmann et Al., 2002) GIS tools help not only to process, analyze, and combine spatial data, but also to organize and integrate spatial processes into larger systems that model the real world (Esri, 2000). As abstractions and simplifications of complex systems and processes, these spatial models can be powerful tools for prediction, forecasting and planning, used to assess scenarios and reduce uncertainties about the future (Good Child, 2005).

Floods in the region damage a large number of transport systems every year. Also,some villages of the region (Gokhmug-Baltali-Babaratma-Garadagli-Gudula-Dashuz) are not well provided with road transport. The main purpose of the model in the region is to identify areas where road and railway lines pass through areas with intensive natural disasters and high damage, and to take appropriate preventive measures.. For this purpose, a DEM file was used, the slope was taken as a basis, the villages, settlements and urban settlements along the lines were identified, and what phase or how many kilometers of the area fell into this area.

The table above provides a Slope analysis of the area. The Slope group section shows the intervals at which the slope of the area is separated. As a result, the area and interest rate of the area covered were calculated. The area of the slope of 0-14 m is 1795 km2, which covers 74.9% of the area. The following modeling tools used in ArcGis when building the area model were Spatial Analyst, Data

managment, and 3D Analyse.



CONCLUSION

As a result of the research, it was determined that the technical condition of local roads did not meet the requirements. This makes it difficult for people living in mountain villages to travel to and from the district centers, and communication with these villages is cut off at certain times of the winter months. Improving the territorial organization of transport in the Sheki region plays an important role in the efficient settlement of the area, and the relatively equal distribution of settlements across the territory. Therefore, improving transport links in relatively sparsely populated areas is beneficial in terms of stimulating economic, social and demographic development in those villages. Although most of the roads pass through low-slope areas, floods in the area cause a large amount of damage to roads and motor vehicles every year. A similar incident was reported for railway transport and lines. Taking into account the tourism potential of the region and the location of the leading agricultural sector, the following is proposed:

1) Billboards: The presence of billboards that can be placed on the road can be an additional source of income for local municipalities and small businesses in the region;
2) Telecommunication junctions: Installation of telephone exchanges in roadside parking lots
3) Smart light poles: Road lighting is very low
4) Sanitary junctions
5) Bicycle line; and
6) Establishment of appropriate infrastructure to promote the use of electric vehicles

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