

UDC [УДК] 338.47:656(571.122)  
DOI 10.17816/transsyst20184344-64

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## FORECAST OF YUGRA TRANSPORT DEVELOPMENT

**Background:** The transport industry is leading in the overall structure of the country's economy. In parts of the regions, this industry can be a branch of specialization.

**Aim:** To forecast further development of the industry in the territory of Yugra.

**Method:** Analysis based on a questionnaire survey of organizations related to the transport industry in Yugra.

To analyze the further development of the transport industry of Yugra, the methods of SWOT analysis and rating ranking were used.

**Results:** The study revealed the main and secondary factors of the transport industry of Yugra. The analysis allowed to determine the strengths and weaknesses of transport, opportunities and threats to its development. On the basis of the analysis three rows of the forecast of transport development are given: pessimistic, moderate and optimistic.

**Conclusion:** Thus, based on the analysis of the data presented, the following conclusions can be drawn:

First, regional or inter-municipal highways, as well as the federal highway, perform a clearly expressed system-forming, supporting role in the common network of Yugra roads – on 8 km of these roads 8.8 km of private and local roads (for example, in Russia this ratio is 2.8 km);

These roads, in comparison with the average indicators for regional or intermunicipal motorways of Russia, have higher loads, both from single types of motor transport, and the total load from all types of motor transport.

Secondly, measurements of traffic on the bridge over the Ob River in Surgut showed that 44 % of passenger cars and 69 % of trucks, as well as 54 % of buses in the transport stream, consisted of transport from 32 other regions of the country.

Taking into account that Rosstat cites the volumes of cargo transportation by organizations in the place of their registration, it is possible to assume with full justification that the actual volume of transported goods along the roads of Yugra is much larger. Above and the dynamics of growth in the volumes of goods transported by road.

Thirdly, the industrial orientation of economic development predetermines the vastness of economic ties between Yugra and other regions of the country, which places regional inter-regional importance for the main regional roads, and therefore the construction and maintenance of such highways should be carried out not only at the expense of the budget of the Autonomous Okrug, but also of the federal budget.

**Keywords:** transport, forecast, factors, trends, SWOT-analysis.

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## ЭВОЛЮЦИЯ, ПРОГНОЗ И ПРЕОБЛАДАЮЩИЕ ТРЕНДЫ РАЗВИТИЯ ТРАНСПОРТА ЮГРЫ

**Введение:** Транспортная отрасль является ведущей в общей структуре экономики страны. В части регионов эта отрасль может быть отраслью специализации.

**Цель:** Дать прогноз дальнейшего развития отрасли на территории Югры.

**Метод:** Анализ на основании анкетного опроса организаций, имеющих отношение к транспортной отрасли в Югре.

Для анализа дальнейшего развития транспортной отрасли Югры были использованы методы SWOT-анализа и рейтингового ранжирования.

**Результаты:** Проведенное исследование выявило основные и второстепенные факторы развития транспортной отрасли Югры. Анализ позволил определить сильные и слабые стороны транспорта, возможности и угрозы его развития. На основании проведенного анализа даны три ряда прогноза развития транспорта: пессимистический, умеренный и оптимистический.

**Выводы:** Самой сильной стороной транспортного комплекса Югры является высокий транзитный потенциал территории округа. Самыми слабыми сторонами являются дороговизна прокладки дорог в условиях болотистой местности и холодного климата и большая зависимость транспорта от нефтегазодобывающей отрасли.

Наиболее соответствующими сильным и слабым сторонам транспортной системы округа являются такие возможности, как: становление национальных сетей в сфере логистики, появление альтернативных видов транспорта, появление новых технологий строительства дорог.

Наиболее опасными угрозами, которые накладываются на слабые стороны транспортного комплекса, являются: стагнация добычи полезных ископаемых и возрастание дефицита бюджета Югры.

**Ключевые слова:** транспорт, прогноз, факторы, тенденции, SWOT-анализ.

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Исследование выполнено при финансовой поддержке РФФИ и Правительства ХМАО-Югры, соглашение №17-12-86010/17-ОГОН «Долгосрочное прогнозирование эволюции экономики ресурсодобывающего региона с учетом пройденного пути и особенностей институциональной среды (на примере Ханты-Мансийского автономного округа-Югры)».

## INTRODUCTION

Transport industry is leading in the overall structure of the country's economy. In some regions this industry can be a branch of specialisation. Therefore, it is relevant to consider issues regarding role and significance of transport in Yugra economy and give forecast of its further development.

### TODAY'S STATE OF YUGRA TRANSPORT

Considerable influence on transport development dynamics is exerted by geographical factors, which to a large extent determine current state of transport complex of Yugra. These are:

- vast territory of the Autonomous Okrug (District);
- uneven distribution of transport infrastructure facilities and transport network discrepancy;
- high concentration of natural resources (hydrocarbon);
- availability of navigable waterways running through the territory of the Okrug (largest river mainlines – Ob, Irtysh; shorter rivers – Konda, Kazym, Severnaya Sosva, Agan, Tromyagan, Vakh, Nazym, etc.);
- specifics of natural conditions (climate, seasonal nature of transport availability, etc.);
- proximity of federal transport ways of federal significance, etc. [1].

The peculiarity of roads in Khanty-Mansiysk Okrug (Yugra) is predominance of non-public roads (Table 1).

The Tyumen – Khanty-Mansiysk federal road, regional and intermunicipal roads of the Okrug ensure that transport from private and local roads enter the country's transport system, and transport access of sectors of economy and inhabitants to railway stations, river ports, and airports. This is what determines their system-forming, supporting role in Yugra road network.

In the entire length of regional and municipal hard surface public roads in Yugra the III class roads prevail, whereas in the Russian Federation it is the IV class roads (Table 1) [2].

As of January 1<sup>st</sup>, 2016 the density of roads of regional and municipal importance in Yugra was 5.5 and 4.2 times respectively less than those in Russia and Ural Federal Okrug. At the same time, the density of winter roads and ice passages of municipal importance in Yugra was 4.8 and 2.3 times higher (Table 2). There is a considerable discrepancy in length of roads in districts of the Okrug.

The federal highway, as well as regional and intermunicipal roads perform structure-forming role in the road network of Yugra. It is them that are joined

Table 1. Length of roads at the beginning of 2015, km.

Federal Subject	Length of roads			Hard surface roads out of the total length					
	Total	Including		Total	Public				Non-public
		Public	Non-public		Total	Federal	Regional and Municipal	Local	
Russia	1612139	1451249	160890	1133687	1023849	51523	473896	498429	10983
UFO*	128728	95451	33277	89907	70616	3291	35918.6	31406.6	19291
Yugra	27074	6692	20382	17138	5520	345	2708	2467	11618

UFO\* stands for Ural Federal Okrug (District)

Table 2. Density of roads as of January 1<sup>st</sup>, 2015, in km/thousand km<sup>2</sup>

Federal Subject	Federal, Regional or Intermunicipal roads	Regional or Intermunicipal Roads	Winter Roads and Ice Passages
Russia	32.76	29.75	1.34
UFO	24.16	22.35	2.19
Yugra	5.76	5.11	4.81

Note: the data used were provided by: Rosstat – volume of freight transported and freight turnover of all industries' organisations; RADOR – length of public roads by federal subjects of Russia.

by local and private roads. Therefore, with some conditions, as assessment of compatibility for forming of transport flow and impact of road transport on regional and municipal roads, a number of indicators per one kilometre of roads in Russia, Ural Federal Okrug and Yugra were considered (Table 2). Let us note that ratios between federal and regional (including intermunicipal) roads differ insignificantly and make: 1 to 9 for Russia, 1 to 12 for Ural Federal Okrug, and 1 to 8 for Yugra [3]. It means the indicators given below are compatible with each other and relatively correct.

## VOLUME OF FREIGHT TRANSPORTED BY ROADS

The leading position in Russia of Yugra in development of industry and resource-based specialization of its economy predetermine the largest (as compared to other regions of Russia) volumes of road transported freight. These volumes are comparable to analogous indicators in federal okrugs (districts), and even superior in some of them [4].

If the volumes of freight transported in UFO in 2014 as compared to 2005 almost remained the same, with those even decreased in Russia, then in Yugra they have increased significantly, which indicates growth in car flow and loads on roads (Fig. 1).

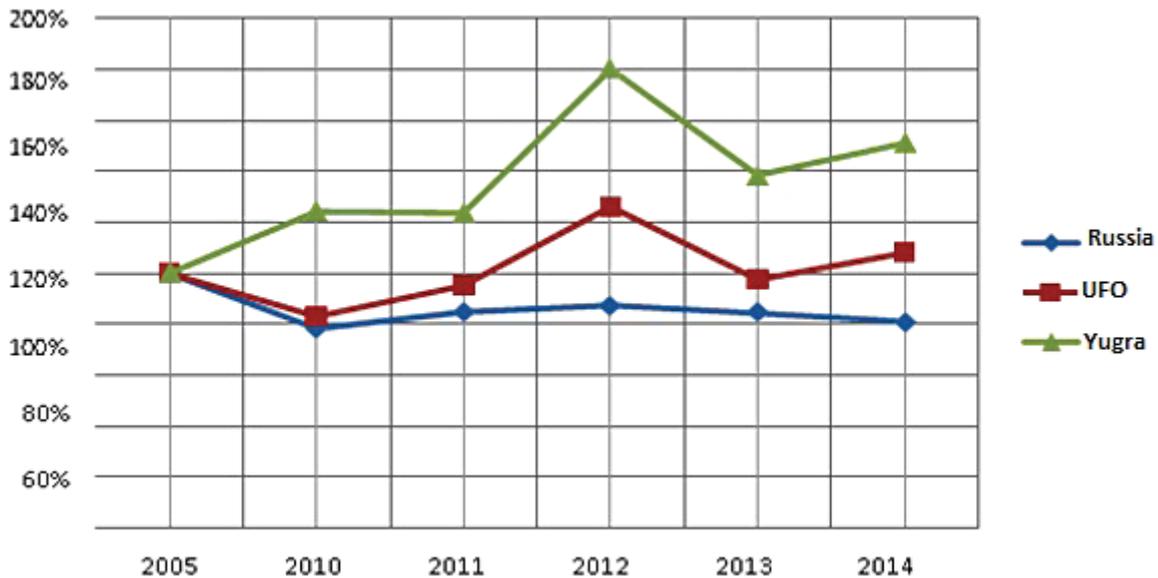


Fig. 1. Volumes of road transported freight by various industries' organisations as compared to 2005 (the data of 2005 have been assumed as 100 %) [4]

So, by volume of car transport, freight turnover and its volume, Yugra roads are considerably ahead of average Russia's and regional indices, which signifies intense loads on existing road network [5, 6, 7, 8].

## FACTORS INFLUENCING YUGRA TRANSPORT DEVELOPMENT

The influence of social factors is most seen in water transport performance. It ensures communication with those settlements which do not have any other transport network. During navigation season, water transport in Yugra territory is one of the major transport ensuring passenger transportation and various cargo delivery.

The most important task relating to maintaining continuous operation of water transport is Okrug's budget financing maintenance works aimed at maintaining passes of small and minor rivers in navigable state.

The scientific and technical progress factor primarily reflects itself in the state of all transport fleet. A strong wear of rolling stock is observed. To overcome increased wear is possible not only at the expense of imported equipment procurement, but

also through new technologies used to upgrade the existing equipment. In this regard, upgrade and new technologies in electric locomotives repair led to 14.2 % reduction in failure, therefore strength reserves of electric locomotives fleet enable its reliable operation for the next 10–15 years.

Location factor reflects itself primarily in configuration of the main transport network which does not meet the today's and tomorrow's freight and passenger flows. Yugra is faced with great difficulties in development road transport, since the main highway Surgut–Pyt-Yakh–Demyanskoye–Tobolsk connecting Yugra with southern parts of Tyumen Oblast (Region) is intensely congested, does not have required capacity, and is in unsatisfactory technical state. Every time the roadbed deteriorated due to natural processes, Yugra would be cut from the mainland. The role of connector with other parts of Russia is partially performed by the Perm–Sovetsky–Khanty-Mansiysk–Nizhnevartovsk highway, but the section running through Tomsk Oblast has not been laid yet. In the perspective, the freight and passenger flow through mainlines is expected to rise. This will be caused by booming development of Yamal-Nenets Autonomous Okrug and commissioning of the Sabetta Port. Currently, the role of meridian transport corridor is performed by the Urengoi–Surgut–Tobolsk–Tyumen Highway. This is highway having no other alternatives, therefore it is vital to construct the second and the third meridian corridors: the Tyumen–Urai–Sovetsky–Nyagan–Beloyarsky–Nadym Highway and the Agirish–Obskaya–Salekhard Railway.

Climate conditions, swampy areas, abundance of rivers have determined certain features of use of road transport. When approving and drawing up the route, one should consider such potential damages as destruction and gouges of parts of road surface, roadbed subsidence, and destruction of barriers, etc. Also, in some options it is possible to draw up fully-fledged logistical schemes engaging water transport, several lorries and handling in storage facilities.

The leading role of Yugra's industry development in Russia has triggered (for a number of regional and intermunicipal roads) increase in transport intensity, which is two and over times more than the permissive one, set by norms for road categories, and this requires urgent measures to reconstruct these roads. The situation with the bridge across the Ob is particularly serious. Its actual traffic density in 2014 was 2.4 times bigger than the designed one, whereby the peak intensity in August 2014 was 3 times bigger than the designed one for 2015, which was set in bridge project documentation for. In order to provide passage over the Ob, it is vital to construct another bridge [9].

In terms of freight transportation by car Yugra is far ahead among other regions of Russia. The Okrug accounts for almost half of the freight volume transport in UFO, thus excelling Far-Eastern and North Caucasian Federal Okrugs

(Districts). At the same time, in relation to UFO and the rest of Russia Yugra is characterised by positive dynamics of growth in volume of road transported freight. On the basis of the fact that federal, regional and intermunicipal roads are structure-forming, in 2014 one kilometre of these roads in Yugra serviced 6.4 and 7.1 times more transported freight than in UFO and the rest of Russia [10, 11].

## STUDY METHODS

In order to identify dominating tendencies in transport, we developed a questionnaire for organisations relating to transport industry in Yugra. This method was tested in the previous study of the author [12]. A total of 15 organisations directly engaged in transport industry have taken part in the questionnaire. The questionnaire was filled in by respondents who work in the most sectors of transport branch of the region, except for pipeline and railway transport. However, the majority of the respondents were from road transport (86.7 %). The questionnaire covered respondents from various parts of the region: Ninzhnevartovsk, Khanty-Mansiysk, Sovetsky, Yugorsk, Nyagan, Urai, Langepas, and Megion, with the answers being mainly from the capital city of the region – Khanty-Mansiysk. Generally, the majority of the respondents were average business representatives (54 %), then small businesses (31 %), and large ones (15 %). Also, representatives of very large and very small businesses were also questioned. Among the questioned, there were those being indirectly connected with transport industry. Among them, the share of transport services customers is 50 % of respondents, of transport services providers – 17 % of respondents. The remainder delivers various transport services. The dominating age of the respondents' businesses was: from 3 to 10 years old – 34 %, from 1 to 3 and emergence stage – 25 % each, from 10 to 20 years old and over – 8 % each. The managers made 31 % of respondents, average managers – 46 %, the rest – business owners. The majority of the questioned (60 %) consider that in recent years, sustainable tendencies in development of various sub-branches of the transport industry have emerged in Yugra. Part of the respondents (13.3 %) think that such tendencies have not shaped themselves, and part of the respondents consider that it is complicated to identify such tendencies (26.7 %).

According to participants' assessments, in sub-branches, the following tendencies are active (Table 3):

In general, development of transport in Yugra shows positive tendency (46.7 %) (Fig. 2).

The shown tendencies, according to the respondents, are relatively stable (53.3 %) and sufficiently sustainable (40 %). The greatest discrepancy was shown

Table 3. Assessment of availability, direction and influence ration of intra-sectoral factors, %

Dominating tendencies	Transport industry sub-branches			
	Road	Water	Air	Railway
Sharp exponential growth	6.6	–	6.6	–
Continuous fast growth	33.4	–	6.7	6.7
Gradual expansion of volume of structure of production	40	–	6.7	20
Stability (maintaining the same level)	13.4	20	53.4	60
Stagnation (gradual reduction in production)	–	40	20	6.7
Crisis (sharp downturn in volumes)	–	33.4	–	–
Sharp chaotic oscillations	6.6	6.6	6.6	6.6

Source: calculated by the author using questionnaire results.

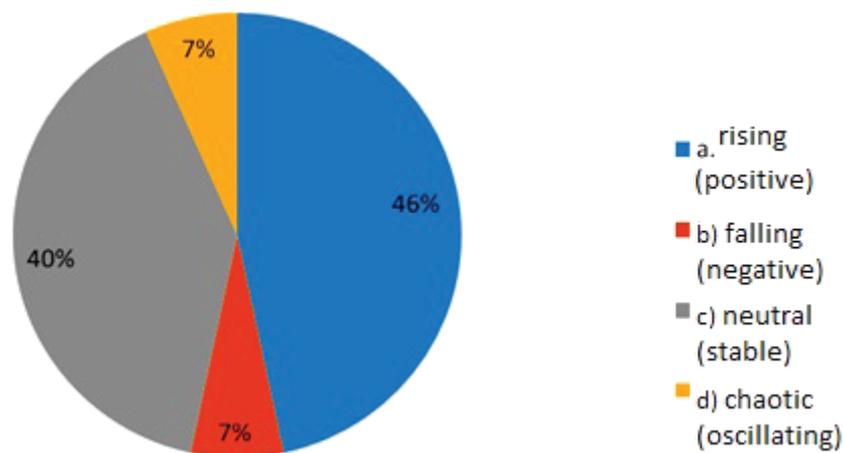


Fig. 2. Respondents' answers about dominating tendency  
Source: calculated by the author using questionnaire results

in forecasts. According to the respondents, in case the tendency is subject to change in the near 10 years, it will more likely to:

- stable – 40 %;
- positive – 33.3 %;
- oscillating – 20 %;
- negative – 6.7 %.

The most important factor indicated by the respondents was dependency on the main economy branch of Yugra.

The significant factors having equal rate of influence were considered to be:

- overall state of Russia's economy;
- regulatory base state.

As the less significant ones, the following factors were indicated:

- competitiveness rate;
- science and technology factor.

The influence of the “sanctions and counter-sanctions” factor on transport industry state was seen as non-significant (Fig. 3).

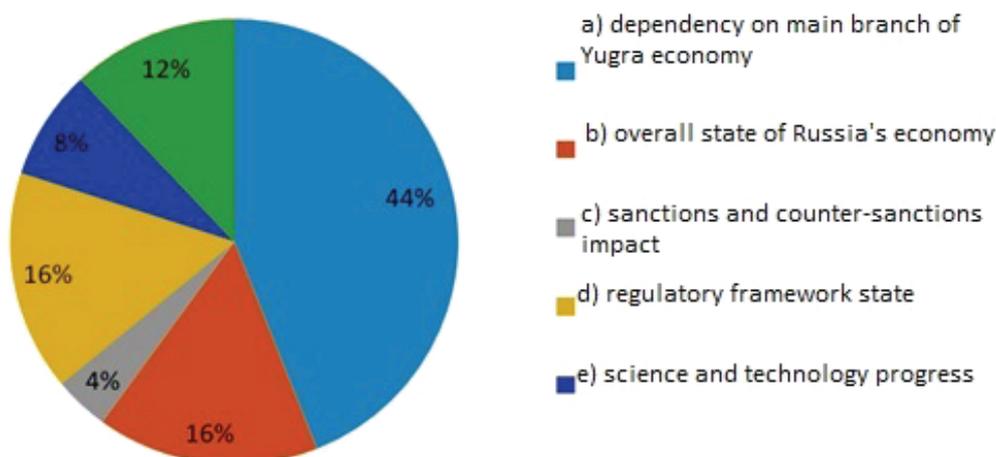


Fig. 3. Factors identifying dominating tendency in transport industry.

Source: calculated by the author using questionnaire results

Evaluation of factors that most determine the dominating tendency in transport industry give the following results: the dominating influence is exerted by interregional factors (57.9 %), all-Russian factors (26.3 %), intra-sectoral factors (15.8 %). None of the respondents maintains that common global factors influence transport industry development.

Interesting results were obtained after questionnaire on the reasons which may influence change of dominating factor in transport industry development (Table 4).

Table 4. Evaluation of influence of factors on possible change of transport industry development, %

№	Factors	Share
1	Change over economic policy	40.7
2	Change of raw materials prices	26.0
3	Change of final products prices	11.1
4	Administration of new sanctions and counter-sanctions	11.1
5	Change of legislation	7.4
6	Withdrawal of sanctions and counter-sanctions	3.7

Source: calculated by the author using questionnaire results.

To analyse further development of transport in Yugra, SWOT analysis and rankings methods were used.

The list of strengths and weaknesses of, opportunities for and threats to Yugra transport systems is given in Table 5.

*Table 5. Strengths and weaknesses of, opportunities for and threats to Yugra transport development*

<b>Strengths</b>	<b>Weaknesses</b>
S1. Well-developed riverways network S2. Proximity of transport passages of federal level S3. Investment attractiveness of Yugra economy S4. High transit potential of Yugra territory	W1. Large distances between inhabited areas, low population density W2. Lack of connectivity of transport system W3. High cost of road construction in swampy areas and harsh climate W4. Large unit cost of transport infrastructure maintenance W5. Great dependency of transport on oil extracting industry
<b>Opportunities</b>	<b>Threats</b>
O1. Delivery of large-scale infrastructure investment projects O2. Rise of national logistics networks, strengthening of interregional relations O3. Exploration and development of new deposits O4. Emergence of alternative transport modes O5. Reduction in resources consumption on transport due to development of energy efficient production and green energy sector O6. Emergence of new road construction technologies	T1. Contingency of reduction in federal investment programmes in transport industry T2. Increase in competitiveness with neighbouring regions T3. Oil extraction stagnation T4. Increase in Yugra budget deficit T5. Extension of sanctions

The strongest side of transport industry in Yugra lies in the territory's high transit potential. The weakest are high cost of road construction in swampy areas and severe climate as well as great dependency of transport on oil and gas extracting industry.

The opportunities that most correspond to strong and weak sides of transport system are: rise of national logistics networks, emergence of alternative transport modes and new road construction technologies. SWOT analysis of Yugra transport system development is given in Table 6.

The greatest threats overlapping weaknesses of transport industry are: natural resources extraction stagnation and increase in Yugra budget deficit [1].

Long-term priorities of SWOT-analysis are:

Table 6. SWOT-analysis of Yugra transport system development

Indicators		Opportunities						Threats					Total
		O1	O2	O3	O4	O5	O6	T1	T2	T3	T4	T5	
Strengths	S1	+1	+2	+1	0	+1	0	0/0	0/0	0/0	0/0	0/0	+5
	S2	+2	+2	0	0	0	0	0/0	+1/0	0/0	0/0	0/0	+5
	S3	+3	+3	+2	+3	0	0	+2/0	+1/-1	0/-3	+1/-1	0/-3	+7
	S4	+3	+3	0	+3	0	+3	+2/0	+1/0	0/0	+1/0	0/0	+16
Weaknesses	W1	-3/+1	-2/+1	0/+1	0/+3	0/+2	0/0	0	-1	-2	-1	0	-1
	W2	-2/+3	-1/+2	-1/+1	0/+3	0/0	0/0	-2	-2	-1	-1	0	-1
	W3	-3/0	-3/0	-3/0	0/0	0/0	0/+3	-3	0	0	-3	0	-12
	W4	0/0	-2/0	-2/0	0/+2	0/0	0/+3	-3	0	-2	-3	0	-7
	W5	-2/+2	0/+3	0/-1	-3/+1	-3/0	0/+1	0	-1	-3	-3	-1	-10
Total		+5	+11	-2	+13	0	+10	-4	-2	-11	-10	-4	X

**SO** – prioritised actions which need to be taken in order to exploit strengths to increase and ultimately use opportunities:

S3O1, S3O2 – increase in investment attractiveness of Yugra transport industry at the expense of delivery of large-scale infrastructure projects and their linking to national logistics networks;

S4O1, S4O2 – delivery of large-scale infrastructure projects, including those allowing for linking to national logistics networks to exploit high transit potential of the territory;

S3O4, S4O4 – development of alternative modes of transport which would enhance investment attractiveness of transport industry of Yugra and exploit high transit potential of the territory;

S4O6 – development of new road construction technologies to exploit transit potential of the territory.

**WO** – prioritised actions which need to be taken to overcome weaknesses and use opportunities:

W1O1, W1O4 – delivery of large-scale infrastructure projects, including development of alternative transport modes, to overcome such weaknesses as large distances between inhabited areas and low population density;

W2O4 – development of alternative modes of transport to overcome lack of connectivity in transport system;

W3O1, W3O2, W3O4 – search for ways to reduce cost of road construction to avoid lost opportunities caused by economic irrelevance such as new infrastructure projects, linking to national logistics networks, and exploration and development of new deposits;

W3O6, W4O6 – development of new road construction technologies to reduce their construction cost and transport infrastructure maintenance cost;

W5O2, W5O4, W5O5 – decrease in dependency on oil and gas extracting industry at the expense of linking to national logistics networks, development of alternative modes of transport and alternative energy sector;

**ST** – *prioritised actions that use strengths to avoid threats, and prioritised actions to prevent losses of strengths under influence of threats:*

S3T3 – Yugra economy diversification, including its transport infrastructure, to avoid stagnation of oil extraction and additional sanctions, which may lead to decrease in investment attractiveness of Yugra.

**WT** – *prioritised actions which overcome weaknesses, to prevent catastrophic consequences of identified threats:*

W3T1, W4T1 – search for reserves to reduce road construction expenditures, transport infrastructure maintenance, so as to overcome consequences of potential reduction in federal investment programmes in transport industry;

W5T3 – search for opportunities to reduce dependency of transport complex on oil and gas extracting industry, so as to overcome consequences of oil extraction stagnation;

W3T4, W4T4, W5T4 – search for reserves to reduce road construction cost, transport infrastructure maintenance cost, and dependency on gas and oil extracting industry, to overcome potential budget deficit.

Evaluation of degree of priority of development of most promising modes of global transport is given in Table 7.

Table 7. Evaluation of degree of priority of most promising transport modes

Transport modes	Potential to acquire the greatest social and economic budget effect	Correspondence to basic technological and organisational priorities	Correspondence to prioritised areas (axes) of transport complex development	Degree of influence of transport complex development on improvement of other directions of social and economic development of Yugra	Total priority ranking
Water	3	1	3	5	12
Air	5	3	1	5	14
Road	10	5	10	10	35

Pipeline	3	3	1	3	10
Railway	8	10	8	8	34

The most overriding modes of global transport in Yugra are road and railway transport. Road transport enables acquiring maximum social and economic, and budget effects, it corresponds to prioritised areas (axes) of development, and exerts the greatest influence on development of other directions of social and economic development of Yugra. Railway transport is slightly inferior to the mentioned indicators, but best corresponds to basic technological and organisational priorities, as it provides sound connectivity of Yugra and mainland [13].

### YUGRA TRANSPORT COMPLEX DEVELOPMENT FORECAST

Long-term forecast of freight traffic builds on forecast of volumes of freight by its types, taking into account the tendencies that formed in major economy branches of Yugra. The forecast was given in three options: pessimistic, in case current negative tendencies in development of gas and oil extracting industry remain unchanged and lack of large-scale infrastructure projects for development of other economy branches; moderate, in case of partial delivery of infrastructure projects; and optimistic, in case of overcoming negative tendency in gas and oil extracting industry development and realising large-scale infrastructure projects of regional and federal levels, such as construction of the Tyumen–Urai–Sovetsky–Nyagan–Beloyarsky–Nadym Highway, bridges across the Ob in Surgut and Oktyabrsky districts, the Priobye–Igrim, the Igrim–Saranpaul, the Agirish–Obskaya–Salekhard highways, the Polunochnoye – Obskaya – Salekhard Railway, the Northern Latitudinal Railway passing through Obskaya, Salekhard, Nadym, Pangody, Novyi Urengoi, Korotchaevo, Sabetta Port and development of Northern Sea Route, and finally realisation of complex investment project of Subpolar Ural development (Table 8) [14].

In case of pessimistic scenario, it is supposed that the volume of freight transported may decline, which can be brought about primarily by oil extraction, consequently associated gas, construction materials and equipment for deposits.

In case of optimistic scenario, it is supposed that oil extraction may fall insignificantly, which can be partially compensated for by development of new deposits and application of new technologies? Besides, in optimistic scenario the option is considered that the volume of freight may rise due to development of Subpolar Ural and setup of West-East and North-South transit transportation.

Table 8. Long-term forecast of freight volume, million tonnes

Type of freight	Basic figure (2014)	Forecast up to 2030		
		<i>Pessimistic</i>	<i>Moderate</i>	<i>Optimistic</i>
<b>Freight of Yugra</b>				
Oil	248	195	211	228
Associated gas	45	35	38	41
Petroleum products	1.55	2	2	2
Construction materials for buildings and accommodation erection	13.24	18	29	18
Construction materials to be used in deposit construction works (including site access roads)	73.04	48	54	60
Construction materials for repair and construction of regional and municipal roads	2.33	3.5	4.4	5.8
Timber	1.6	1.6	3.2	7
Food and consumer goods	3.22	3.58	3.58	3.58
Industrial goods	6.45	7	7	7
Oil and gas extracting equipment	3.65	2.4	2.7	3
Other types of freight	47.84	71.76	71.76	71.76
<b>Transit freight (excluding gas transit from Yamal-Nenets Autonomous Okrug)</b>				
Delivery of equipment and materials for Yamal peninsula deposits	3.69	1.49	1.49	1.49
Transit (transshipment) of freight for Yamal	27.98	34.98	35.38	34.98
Transit of LNG and petroleum products to Sabetta Port	0.00	0.00	3.00	10.00
Delivery of equipment and materials for deposit in northern Tomsk Oblast	1.49	7.47	7.47	7.47
Transit freight by Northern Latitudinal Railway	0.00	0.00	3.79	37.95
<b>New types of freight due to development of Subpolar Ural</b>				
Construction materials	0.00	0.00	3.00	14.00
Run-of-mine	0.00	0.00	2.00	18.40
Brown coal	0.00	0.00	6.00	10.00
Mining industry equipment and machinery	0.00	0.00	0.10	0.50
Total	479.32	434	491	584

In moderate scenario, estimation of volume of freight is more conservative. The structure of freight transportation at the directions given above is presented in Table 9 below.

Table 9. Structure of freight transportation at certain directions, million tonnes

Direction of transportation	Basic figure (2014)	Forecast up to 2030		
		<i>Pessimistic</i>	<i>Moderate</i>	<i>Optimistic</i>
Internal radial transportation	17.91	26–27	29–30	37–38
To Yugra	118.26	108–109	126–127	122–123
From Yugra	309.99	255–256	283–284	325–326
South-North/North-South transit	31.66	36–37	39–40	46–47
West-East/East-West transit	1.49	7–8	12–13	52–53
Total	479.32	434–435	491–492	584–585

In pessimistic scenario, the structure of transportation for each direction changes insignificantly, with the volume of transportation out of Yugra and internal radial transportation increased.

In optimistic scenario, the volume of transportation increases three times as compared to the pessimistic one. Also, the volume of internal radial transportation increases sharply (more than twice), and the import to Yugra hardly increases.

In moderate scenario, the evaluation of transit volumes is also conservative. The structure of transportation for transport modes is given in Table 10.

Table 10. Structure of freight transportation by transport modes, million tonnes.

Transport mode	Basic figure (2014)	Forecast up to 2030		
		<i>Pessimistic</i>	<i>Pessimistic</i>	<i>Pessimistic</i>
Freight sent by railway	13.80	16–17	25–26	63–64
Freight received by railway	15.00	17–18	23–24	61–62
Road transport	223.9	209–210	234–235	235–236
Internal water transport	3.36	4–5	4–5	4–5
Pipeline transport	236.26	185–186	201–202	218–219
Other transport modes	0.1	0.2	0.3	0.5
Total	479.32	434–435	491–492	584–585

In pessimistic scenario the structure of transportation by transport modes changes inconsiderably.

In optimistic scenario, almost 4 times increase in transportation by railway is observed, since it is railway transport that will carry natural resources from

Subpolar Ural, and will be a part of transit transportation in both latitudinal and meridian directions.

In moderate scenario, the role of railway transport is limited, since it may turn out that the volume of freight is not sufficient.

Long-term passenger transportation forecast.

The forecast of passenger transportation is more dependent on Yugra population growth, than on infrastructure projects delivery. Considering that the population of Yugra is forecast to grow up to 1791 thousand people by 2030, the volume of transportation will grow proportionally. The structure of passenger transportation by directions is given in Table 11.

Table 11. Structure of passenger transportation by directions, million people.

Direction of transportation	Basic figure (2014)	Forecast up to 2030
Within settlements	92.80	93–94
Internal radial municipal transportation	1.57	1.6–1.65
To Yugra	2.55	3.5–4.0
From Yugra	2.48	3.5–4.0
South-North/North-South transit	1.10	1.5–1.8
West-East/East-West transit	0	0.6–0.8
Passenger transported (sent) in total	100.5	104–105

The population growth will trigger increase in transportation in all directions, but due to motorisation rate increase, it will not be that fast [15]. Due to development of the latitudinal transport corridor, a new type of passenger transportation will emerge, that is West-East (and reverse) transit. The structure of passenger transportation by transport modes is given in Table 12 [1].

Table 12. Structure of passenger transportation by transport mode, million people.

Transport mode	Basic figure (2014)	Forecast up to 2030
Railway	2.4	4.0–5.0
Road transport (buses, shuttles, taxis)	89.1	93–94
Internal water transport	0.4	0.3
Others (air, non-public, etc.)	8.6	6–6.5
Passenger carried (sent) – total	100.5	104–105

The dominance in the structure will be retained by road transport; at the expense of increase in connectivity, railway transport volume will rise. The share of other types of transport will fall owing to road network development.

The main directions and activities of development and technical refurbishment of transport complex should be:

- transition of transport modes to natural gas-based fuel;
- transition of transport modes to electric traction;
- implementation of satellite navigation and monitoring systems;
- implementation of autopilot systems on road transport;
- expansion of Wi-Fi and mobile phone networks;

All activities must be undertaken with maximum use of scientific and technical potential.

## CONCLUSIONS

Thus, on the basis of analysis of the data presented, one can make the following conclusions.

*Firstly*, regional and municipal roads as well as the federal road have an express fundamental structure-forming role in Yugra road network: one km of these roads accounts for 8.8 km of privately owned and local roads. In the rest of Russia, this relation is 2.8 km, for instance.

As compared to average regional and intermunicipal roads of Russia, these roads have higher loads from both single transport units and total loads from all types of road transport.

*Secondly*, road transport flow is predominantly composed of other regions' transport.

Since the Rosstat (Russia's Statistics Agency) provides data on volumes of freight transportation by organisations' legal addresses, the actual volume of freight transported by roads is much higher. The dynamics of growth of freight transportation by roads is higher as well.

*Thirdly*, the industrial focus of Yugra economy development predetermines its multiple connections with other regions of Russia, which gives major regional roads interregional importance and, consequently, construction and maintenance of these roads should be provided not only at the expense of the Autonomous Okrug budget, but the expense of the federal one.

*Fourthly*, the dominating factors influencing development of transport complex in Yugra are nature and climate conditions, geographical location and location of town-forming enterprises in the territory of the Okrug.

The key agents responsible for Yugra transport complex development are:

- 1) Yugra government, whose interests consist in providing transport accessibility for all inhabited areas, industry branches development, small and average businesses;
- 2) cities' and municipalities' administration, interested in solving local transport problems;
- 3) business representatives, who can be divided into three groups:
  - VINKs (Vertically Integrated Oil Companies), interested in decrease in investment and operational expenditures for road network and transport infrastructure;
  - big investors, including logistics companies of national level, interested in attraction of profit from transit transportation;
  - small and average transport and related businesses, interested in continuous transport services.

## ACKNOWLEDGMENT

The study was conducted with financial support of RFBR and the Government of Khanty-Mansiysk Autonomous Okrug (Yugra), Agreement №17-12-86010/17-ОГОН (OGON) “Long-Term Forecast for Evolution of Economics of Resources Extracting Region, Considering the Path Completed and Peculiarities of Institutional Environment (by the example of Yugra)”.

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**To cite this article:**

Bolshanic P.V. Forecast of Yugra Transport Development. *Transportation Systems and Technologies*. 2018;4(3):44-64. doi: 10.17816/transsyst20184344-64

**Цитировать:**

Большаник П.В. Эволюция, прогноз и преобладающие тренды развития транспорта Югры // Транспортные системы и технологии. – 2018. – Т. 4. – № 3. – С. 44–64. doi: 10.17816/transsyst20184344-64