

STRATEGIC DEVELOPMENT AREAS OF THE LATVIAN ROAD BUILDING INDUSTRY

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The article aims at evaluating the future development areas of the road building industry, analysing the road building development in Latvia, performing financial analysis of road building companies, and comparing the Latvian road building industry with other Baltic States.

National motor roads in Latvia are divided into three groups: state main roads, state regional roads, and state local roads. The article provides a theoretical review of the road building industry in Latvia, including the classification of national roads. The authors analyse the Latvian road building industry, its largest companies, and compare the Latvian road building industry with other Baltic States.

Areas of the road building industry in Latvia encompass different aspects, facilitating to improve the road infrastructure and its accessibility, ensuring an efficient and safe transport system, and promoting the development of the national economy. Road building and motor roads are very important for Latvia's national economy. This has been the case for decades. To facilitate the efficient operation of motor transport, which provides the basis for other industries in the national economy, it is necessary to maintain and develop the network of motor roads properly.

The road industry is closely connected to other industries, and, in the opinion of the authors, it fulfils the social function in the most direct way, as roads are used by residents and there is both synergy and cooperation between road networks and socioeconomic factors. Networks of national roads should also be evaluated in view of public interests – whether the roads ensure the well-being of residents and, hence, the development of the region.

Keywords: Construction, infrastructure, motor roads, road construction.

1. INTRODUCTION

The topicality of the selected theme of research is substantiated by the fact that road building is one of the most important infrastructure industries in any country. Roads ensure convenient and safe relocation for people and freight, promote economic growth and social development. The Latvian road building industry is currently in a difficult situation. The road infrastructure in Latvia has become obsolete, and significant investments are required for its renovation and development. However, the state budget capacity is not sufficient for such investments to ensure the road infrastructure development in accordance with modern requirements. Therefore, it is required to develop a strategy for ensuring the development of the road building industry and its competitiveness in the long-term perspective. The road building industry faces several challenges, including a lack of labour force, high costs, and big competition, as well as an unclear model of financing that encumbers the development of road building companies. To ensure the sustainable development of the industry, it is required to find solutions to these challenges.

Latvia has an open economy, and its growth is related to international trade. Good roads help to ensure that Latvian companies have convenient and safe access to the international market. Roads are significant for the development of entrepreneurship, as they allow reducing transport expenses and increasing production efficiency. Good roads help companies transport goods and services more conveniently, thereby reducing transportation expenses. It makes companies more competitive and promotes production growth. High quality of roads helps connect regions and pro-

motes their economic development. It is especially important for Latvia, as it is a relatively large country with small towns and considerable distances between them. Regarding the attraction of investments, the condition of infrastructure is extremely important, as inappropriate infrastructure can complicate the process of attracting investments.

When performing road construction and renovation, a big emphasis is laid on the qualitatively developed technical project documentation, to reduce to a minimum unforeseen works at the project implementation stage, which could be anticipated at the project development stage [1].

Although motor roads are significant for the entire country, their technical condition raises considerable concern, being unsatisfactory and in some places even hazardous for users. Since 1991, the road construction deficit of several billion euros has been accumulated in Latvia – to liquidate the motor road repair deficit for the works that had to be performed at the time stipulated by the regulations, EUR 2.94 billion is required according to the 2023 prices [2].

Every year, the financing volume allocated for the construction of motor roads is twice less than required. In the situation when motor roads and bridges are renovated in due time and there is no repair deficit, the required financing for the national network of motor roads is EUR 648 million per year. In the event renovation of road pavement is not performed at the required time, constructive layers of motor roads lose their technical properties and cannot ensure the needed resilience for loads caused by transport, and, as a result, the fast collapse of motor roads takes place.

The significance of construction is

determined by its considerable proportion in the gross domestic product. Construction is a relatively labour-consuming process, and, on the state level, it attracts about half of all capital investments. Construction is related to any branch of the national economy, creating a base for it in the form of buildings and structures. Therefore, it is important for every country to develop a viable construction industry [3].

The construction industry plays a significant role in the Latvian national economy – its proportion in added value reaches 5.9 %; it employs 6.4 % of the entire labour force; its contribution to the Latvian budget is 2.3 % of all tax revenues [4]. A significant share of such revenues is directly related to the road construction industry.

To achieve positive progress in improving the Latvian network of motor roads, a number of measures need to be taken. It is important to manage the existing financial resources efficiently and create new opportunities to obtain additional financing for road projects in Latvia, follow innovations in the industry, and find opportunities for attracting new specialists. Reforms are required to ensure the sustainable development of the industry.

Sustainability and sustainable development could become an attractive slogan

for a long-awaited solution in the strategic development of the road industry [5].

Every year, more roads are built all around the world, and a large part of them, which are to encounter high-intensity traffic, are asphalted. Such a process can be time- and resource-consuming; thus, it is important to ensure maximal longevity of the built construction and provide methods for improved architectural type and used material quality [6].

The article aims at analysing the road building development in Latvia, performing financial analysis of road building companies and comparing the Latvian road building industry with other Baltic States, making conclusions regarding the development of the road building industry in Latvia.

The following research methods have been used during the research: monographic or theoretical method, graphical method, statistical data analysis, descriptive analysis, comparative analysis – reflecting information in figures and tables. The research materials and data for analysing theoretical and factual sources have been mostly taken from the internet resources, scientific databases, and theoretical books, as determined by the availability of information. Limitations of the research are the availability of actual statistical data and information.

2. THEORETICAL ASPECTS OF STUDYING THE ROAD BUILDING INDUSTRY

Real estate, including motor roads, is one of the property types that gives benefit to its owner and often directly affects the environment, processes, and people. Not only safety and quality of the property is important, but also its landscape and aesthetic delight rendered to passers-by, tourists or users. Additionally, it also promotes the economic development [7].

According to Section 3 (3) of the Law on Roads, roads in Latvia are divided into:

- main roads connecting the national road network with the main road network of other countries and the capital city with other cities of the Republic of Latvia or bypass roads of cities of the Republic of Latvia;

- regional roads connecting the administrative centers of districts with each other or with the cities of the Republic or with the capital, or with the main or regional roads or with each other;
- local roads connecting the administrative centers of a county with the county towns, the populated areas of the county in which parish administrations are located, villages or other public roads, or between the administrative centers of individual counties [8].

Motor roads are complex engineering structures outside city boundaries, whose purpose is to ensure transportation for vehicles, whereas ‘road’ is a wider term, which includes also city streets. From the perspective of the user, motor roads and streets form a united network of roads, where traffic is regulated according to uniform rules, and, therefore, identical driving conditions should be provided on them. Roads can be classified according to their:

- administrative belonging (substantiating management and usage of roads);
- cross-section form (characterising the carrying capacity of the road);
- pavement type (characterising the physical and mechanical properties of the road structure);
- surfacing type (determining the driving comfort level and the road management strategy) [9].

Administratively, according to the property rights and management responsibility, the Latvian roads are divided into the following groups:

- state motor roads (main, first- and second-class motor roads);
- municipal roads (city streets and parish roads);
- forest roads (roads for state forest management);

- private roads (internal roads of commercial facilities and households) [9].

National motor roads in the territory of Latvia are a significant transport infrastructure, as they ensure important connection between cities and countries. According to the the Law on Roads, state motor roads include all road routes connecting Latvian motor road networks with main motor road networks of other countries or with the Latvian capital – Riga and other towns or town by-pass roads. These national roads are recognised on maps and other informative materials, as they are designated by the letter “A” and have a numbered sequence for their identification. Currently, Latvia has 15 state main roads, their designation, thus, being from A1 to A15 [8]. As an example, A1 main road can be mentioned, which connects Estonia with Lithuania, crossing the Latvian territory, as well as A7 main road from Riga to Lithuania, which goes through Bauska and other regions. State motor roads form a publicly available network of roads by which all traffic participants can move without restriction, except for cases when weight restrictions are set or road repairs take place. State motor roads are the property of the Republic of Latvia, and their management is entrusted to the Ministry of Transport, which is, in turn, delegated to the State Limited Liability Company “Latvijas Valsts ceļi” to conduct maintenance and management of roads.

When developing a motor road construction project, special attention should be devoted to materials, as they form a considerable part of the total construction costs. Therefore, specifications of road construction are significant, which include certain requirements for each separate construction case. At the beginning of each work specification, binding instructions can be provided to the construction performer, for example,

in cases when the construction project has no indications regarding the usage of the exact types of products stipulated in the project, etc.

When building motor roads, it must be taken into account that road surfacing consists of two parts: pavement and base. Pavement can be made of one, two, or three layers. The base consists of two layers – a carrying layer and an additional layer. In recent years, there have been increasing discussions about both the quality of materials and their effect on the environment.

For example, one of the used materials is bitumen. As stated by scientists from India, in the surrounding environment temperature, bitumen is solid and causes no threat to the environment, and human health. However, in the course of production/construction, it is heated, stored, transported, and used, thus, causing emission of different hydrocarbons [10]. It, therefore, raises questions about the real effect of bitumen on the environment and human health.

The supply of materials is very important, especially in road construction projects, as they are required in the daily construction process. Lack of materials is the main source of losses in the construction site productivity. This happens because

the used material management methods lack structured communication and clearly defined tasks [11].

To achieve positive progress in improving the Latvian network of motor roads, the State should take different measures – it is significant to efficiently manage the available financial resources and create new opportunities for obtaining additional financing for motor road projects in Latvia, follow innovations in the industry, and find opportunities for attracting new specialists. Reforms are needed to ensure the sustainable development of the industry.

According to the available statistics, as of 31 December 2023, the total length of motor roads and streets registered in Latvia was 71 157 km. The average density of the road network is 1.102 km per 1 km². The total length of state motor roads administered by the State Limited Liability Company “Latvijas Valsts ceļi” is 19 895 km. The average density of the state road network is 0.308 km per 1 km². “Latvijas Valsts ceļi” administers 955 bridges, of which 891 are made of reinforced concrete, 16 of stone, 45 of iron, and 3 of wood. The total length of all bridges is 28 100 m (see Fig. 1) [12].

Table 1. Division of Motor Roads in Latvia [12]

Classification of Roads	Length of roads as of 31 December 2023 (km)			
	Black top	Crushed stone or gravelled	Unpaved	Total
National roads, incl.	9803	10 092	00	19895
Main roads (A)	1676	-	-	1676
Regional roads	4756	707	-	5463
Local roads (V)	3358	9326	-	12684
By-roads	13	59	-	72
Municipal roads and streets, incl.	6604	31423	-	38027
roads	1434	28034	-	29468
streets	5170	3389	-	8559
Forest roads	29	12119	1087	13235
Total roads and streets	16436	53634	1087	71157

The authors of the article, when analysing the classification of the Latvian motor road network, conclude that the proportion of this state motor road infrastructure is comparatively big, taking into account the country area and the number of residents. The relatively big area of Latvia, compared to the number of residents, requires a wide and efficient network of motor roads to ensure communication and access in the entire country. The distribution of Latvian residents in the territory can be comparatively scattered, thus making this aspect particularly important.

Therefore, it can be concluded that a network of motor roads is a major component of a viable and developed State. To efficiently serve residents and companies scattered throughout the entire territory of the country, motor roads should ensure not only fast and safe travelling between cities and towns but also access to rural areas. The development of such a network of motor roads not only promotes economic development and growth of business activities but also improves the quality of life, providing residents with convenient access to transport and communication.

3. ANALYSIS OF THE ROAD BUILDING INDUSTRY IN LATVIA

The number of companies operating in the Latvian road building industry has increased over time. As of the end of 2023, 378 companies have been operating in Latvia under the NACE code 42.11, which is the construction of roads and main motor roads, without account of bridge and rail-road construction companies, the total number of which is 21 [13]. Thus, in total, 399 companies are involved in the construction of vehicle roads in Latvia. However, most of these companies are small.

When investigating the technical condition of Latvian motor roads, it can be concluded that the road condition is improving with every year, as of the end of 2022, 78.3 % of state main roads and 57.5 % of state regional roads with asphalt concrete pavement were in a good or very good technical condition. This is the best indicator over the past 30 years. Since 2005, the volume of roads in a good or very good technical condition has not only doubled, but has increased more than twice, from 32 % to 78.3 % in the main road segment and from 22 % to 57.5 % in the regional road segment [12].

As of 15 April 2024, a total of 32 construction objects have been registered. Out of 36 Latvian regions, construction is being conducted in 19 (Table 2) [12]. Generally, regions with just one construction object dominate, whereas Cesis Region differs from all others by having construction at four objects.

To perform a more detailed analysis regarding the development of the road building industry in Latvia, the authors have selected six big road building companies in order to get a better understanding of the industry development tendencies in the country.

The authors of the article have selected the following companies:

- Road building firm “BINDERS”;
- Joint Stock Company “A.C.B.”;
- Limited Liability Company “TILTS”;
- State Joint Stock Company “Latvijas autoceļu uzturētājs”;
- Limited Liability Company “VIA”;
- Limited Liability Company “SC GRUPA”.

Table 2. The Current List of Construction Objects in Latvia as of 15 April 2024 [12]

Number of Objects	4	3	2	1
Regions	Cesis Region	Dobele Region	Gulbene Region	Marupe Region
		Aluksne Region	South Kurzeme Region	Limbazi Region
			Ogre Region	Smiltene Region
			Jekabpils Region	Kuldiga Region
			Jelgava Region	Ventspils Region
			Valka Region	Ludza Region
			Tukums Region	Rezekne Region
			Talsi Region	Preili Region

To analyse the position of the selected companies, the authors have performed their financial analysis.

During the period from 2019 to 2022, the net turnover of the road building firm LLC “BINDERS” decreased from EUR 107 million to EUR 86 million. During the reporting year, profits or losses were fluctuating. In 2022 and 2021, losses were observed of EUR 2.8 million and EUR 345 thousand, correspondingly. Loss and profit fluctuated in a cyclical manner, which might be related to the specific features of the industry or the company.

During the period from 2018 to 2022, net turnover of JSC “A.C.B.” increased from EUR 93 million to EUR 105 million. The increase is observed every year, except for 2021, indicating the company’s growth. When comparing 2021 with 2022, its net turnover increased considerably – by EUR 31 million. The net turnover increase indicates the company’s successful growth and potential on the market. During the reporting year, profits or losses were fluctuating, but, in general, a positive tendency was observed.

The net turnover of JSC “Latvijas autoceļu uzturētājs” was fluctuating, but, in general, remained comparatively stable. In 2022, the company’s net turnover slightly decreased, comparing with the previous year, by EUR 6.6 million. During the

reporting year, its profit decreased considerably from EUR 3.9 million in 2021 to EUR 1 361 in 2022, indicating challenges or changes in the company’s operation.

The net turnover of LLC “VIA” remained stable during the period from 2018 to 2021, when it increased from EUR 17.5 million to EUR 21.6 million. Comparing 2021 with 2022, the company’s net turnover increased by about EUR 2 million. It remained on a stable level, which indicated that the company maintained a balanced business volume. During the reporting year, its profit was fluctuating; however, a positive change took place from 2021 to 2022. Profit of the reporting year increased considerably in 2022, which could be the result of a more efficient operation or other factors of success. In 2020, the company had a loss of EUR 506 thousand. In the previous years, there were fluctuations of profit and loss, which could be influenced by different factors or change of the company’s strategy.

LLC “SC GRUPA” experienced losses in 2022 and 2021, which was a noticeable contrast to the profit growth in previous years – from 2018 to 2020. LLC “SC GRUPA” explained the caused losses in its management report with fast growing costs. On 24 February of the reporting year, Russia started its brutal invasion into Ukraine, which caused a fast and uncontrolled growth of costs for practically all

resources required for road building: bitumen, fuel, and gas. The growth of prices for these resources, in its turn, caused a fast growth of costs for transport and construction equipment services, mineral materials, etc. [13].

In the opinion of the authors, turnover and profit are two important indicators that allow making different conclusions about the financial situation and operation of construction companies. The authors reckon that a high turnover indicates that a company sells its products or services on the market successfully. A higher turnover can be evidence of the fact that a company efficiently manages its resources and enjoys demand in the industry, as well as high turnover can indicate that a company is competitive and occupies a stable position on the market. The profit level with regards to the turnover (profitability) is an important indicator of a company's efficiency. A high profitability indicator demonstrates a company's capability to obtain profit from its investments. A stable profit can indicate financial stability and sustainability of a company. A high level of profit allows a company to make investments, develop, and continue investing in the future.

In general, high turnover and profit indicate that a construction company is successful on the market, can ensure the demand for services or products and has financially stable activities. However, it is important to consider other indicators and factors as well, for example, the structure of expenses, liabilities, and the market situation, in order to make a more complete analysis of a company.

The conclusion of the authors that big road building companies operate with a small profit may encompass several important aspects and conclusions. The road building industry has high competition, which leads to low profit indicators. To retain their market position, big com-

panies can be forced to offer competitive prices that can limit the received profit. To increase the profit level, it might be required for companies to improve the efficiency and mechanisms of their operation, to reduce expenses. This may include a technological innovation, a more efficient project management, or optimisation of resources. Big road building companies can be sensitive to economic cycles; the authors conclude that profit can decrease during downturn periods and increase during boom periods.

Loss of profit from the operation of a road building company can be the result of different factors and conditions. A company can operate at a loss, as there is intense competition and a demand for low prices in the road building industry. If a company is forced to offer prices that do not cover its operational expenses, this can lead to a loss of profit. Losses can result from the incomplete or poor management of a project. Incorrect budget planning, inappropriate coordination of resources, or project delay can increase expenses and reduce profit. A company can also face a loss of profit in the event of an unforeseen increase in expenses for materials or labour force. Growing prices for raw materials or unforeseen labour force issues can influence the budget stability considerably. If a company manages the risks involved in certain construction projects inefficiently, it can cause additional costs and losses. Unforeseen circumstances, for example, idle standing or acts of nature, can increase project costs.

In its turn, a company that does not invest sufficient funds in new technologies and improvements can lose efficiency and competitiveness, which leads to a reduction in profit. If a company is unable to adjust to new regulatory requirements, amendments thereto, or industry innovations, it may incur additional expenses and experience a negative impact on its profits.

When studying big road building companies, the authors conclude that all of them have been engaged in road construction for over 20 years. Big road building companies usually have a sufficient and qualified labour force, which allows them to offer different road construction services. Large companies usually participate in several big road construction projects simultaneously and enter into extensive long-term agreements with state or municipal authorities. In the course of time, to increase their competitiveness, the companies continue developing their operation types and get engaged also in the production of materials, as well as follow modern technological tendencies. It has to be noted that the aforementioned road building companies are among the biggest employers in the construction industry in Latvia – SJSC “Latvijas autoceļu uzturētājs” occupies the first position, the road building firm “BINDERS” – the third, LLC “TILTS” – the fifth, JSC “A.C.B.” – the sixth, LLC “SC GRUPA” – the 35th and LLC “VIA” – the 42nd [13].

It can be concluded that SJCS “Latvijas autoceļu uzturētājs” dominates in the industry, as the company occupies the first position and, most probably, plays a significant role in road maintenance and promotion of the industry development in Latvia. This indicates that this company can be the main participant in the maintenance and development of the state road infrastructure. Large road building companies, for instance, LLC “BINDERS”, JSC “A.C.B.”, and LLC “TILTS”, might be ensuring a significant part of jobs in the construction industry. Thus, these companies not only can perform significant construction projects but also create jobs. Alongside with big companies, the list also contains smaller participants, for example, LLC “SC GRUPA” and LLC “VIA”, which occupy the 35th and the 42nd positions. It demonstrates that there

is competition in the construction industry and opportunities for small companies to participate in and perform construction projects. When reviewing the list of companies, it appears that the industry is active and diverse. It can indicate that there is a significant interest and demand in Latvia for road building services that stimulate competition and innovations. The road building industry in Latvia is a dynamic and important constituent of the national economy, where big companies dominate, but smaller participants are involved as well, creating jobs and promoting the development of the industry.

Road building is the national economy industry that influences every Latvian resident, as each of us uses roads to travel from one point to another, conducting important activities, for example, transportation of goods. A well-arranged infrastructure is a significant precondition for the attraction of investments and the growth of the national economy. Investment projects are conducted in places where convenient and high-quality roads are available. Although the total Latvian road network coverage is sufficient, the technical condition of the roads is not acceptable and does not meet the needs for safe and continuous transportation. In comparison with neighbouring countries, the current condition of Latvian motor roads is the worst. For example, in 2020, 15.60 % of blacktop roads were evaluated as ‘very bad’. The situation has improved in recent years, but not in a sufficient volume (see Table 3). Such a situation has remained on Latvian motor roads for several years, as every year insufficient financing is invested in the road building industry. This bad situation with the roads is also related to the big construction deficit in the road building industry, which constitutes EUR 2.94 billion.

One must think about the necessity to

develop qualitative result indicators that could be used to evaluate technical parameters and sustainability of materials used in construction [14].

The main problems of the network of motor roads are related to the road pavement and carrying capacity of bridges – roads were built in the 1960s and up to the 1980s in accordance with the standards valid at

that time, which set the maximum motor transport axle load of 10 t and the maximum gross vehicle weight of 36 t. Today the market needs and the European requirements set 11.5 t and 44 t, correspondingly. As a result, in some sections, there is the situation when quality of the motor roads cannot be ensured by applying simple repair methods.

Table 3. Technical Condition of Blacktop Roads Inspected by “Latvijas Valsts ceļi”

Technical Condition of Black Top Roads				
Technical Condition	2017	2018	2019	2020
Very good	14.80 %	16.60 %	21.50 %	25.60 %
Good	21.80 %	22.70 %	21.30 %	25.10 %
Satisfactory	20.60 %	21.40 %	20.20 %	18.60 %
Bad	19.20 %	17.60 %	18.30 %	15.10 %
Very bad	23.60 %	21.70 %	18.70 %	15.60 %
In total, %	100.00 %	100.00 %	100.00 %	100.0 %

These data demonstrate that the condition of roads has improved in recent years, as, comparing 2017 with 2020, the number of state roads whose technical condition is evaluated as ‘very good’ has increased by

10.80 %. The number of state roads whose technical condition is evaluated as ‘very bad’ has decreased by 8 %, when comparing 2017 with 2020.

Table 4. Technical Condition of Gravelled Roads Inspected by “Latvijas Valsts ceļi”

Technical Condition of Gravelled Roads				
Technical Condition	2017	2018	2019	2020
Good	9.20 %	6.20 %	6.20 %	6.70 %
Satisfactory	48.40 %	47.40 %	42.60 %	37.40 %
Bad	42.40 %	46.40 %	51.20 %	55.90 %
In total	100.00 %	100.00 %	100.00 %	100.00 %

More than half of the gravelled roads supervised by Latvijas Valsts ceļi are evaluated as being in a bad condition in 2020 (see Table 4). Whereas roads the condition of which is satisfactory form 37.40 % of the road network. When analysing the statistics, it can be concluded that Latvian gravelled roads are in a bad condition.

Local gravelled roads, which are mostly

within the territory of the country, are least loaded. In the recent decade, minimal investments have been allocated for these roads and, as a result, the condition of gravelled roads is improving very slowly. In 2022, only 18.5 % of regional gravelled roads and 8.9 % of local gravelled roads were in a good or very good technical condition. A lot of the local state roads do not perform

the function of state motor roads anymore and about 4 000 kilometres of roads should be transferred to municipalities [15]. It is also significant to ensure continuous and qualitative road maintenance, being quite a wide spectrum of activities, which includes different road operation processes with very specific functions and tasks [16].

The load of roads in Latvia is influenced by several factors, including:

1. density of population, economic activities;
2. economic factors, which encompass activities of merchants and different companies;
3. transport flow, which differs with account of both the road classification

and the usage of roads, either as local or international significance roads;

4. quality and accessibility of roads – the higher the road quality and accessibility, the bigger the traffic and, thus, also the load.
5. road infrastructure development – more attention is devoted to the road development, the higher the road load, attracting a bigger flow of transport.

When developing the road infrastructure, improvement, renovation, widening, and modernisation of the existing roads are set as the goal, providing a safe and efficient transport flow in the country.

4. COMPARISON OF THE ROAD BUILDING INDUSTRY IN THE BALTIC STATES

Latvia has been increasingly more compared with Lithuania and Estonia in different contexts, for example, with regards to differences in the road tax amount, compared with Lithuania, or introducing a beverage packaging deposit system as in Esto-

nia. However, the condition and financing of roads are also aspects to be considered when comparing the Baltic States. Latvia's results in this connection do not provide a favourable comparison with those of other Baltic States.



Fig. 1. Road quality in Europe: The best and the worst roads in Europe [17].

People were given the opportunity to evaluate from 1 (extremely bad – among the

worst in the world) to 7 (extremely good – among the best in the world).

Although the general tendency is observable (Eastern Europe has, on average, worse indicators than Western Europe and the Nordic countries), there are some deviations. For example, Belgium has much worse roads than its neighbours. This contrast is even stronger, since the Netherlands has the best road quality in Europe (6.4 points, compared to 4.4 of Belgium). Certainly, it also provokes jokes on the part of the Dutch with regards to their neighbours, saying that the difference between the roads in the Netherlands and Belgium can be not only seen, but also felt and heard (see Fig. 1) [17].

The European average indicator is 4.8 points, calculated using the mean value from evaluations of roads across all countries. This evaluation is based on the World Economic Forum's polling, where a scale of 1 to 7 was used. One on this scale means that the road condition is extremely bad among all roads in the world, but 7 means that the road condition is extremely good and is among the best roads in the world

[17]. Evaluation of the quality of Latvian roads is one of the lowest in Europe, being 3.6, which means that road quality in Latvia is considered poor, as the evaluation of Latvian roads lags the EU average by 1.2 points. In the context of the Baltic States, the situation is not much better, as also here Latvia gets the lowest evaluation from all Baltic States (see Fig. 1). Taking into account the fact that the length of state roads in Latvia is 20 020 km, in Lithuania 21 203 km and in Estonia 16 969 km (see Fig. 2), the road condition in Lithuania and Estonia is very close to the European average, in contrast to Latvia. The Estonian evaluation is 4.7, lagging behind the European average only by 0.1 points, which means that the state roads are evaluated as satisfactory. Whereas, Lithuania is evaluated with 4.8 points, which is the average indicator in Europe.

Thus, the authors conclude that it is clearly seen that the worst quality of roads in the Baltic States is exactly in Latvia.

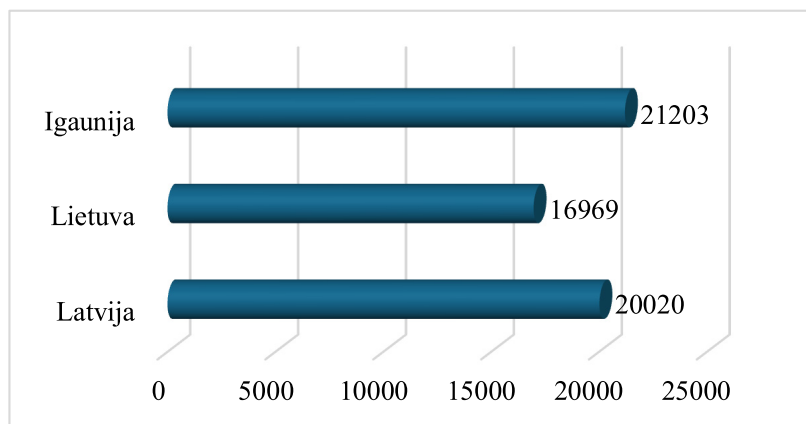


Fig. 2. Financing for state motor roads in the Baltic States in 2023 [18].

Comparing financing for state roads in the Baltic States, it can be concluded that in 2023, Estonia had the smallest financing, whereas Lithuania – the biggest. The state budget for Latvia was EUR 221 million,

which was by EUR 69 million more than in Estonia, but by EUR 143 million less than in Lithuania. The EU financing (CF, ERDF, etc.) for Lithuania was the highest – EUR 91 million, which was by EUR 35 million

more than for Estonia and by EUR 76 million more than for Latvia. An important factor to be mentioned is that in 2023, Latvia did not have the European infrastructure connection tools financing, for Estonia it was EUR 15.3 million and for Lithuania – EUR 55.3 million [18]. It can be concluded that differences in financing between the Baltic States indicates different priorities and challenges in the development of state roads. Every country must consider how to optimise its financial resources in order to ensure the efficient and sustainable development of the road infrastructure.

Comparing the 2022 budgets, it can be concluded that Estonia had the smallest financing, whereas Lithuania had the biggest also in 2022. The total Latvian financing for roads was EUR 313 million, in Estonia – EUR 228 million, and in Lithuania – EUR 582 million [2].

It is stated that road construction in Latvia is one of the most expensive in the Baltic States, but such a statement lacks a precise definition with regard to what road construction costs are compared – whether these are costs per kilometre, or design costs, or maintenance costs. Construction costs are hard to be compared, as every road is a unique structure with different composition, usage of materials, applied technologies and methods. These factors, as well as costs of materials and complex technologies, can influence construction costs considerably. Costs of materials in Latvia are higher than elsewhere in the Baltic States, and it is logical with account of

the limited natural resources and accessibility of construction materials in this country. As an example, dolomite rock can be mentioned, which is used for groundwork base and asphaltting. This rock is less durable in Latvia, comparing to Estonia and Lithuania, which means that it is practically not used in Latvia, especially in the construction of state roads, but rather for insignificant motor road projects. Whereas dolomite rock extracted in Estonia and Lithuania can be used wider, as it has good durability. Due to this reason, when repairing state motor roads in Latvia, it is required to import such materials from other countries, increasing transport costs and total costs of materials.

A similar situation is also with granite rock, which Latvian entrepreneurs obtain from Sweden, Norway and Lithuania, as such type of rock is not available in Latvia. This increases construction costs, as, in addition to costs of materials, transport costs must also be included. Whereas, Estonians obtain this material from Finland, as they also do not have it available.

However, when speaking about bitumen, which is used in the production of bituminous concrete, it is not manufactured in Latvia and, thus, needs to be imported, which increases the total costs of materials. It is also worth indicating that Estonia and Lithuania have plants where bitumen is produced for such usage.

Thus, the authors conclude that road construction in Latvia costs more than in other Baltic States, as Estonia and Lithuania have more resources available.

5. CONCLUSIONS

The road building industry is a significant branch of the Latvian national economy, which affects every resident, as roads are used for all purposes – from trav-

els from point A to point B to information exchange. A well-maintained infrastructure is an important precondition for attracting investments and promoting the growth of

the national economy. Investment projects are selected at places where qualitative roads are available. In general, the Latvian road network is spread sufficiently, but its current condition does not meet the requirements of safe and continuous traffic.

In Latvia, the road building industry is especially significant and growing, as, in order to promote the national economic growth, improve the life quality of residents and ensure that Latvian international motor roads comply with the standards of the European motor road network, it is required to maintain and develop the motor road infrastructure efficiently.

To achieve a positive progress in improving the Latvian road network, the State should take different measures; it is significant to manage efficiently the available financial resources and establish new opportunities for obtaining additional financing for motor road projects in Latvia,

follow the industry innovations, and find opportunities for attracting new specialists to the industry. Reforms are needed to ensure the sustainable development of the industry.

When investing in the road infrastructure development, new roads are constructed, existing ones are modernised, by implementing safety measures in road design, improvement of the construction standards, road lighting, etc. The infrastructure development also includes environment protection measures by using environmentally friendly materials and promoting the usage of sustainable transport solutions.

Overall, all measures implemented in road construction and its infrastructure development form a significant element in promoting the national economy and well-being of the population by ensuring a safe and efficient transport system.

REFERENCES

1. Upītis, M., Amoliņa, I., Geipele, I., & Zeltiņš, N. (2020). Measures to Achieve the Energy Efficiency Improvement Targets in the Multiapartment Residential Sector. *Latvian Journal of Physics and Technical Sciences*, 57(6), 40–52. DOI:10.2478/lpts-2020-0032
2. Latvijas Valsts ceļi. (2023). *Valsts autoceļu tīkla 2020. gada statistika*. [National Road Network Statistics 2020]. Available at: <https://lvceļi.lv/celu-tikls/buvnieciba-un-uzturesana/celu-klasifikacija/>
3. Lūce, I., & Amoliņa, I. (2019). Competence of local government building board in elimination of the consequences of arbitrary construction. In: IOP Conference Series: Materials Science and Engineering (vol. 660): 4th International Conference on Innovative Materials, Structures and Technologies (IMST 2019). 25–27 September 2019, Riga, Latvia. Bristol: IOP Publishing, Article number 012044. DOI:10.1088/1757-899X/660/1/012044
4. Latvijas Būvuzņēmēju apvienība. (2023). *Būvniecības nozares rādītāji*. Available at: <https://www.latvijasbuvnieki.lv/statistika/>
5. Cimbale, A., Amoliņa, I., Geipele, I., & Zeltiņš, N. (2023). Analysis and Implementation of Energy Efficiency Measures in Multi-Apartment buildings in Latvia. *Latvian Journal of Physics and Technical Sciences*, 60(5), 56–72. DOI:10.2478/lpts-2023-0031
6. Braunfelds, J., Senkāns, U., Šķēls, P., Poriņš, J., Haritonovs, V., Spolītis, S., & Bobrovs, V. (2023). Development of the strain measurement calibration technique for road pavement structural health monitoring applications using optical FBG sensors. In 2023 Photonics & Electromagnetics Research Symposium (PIERS 2023): Proceedings (pp. 1060–1065). 3–6 July 2023, Prague, Czech Republic. Piscataway: IEEE. DOI:10.1109/PIERS59004.2023.10221310

7. Puķīte, I., Zīra, M., & Geipele, I. (2019). Identification and monitoring of degraded real estate in the context of urban environmental analysis and development planning in the city of Riga. In The 4th International Conference on Innovative Materials, Structures and Technologies (IMST 2019): Book of Abstracts (pp. 70–70). 25–27 September 2019, Riga, Latvia.
8. Supreme Council. (1992). *On Motor Roads*. Reporter of the Supreme Council and Government of the Republic of Latvia. Available at: <https://likumi.lv/ta/id/65363-par-autoceliem>
9. Jeļisejevs, B. (2006). *Ceļu būves un ceļu uzturēšanas darbu organizācija un tehnoloģija*. [Organisation and Technology of Road Construction and Maintenance Work]. Textbook. Rīga: RTU izdevniecība.
10. Sippy, K. C., Sangita, S., Anuradha, S., & Gangopadhyay, S. (2010.) Recent Trends of the Emission Characteristics from the Road Construction Industry. *Environ. Sci. Pollut. Res. Int.*, 17 (9), 1493–501.
11. Awaad, S. Mansour, D., Mahdi, I., & Abdelrasheed, I. (2024). Impact of Material Supply Chain on the Productivity Optimization for the Construction of Roads Projects. *Nature Research*, 14 (1), 3294
12. Latvijas Valsts ceļi. (n.d.) *Aktuālo būvobjektu saraksts*. [List of Current Construction Sites]. Available at: <https://lvceli.lv/celutikls/buvnieciba-un-uzturesana/aktualo-buvobjektu-saraksts/>
13. Lursoft. (n.d.) Nozare pēc NACE koda [Sector by NACE Code]. Available at: <https://nace.lursoft.lv/42.1/celu-un-dzelzcelubuvnieciba?vr=3&old=0>
14. Geipele, I., Puķīte, I., & Kauškalē, L. (2016). Importance of business incubators for new business and its development in Latvia. In Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management (pp. 1199–1206). 8–10 March, 2016, Malaysia, Kuala Lumpur. [S.l.]: IEOM Society.
15. Latvijas Valsts ceļi. (2023). *Valsts asfaltēto ceļu stāvoklis ir labākais pēdējo 30 gadu laikā* [The Country's Asphalted Roads Are in the Best Condition for 30 Years]. Available at: <https://lvceli.lv/aktuali/valsts-asfalteto-celu-stavoklis-ir-labakais-pedejo-30-gadu-laika/>
16. Amoliņa, I., & Geipele, I. (2017). Different approaches to building management and maintenance meaning explanation. In: Procedia Engineering, (pp. 905–912). 26–27 May 2016, Lithuania, Vilnius. Germany: Elsevier. DOI:10.1016/j.proeng.2017.02.099
17. Cipan, V. (2022). *Road Quality in Europe: The Best and Worst Roads in Europe*. IOP Publishing Ltd. Available at: <https://viborc.com/road-quality-in-europe-the-best-and-worst-roads-in-europe/>
18. Autoceļu avīze. (Spring, 2023). *Kaimiņvalstīs krasas atšķirības finansējumā valsts autoceļiem*. [In Neighbouring Countries, Funding for National Roads Varies Dramatically.] Latvijas Valsts ceļi. Available at: <https://lvceli.lv/wp-content/uploads/2023/03/AA-pavasaris-2023-nonprint.pdf>