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REDUCING ROAD FREIGHT TRANSPORT CARBONISATION LEVEL AND PROBLEMS OF "GREEN FINANCING" BY COMMERCIAL BANKS IN LATVIA

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Abstract. In this article, the authors shall conduct a study of the impact of road freight transport on air pollution. The objective of the present study is twofold. Firstly, it seeks to reduce carbon emissions from road freight transport in Latvia. Secondly, it aims to encourage Latvian commercial banks to offer "green financing". In the course of the study, the following hypotheses were proposed by the authors: there is a correlation between the volume of investments in environmental protection and the EURIBOR interest rate; environmental pollution is dependent on the EURIBOR interest rate. The authors have demonstrated that 74% of the Latvian truck fleet has a high level of wear and tear, which shall lead to an increase in CO_2 air pollution. This could be a potential avenue for the "green financing" facilitated by commercial banks. However, the commercial banks have declined to provide financing for "green projects" due to the perceived instability of the regulatory framework and the associated political risks. Consequently, "green financing" has been classified within the "high risk" category, which, in turn, necessitates the implementation of higher interest rates. In the context of the instability of business activity in the field of road freight transport, the risk of non-repayment of borrowed funds is increased. The following methodologies were employed in conducting the study: firstly, an empirical approach was adopted in the form of a modified group discussion, with the accompanying literature study constituting the initial phase of triangulation as a study strategy. This has enabled the formulation of hypotheses. In the subsequent phase of the triangulation process, a quantitative preliminary study of statistical indicators has been conducted. The indicators encompass the volume of road freight transport, air pollution, the service life of the truck fleet, the volume of environmental financing and the EURIBOR interest rate. The primary objective of the quantitative preliminary and main study has been the empirical collection of reproducible data. The present study employs a partial least squares structural equation modelling (PLS-SEM) approach for the purpose of testing the hypotheses that have been proposed. The objective of this procedure has been to investigate cause-and-effect relationships.

Keywords: road freight transport, "green financing", commercial banks, financial risks, Latvia.

JEL Classification: G21, G32

1. Introduction

To successfully implement the Sustainable Development Goals (SDGs), the United Nations Environment Programme (UNEP) is working with countries, financial regulators and the financial sector to align financial systems with the 2030 Agenda for Sustainable Development. In order to achieve this, it will be necessary to direct financial flows in order to support the achievement of the SDGs. Financial markets lie at the heart of today's globalised economy, through which banks and investors allocate capital to various sectors. The capital allocated today will shape the ecosystems and also production and consumption patterns of tomorrow.

The main areas of current work on the green financing shall be the following:

– Support of public sector in favourable environment creation.

– Promoting public-private partnerships in the field of financing mechanisms such as "green bonds".

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– Growing the capacity of community enterprises in the field of microcredit (UN Environment Program).

In the European Union, as in other countries worldwide, the development of the "green economy" is ongoing. The military actions in Ukraine have resulted in an increase in the cost of traditional energy resources, which has, in turn, led to an acceleration in the development of green financing in EU countries. Nevertheless, extant barriers and issues are proving to be a significant hindrance to the resolution of the "green financing" issues. In this article, the authors analyse the problems in the "green financing" by commercial banks in Latvia, and also suggest ways to solve them.

Currently, one of the most pressing tasks for the whole world, and for the EU in particular, is to find alternative and additional "green financing", i.e., "green projects". The tasks and plans set out for countries around the world and the EU to transition to sustainable economic development models obviously do not coincide with the possibility of obtaining financing to implement all the established tasks. The necessary investments for implementing all the projects indicated for the G20 countries alone are estimated to be in the region of tens of trillions of dollars (Olevskis, 2000).

2. Literature Review

A large number of scientists have studied the problems associated with financing "green projects" worldwide. Noteworthy is the work of the McKinsey Global Institute, which has engaged with investments in global economic infrastructure in 2016, 2022 and 2023 (McKinsey Global Institute; Deloitte). Also notable are the contributions of Johannes Truby, Pradeep Philip and Bernhard Lorentz, who have addressed the challenges of financing environmentally friendly energy (Porfirjev, 2016), and Porfirjev Boris, who has examined the pace of development of the global "green economy" (Porfiryev, 2013; Della Croce, Kaminker, Stewart, 2011). Della Croce, C. Kaminker and F. Stewart, who examined the role of pension funds in financing green initiatives (Della Croce, Kaminker, Stewart, 2011); and G. Inderst, C. Kaminker and F. Stewart, who defined and measured green investments (Inderst, Kaminker, Stewart, 2012).

Concurrently, the extant literature has been constrained to the examination of legislative restrictions in the implementation of "green projects", in addition to the attraction of state and interstate financing for the implementation of said projects. In exceptional circumstances, the potential for financing through the attraction of private pension funds has been a subject of discussion. Concurrently, the extant research papers have paid insufficient attention to the possibilities of alternative financing through the involvement of commercial banks in this process. At this stage in the implementation of processes for developing financing for "green projects", these banks are preferring to adopt a wait-and-see position.

The EU has adopted the document "A Sustainable Europe by 2030", in which it sets ambitious goals for the implementation of environmental policy. These include the increase in CO_2 emissions by 2030 reaching no more than 1.5% compared to the post-industrial period, and by 2050, the formation of a climate-neutral society (European Commission). It is widely acknowledged that the transport industry exerts a substantial influence on global warming processes, with the extent of this influence being gauged by the degree of pollution and the level of carbonization (CO_2 emissions).

3. Results and Discussion

Latvia functions as a transportation and logistics nexus between the West and the East, providing strategic access to both the EU market and Central Asia (US department of sates). The transport industry exerts a substantial influence on the country's economy as a whole. The transport and logistics industry in Latvia constituted 7.0% of GDP in 2023 (European Commission Country Report Latvia 2023).

As illustrated in Figure 1, the authors have estimated the level of carbonisation in Latvia during the period from 2018 to 2021.

As demonstrated in Figure 1, the authors have presented the volume of CO_2 in the air, both from biomass and without biomass, in the transport industry. As evidenced by the data, during the period under study, there was a discernible downward trend in CO_2 emissions in Latvia. However, it is pertinent to note that during the pandemic, there was a concurrent decline in road transport shipments.

In consideration of the objective of the present study, the authors hereby propose to conduct an analysis of road freight transport in the period from 2018 to 2023, as illustrated in Figure 2 (Official statistics of Latvia).

As evidenced by the data, there has been a decline in the volume of road freight transport in Latvia during the period under study. In 2020, the repercussions of the pandemic resulted in a decrease of almost 14% in road freight transport in Latvia when compared to 2018. However, the minimum value of transportation was recorded in 2023, at 9146 million tons, representing a 21.2% decrease compared to 2018. It is evident that political factors, notably the military actions in Ukraine, have exerted a significant influence on the trade relations between the two countries.

In recent years, the adoption of national environmental protection programmes by states has prompted manufacturers of both passenger and

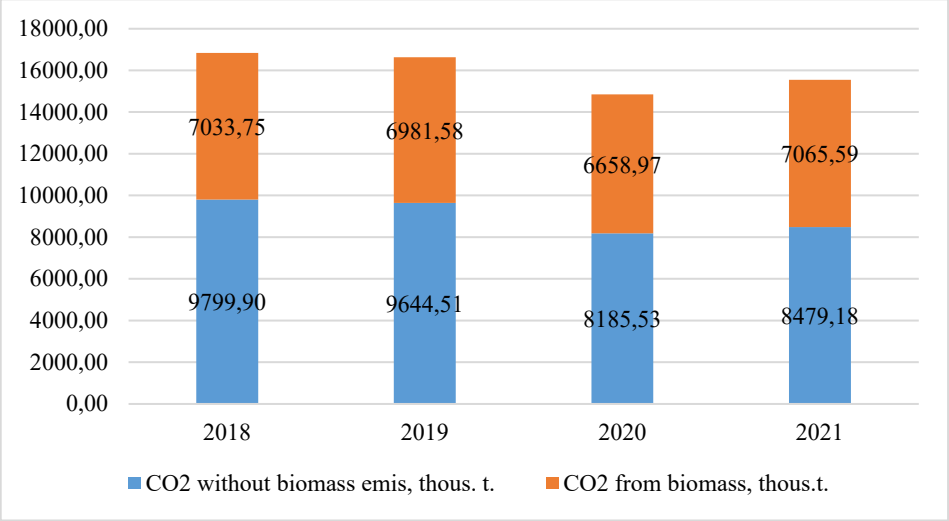

Figure 1. Air pollution in Latvia: CO_2 emissions with and without biomass, thousand tons

Source: developed by the authors

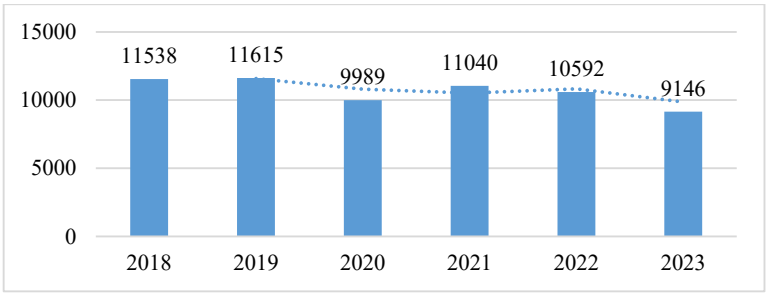

Figure 2. Analysis of road freight transport in Latvia, million tons

Source: developed by the authors

freight vehicles to introduce a new generation of vehicles to the market, either with an electric engine or with reduced CO_2 emissions. Consequently, the authors posit that conducting an analysis of the truck fleet is imperative to assess the environmental impact of Latvian motor transport.

So, according to the Road Traffic Safety Department in Latvia (RTSD), a service life of the majority of trucks registered in Latvia composes more than 11 years, up to 21 years, see Figure 3 (Road Traffic Safety Department in Latvia).

When the freight transport with a service life of more than 21 years is included in this number, it is evident that 74% of the freight transport is more than 11 years old. It is evident that there is considerable potential for commercial banks to provide financing for freight transport.

In the course of evaluating the banking system of Latvia, it is important to acknowledge the considerable free resources possessed by commercial banks on their balance sheets. These resources have the potential to be utilised for the financing of "green projects". The question therefore arises as to why commercial organisations behave in this manner. The following question must be posed: in what manner may commercial banks participate in the processes of financing and lending to so-called "green projects"? The authors of this article have undertaken the task of providing answers to these questions.

As the authors previously indicated, the UN Environment Programme (UNEP) and countries around the world have set themselves the ambitious goal of achieving zero greenhouse gas emissions by 2050, having frozen them at the 2030 mark. According to the Deloitte Research Centre, this will require annual investments of up to 7 trillion USD. At the same time, investments totalling slightly more than 2 trillion USD are currently being made (Deloitte). At this rate, the established goals will not be achieved within the specified time frame.

Following a survey conducted in 2020, the following challenges in the implementation of the "green financing" have been identified by International Finance Corporation, World Bank group:

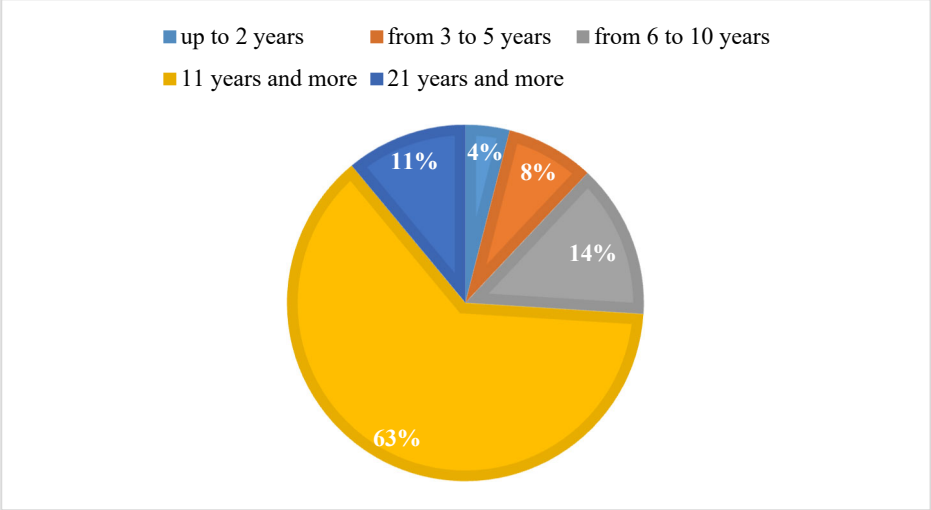

Figure 3. The number of trucks of Latvia in 2020, by a Service Life

Source: calculated by the authors

– Vulnerability to climate-related risks.
– Limited insurance coverage for climate-related losses.
– Bank-dominated financial sectors, shallow financial markets (International Finance Corporation).

The authors of the article in question are in broad agreement with the list of problematic issues that has been specified. It is proposed that the matter be considered in the context of the potential for "green financing" by commercial banks.

It is imperative to acknowledge that commercial banks are conservative institutions that meticulously evaluate the risks associated with the issuance of credit funds. The issue of lending has been a persistent concern for numerous EU Member States. Consequently, the President of the Bank of Latvia, Martins Kazaks, initiated a discourse on the inadequate financing of projects, including "green projects", by commercial banks in Latvia, in the immediate aftermath of the global Coronavirus pandemic. It has been acknowledged that competition within the banking sector is inadequate. Despite the capacity of commercial banks to lend and possess sufficient capital, there is excessive caution when it comes to loan issuance. It is evident that the banking sector has not exploited its lending potential (Bankas negrīb dot kredītus).

It is evident that there has been an annual escalation in investment directed towards ambient air and climate in Latvia. From 2018 to 2023, the investment increased from 9503.5 million EUR to 34853.7 million EUR, representing a substantial surge of 366% (!) (Official statistics of Latvia).

Attracting foreign investment in Latvia's ecology is also complicated. The investment climate in Latvia is assessed by foreign investors, who have allocated the lowest possible score of 1.9. The assessment of the overall investment climate in Latvia by foreign investors has reached its lowest rating of 1.9 points out of 5. A comparative analysis reveals a decline of 0.4 points in the rating when viewed in contrast to the 2022 figures. This finding is supported by the results of the "Sentiment Index 2023" research conducted by the foreign investors (Foreign investors council in Latvia).

Yanis Brazovsky, the representative of the Finance Latvia Association, has emphasised that a mere 25% of enterprises in Latvia may be eligible for loans. It has been observed that in order to facilitate the provision of more active loans, a consensus on risk sharing is imperative. The risk of financial losses is to be shared by banks, entrepreneurs and the state, respectively (Investgazeta).

Thus, having conducted the analysis, the authors shall propose to summarise the experts' conclusions:

1) The commercial banks provide weak financing, and not only for the "green" economic projects.

2) Part of the risk of the financial losses should be borne by the state. Then the commercial banks may be encouraged to start financing more risky projects, including the "green" ones.

3) It shall be impossible to force the commercial banks to lend.

Consequently, Latvian commercial banks tend to underfinance "green projects" due to their perception of these projects as high-risk and low-yield. Alternatively, they could utilise their extant resources to issue the loans, thereby generating profit.

It is imperative to undertake a thorough analysis to ascertain the reasons why "green projects" are perceived as high-risk and low-return propositions for financial institutions.

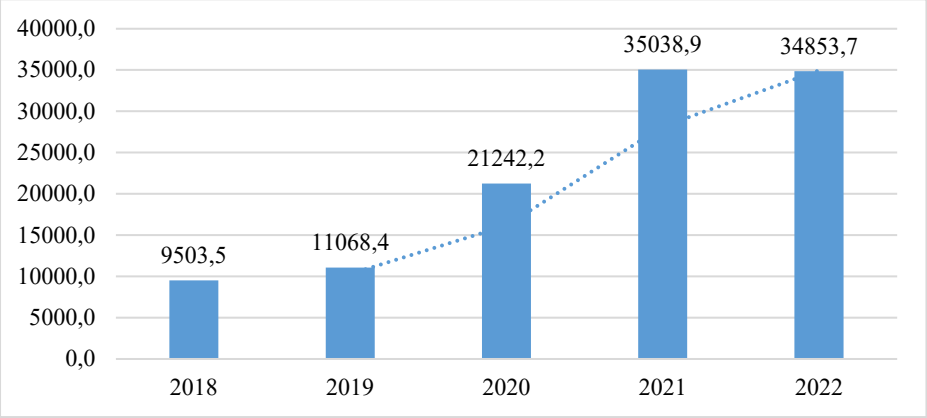

Figure 4. Protection of ambient air and climate, million EUR

Source: calculated by the authors

In order to provide a satisfactory answer to this question, it is first necessary to understand why "green loans" so often fall into the category of "high-risk projects" in the context of commercial bank projects.

As experts have noted, the situation in many countries where there is a lack of clear definitions of "green financing" and rules for market participants still scares off potential investors (G20 Green Finance Study Group). Without clarity on these issues, it will be impossible to adequately manage the risks of "green investments", effectively monitor project implementation, ensure proper control, accounting and reporting, and competently assess the socio-economic efficiency of programme and project implementation (Olevskis, 2000).

The statements made by the scientists are supported by clear justifications. In Latvia, for instance, the introduction and generation of "green electricity" is accompanied by constant changes in legislation and tariffs at which the generated electricity is purchased from its producers. In the event of financial resources being allocated to the procurement of new trucks, a concomitant level of risk must be acknowledged. The war in Ukraine has precipitated a decline in freight transportation within the nation, exceeding 21% (Fig. 2). This has consequently engendered a diminution in the profits of entrepreneurs, difficulties in the repayment of loans, and, in the final analysis, an escalation in the risk profile of these investments (Olevskis, 2000).

In the subsequent stage of the research, it will be necessary to analyse which loan interest rate would be acceptable to commercial banks for financing high-risk projects, including those designated as "green investments". In order to undertake this investigation, it is first necessary to ascertain the contemporary cost of money for commercial banks.

In its turn, 6-month LIBOR rate in 2023-2024 was almost 6% (LIBOR Rates 6 m).

With the banks making the most moderate claims to cover possible losses on risky loans, the rate at which financing will be available from commercial banks for 'green projects' in Europe will be at least EURIBOR+3%, while in America it will be LIBOR+3%. Therefore, the interest rate on a loan in Europe will be 7% per annum, and 9% in America. This shall be the rate without additional expenses for reviewing the loan, insurance, fees for reserving money, fees for issuing the loan, etc. The inclusion of all these expenses will result in the real cost of the loan in Europe increasing to 8.5%, and in America exceeding 10%.

According to experts in the field of lending for "green projects", the profitability of such projects has been found to fluctuate around 6-9 per cent per annum, with the payback period for these projects ranging from 8 to 20 years (Financing Green Energy Projects: Long-Term Loans). It is evident that, given the substantial profitability, it will be unfeasible to obtain bank financing, as the cost of money for commercial banks is approximately analogous at present (EURIBOR Rates 6 m; LIBOR Rates 6 m). It is important to note that there is a current trend towards lower EURIBOR and LIBOR rates. It is conceivable that within a year or a year and a half, when interest rates fall below 3%, banks may become more inclined to lend to "green projects".

It is therefore imperative that the transport industry of Latvia accesses "green investment" or "green financing" for its vehicle fleet in order to achieve the established goals of reducing the level of carbonisation. It is imperative for transport and logistics companies to consider financing more modern trucks that emit minimal or zero CO_2 emissions. However, in the prevailing circumstances, such "green projects" are likely to carry a significant degree of risk for commercial banks in Latvia. In order to identify the dependence between these indicators, the authors shall propose

an approach based on a partial least square's structural equation modelling (PLS-SEM).

4. Research Methodology

In order to assess the empirical relationship between latent variables, the authors utilise the PLS-SEM method. This method was proposed by (Wold, 1982). The evaluation method is founded upon the consistent utilisation of orthogonalisation and PLS-regression. According to several scientists (Becker, Jan-Michael, Arun Rai etc., 2013; Hair, Joe F., Marko Sarstedt, 2012; Pages, Jérôme, and Michel Tenenhaus, 2001), this method boasts several advantages, including its ability to accommodate conditions related to the object under study, its capacity to handle volumes, its correlation with other methods, and its adherence to normal distribution. This method involves the processing of a limited amount of data, thereby enhancing statistical power. PLS-SEM employs empirical data to evaluate complex theoretical models (Marko Sarstedt, Christian M. Ringle, etc. 2014), thereby underscoring its capacity to provide latent variable scores as specific linear combinations of their manifestations.

Schubring and others (International Finance Corporation) demonstrate that the efficacy of PLS stems from its capacity to estimate the parameters of complex models without the numerous distributional and other limitations encountered in traditional econometric models. PLS-SEM has become a prevalent statistical method within numerous scientific domains (Becker, Jan-Michael, Arun Rai etc., 2013; Hair, Joe F., Marko Sarstedt, 2012).

In the first procedure, latent variables are determined by the manifest indicators:

$$Yi = \sum_{h=1}^{p} \left(w_{jh} * x_{jh} \right) \quad (1)$$

The following equation illustrates a measurement model using composite indicators, where Y is a linear combination of indicators xj, each of which has a weight of wj.

In the second stage, each latent variable was estimated by other latent variables using the following formula:

$$Z(j) = \sum_{i=j}^{p} \left(e_{ij} * yi \right) \quad (2)$$

Where $e_{ij} = sign\ cor\ (y_i y_j)$ $w_{yh} = cor\ (Z_j, xj_h)$.

Subsequently, the aforementioned steps are repeated until the algorithm converges. The coefficients of the regression have now been determined.

The structural model was then assessed as reliable and valid. An R^2 estimate is required for each endogenous latent variable. Pages J. and Tenenhaus M. (Road Traffic Safety Department in Latvia) define R^2 as:

$$R^2 = \sum_{k=0}^{n} aj * correl(Yj\,xj) \quad (3)$$

A higher indicator of R^2 indicates a higher degree of prediction accuracy (Becker, Jan-Michael, Arun Rai etc., 2013; Hair, Joe F., Marko Sarstedt, 2012).

To achieve the goal, the authors put forward the following hypotheses:

H1: The volume of investments in environmental protection is related to the EURIBOR interest rate.

H2: Environmental pollution depends on the EURIBOR interest rate.

The calculation data is presented in table's № 2 – № 4.

Table 2

Assessment results of the measurement model in Latvia

Latent variable	Indicator	Loading	CR	AVE
Protection of climate	Protection of ambient air and climate, mln Eur	0.483	0.784	0.697
EURIBOR	EURIBOR, %	0.534	0.056	0.561
Air pollution	Air pollution, CO2 thous. ton	0.546	0.913	0.723

The assessment of reliability is conducted through the utilisation of Composite Reliability (CR). The AVE is calculated as the mean of the squared loadings of each indicator associated with a construct. Statistically, convergent validity is established when the Average Variance Extracted (AVE) is >0.50. In the present case, all indicators exceed 0.5.

Table 3

Discriminant validity assessment

Fornell-Larcker Criterion			
	Protection of climate	EURIBOR	Air pollution
Protection of climate	0.318		
EURIBOR	0.423	1.000	0.679
Air pollution	0.891	0.597	1.000
Heterotrait-Monotrait Ratio (HTMT)			
	Protection of climate	EURIBOR	
Protection of climate	0.301		
EURIBOR	0.396	1.000	0.782
Air pollution	0.402	0.687	1.000

The structural model results are presented in Table 3. In accordance with the Fronell-Larcker criterion, the square root of the mean variance extracted by a construct must exceed the correlation between the construct and any other construct. It is suggested by Pages et al. (2001) that the acceptable level of discriminant validity of the heterotrait-monotrait ratio of correlations (HTMT) is less than 0.90.

Table 4
Structural relationships and hypotheses testing

Hypotheses	Path coeff.	Stan. Error	T-Statitic	P-Value	Result
Protection of climate and EURIBOR	0.212	0.0995	3.806	0.003	Supported (H1)
Air pollution and EURIBOR	0.248	0.0995	3.254	0.002	Supported (H2)

As demonstrated in Table 4, all path coefficients pertaining to the inner relations are presented as unstandardised. Specifically, the hypothesis that EURIBOR exerts a positive influence on climate protection (green investment) is substantiated ($\beta = 0.212$, $p < 0.01$). Conversely, the study established a positive correlation between EURIBOR and air pollution, which was statistically significant at the 1% level.

The increase in EURIBOR has also been demonstrated to be a contributing factor to the rise in air pollution (CO_2). The hypotheses proposed by the authors for H2 pertain to the positive impact of device usage on e-waste ($\beta = 0.248$, $p<0.01$).

5. Conclusions

Basing on the conducted research, the authors of the article shall come to the following conclusions:

1) During the period under scrutiny, there was a significant decline in road transport in Latvia, particularly in the aftermath of the pandemic and the military actions in Ukraine. This decline was marked by a 21% decrease in volume in 2023 compared to 2018.

2) Concurrently, the level of carbonation from motor vehicles has been declining.

3) The Latvian road freight transport sector is dominated by an ageing fleet of vehicles, with 63% being 11–21 years old and 11% being over 21 years old. The car transport industry will require either a fleet of new cars or “green financing”.

4) The "green financing" shall be a high-risk business project, since the legislative framework in Latvia which ensures the economic development of the "green financing" is poorly developed and constantly changing.

5) The profitability of such "green projects", estimated at between 6-9% per annum, is not commensurate with the business model of commercial banks. Consequently, these projects cannot be financed without state support.

6) The state should bear part of the risk of financial losses. This would encourage commercial banks to start financing riskier projects, including green ones.

7) The authors' calculations, based on the approach of the partial least square's structural equation modelling (PLS-SEM), have proven the hypotheses put forward by the authors: the volume of CO_2 in the transport industry shall be affected by the EURIBOR interest rate, since the volume of investments in the environment also depends on the EURIBOR level. It is evident that a comprehensive approach to the sustainable development of national economies is imperative. The utilisation of "green finance" is expected to gain greater traction in a more stable economic environment, as evidenced by the EURIBOR rate on the EU market.

Basing on the obtained conclusions, the authors of the study shall make the following suggestions:

1) The EU countries, in common with all other countries worldwide, should develop common legislation that will take into account the interests of all stakeholders in the "green finance" sector. This is essential if they are to be able to develop the "green economy" and "green finance" in a sustainable manner. It is imperative to establish comprehensive regulatory frameworks that facilitate the effective implementation of "green finance", ensuring that provisions are consistently comprehensible and enduring, thereby fostering long-term collaboration.

2) A clear and understandable regulatory framework would enable commercial banks to develop a reliable long-term "green finance" business model focused on a fixed interest rate that is not tied to EURIBOR and/or LIBOR.

It is only in such circumstances that entrepreneurs will be in a position to access "green finance" and to repay loans issued for the purpose of updating vehicle fleets, with the result that air pollution will be reduced. Concurrently, Latvian commercial banks will have the capacity to transition these loans from the category of high risk to that of low risk. This will enable countries to fulfil their commitments under SDG 17 and contribute to the sustainable development of the Earth.

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