

Financial Support of Passenger Transportation in the Regional Road Transport System of Ukraine

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Abstract The article considers the forming resource elements of financial support of passenger transportation in the regional road transport system of the state, taking into account the impact on their structure of interdependent basic parameters of financial flows of public-private partnership. A methodological approach to assessing the formative resource elements of financial support for passenger transport in the region, which is based on the concept of developing the financial potential of the road transport industry, which determines the interaction of various factors under the general financial mechanism and aims at ensuring target parameters of profitable activities is developed. The mechanism of redistribution of own and credit resources between separate objects of the regional road transport system is substantiated, as it is a vector of integration direction of movement of the financial streams arising between the road transport enterprises in the sphere of passenger transportations. Changes in the basic parameters of financial flows of road transport enterprises in the cycle of financial support of passenger traffic in the region have been formalized. The analysis of the species structure of the road transport system and the volume of passenger turnover of Ukraine is carried out. The conditions of redistribution of financial resources by the State Road Fund of Ukraine between the regions and the share of implemented public-private partnership projects in the field of road transport of the country are determined. The scenario of the optimal market value of road transport

enterprises in the cycle of financial support of passenger transport of the region is offered.

Keywords Transport, Public Transport, Passenger Transportation, Road Transport Infrastructure, Financial Support, Investments, Public-Private Partnership

1. Introduction

The completeness of the growth rate of the country's financial potential is due to the development of transport infrastructure, the effectiveness of which depends on the successful functioning of the financial system of the regions, which, in turn, is closely linked to the management of financial resources of passenger transport companies. However, the inefficiency of the latter is largely a prerequisite for unstable financial security of the regions of Ukraine.

During the movement of financial flows between the transport industries, financial institutions and the state is the distribution and redistribution of revenues generated in decentralized funds, the irrational use of which affects the state of the regional economy as a whole. At the same time, formative sources of mobilization and use of financial resources, provided financial support for passenger transport are one of the important components

of transport development in regions where the problem of optimal combination of self-financing with state financial regulators remains relevant. In addition, signs of unstable development of the transport system in the field of passenger transport are caused by the problems related to the lack of: an effective mechanism for investing in technical re-equipment and modernization of vehicles and the gradual closure of unprofitable but socially necessary bus routes; the state system of compensation to carriers for expenses related to the transportation of privileged categories of passengers; a harmonized system of legal acts and a financial mechanism adapted to modern conditions. In addition, the development of public passenger transport in developing regions is due to: large unregulated sector of illegal transportation, inadequate quality and safety of transportation, social protection of staff, low availability of transport infrastructure in rural areas, for people with disabilities and limited mobility, inefficient toll collection system and significant shadow cash flow, significant financial burden on transport companies associated with the implementation of socially significant transportation, low level of funding for new transport technologies.

Unsustainable funding frameworks, coupled with a lack of government subsidies following the economic crisis, have put significant stress on the economic and financial sustainability of the country's public transport system. Scientists are also looking at issues related to the ideal balance of private contributions and public assistance in relation to the cost of services, and how much each of these categories should increase over time. Therefore, the objective of our study is the implementation of a methodological approach and its practical application in the implementation of formative resource elements of financial support for passenger transport in the regional road transport system, given the impact on their structure of interdependent basic parameters of financial flows of public-private partnerships.

2. Literature Review

A significant contribution to solving issues related to the transport economy, the development of the transport sector with an emphasis on infrastructure, financial aspects in the context of transformational changes in the financial and economic environment, environmental issues that directly affect the development of the transport industry was made by V. Balin [1; 2], N. Bezbakh and V. Brahinskyi [3], V. Boiko and Z. P. Dvulit [4], L. Bychikova [5], K. Davtian [6], D. Dmytryk [7], O. Dymchenko [8], D. Ilchenko [9], N. Ivanova and T. Hanieieva [10], O. Zakharova [11], V. Zhavoronkov [12], O. Zhelezniak and L. Oleshchenko [13]. Among the world's leading scientists who reveal modern aspects of the development of the road transport industry, it is worth noting such scientists as: M. Forster [14], K. Ingram [15], B. Kerner [16, 17], W. Laurance, G. Clements and S.

Sloan [18], P. Ovchar and S. Holubka [19-21], S. M. Shkarlet, I. O. Khomenko and V. V. Kontseva [22], C. Winston [23]. At the same time, highly appreciating the results of research, it should be noted that research on the development of financial support for passenger transport in the road transport sector and its structure at the meso level is insufficient [24; 25].

It should be noted that the transport policy and financial support of passenger transport in the EU is based on the following principles: mandatory conclusion of public service contracts with preliminary definition of financial parameters (amount and distribution of costs, revenue collection format, profitability, procedure, terms and conditions of compensation payments, their size, etc.); transparency of contracts and fair competition; compensation or exclusive rights in exchange for the performance of public service obligations; economic feasibility and publicity of compensation payments. In most EU Member States, passenger transport is funded from generated revenue which include direct and indirect taxes. The main problem of this form of financing is that there is considerable competition between the requirements for subsidies from public funds. On the other hand, Germany has increased the quality of its public transport service, increasing number of passengers and performance while reducing costs and need for subsidies. In Spain several Autonomous Communities contribute to the financing of public urban transport. All these countries have a stable regulatory framework that provides binding rules to the different administrative stakeholders for meeting measurable medium and long-term goals. At the same time, the scale and complexity of the transformation of the financial support of passenger transportation in the regional transport system of developing countries requires modernization and strategy in the integrated and dynamic financial system of the state; the latter, in the context of financial decentralization, should be aimed at improving the efficiency of budgetary, investment and credit mechanisms aimed at managing financial flows and increasing the financial resources of transport infrastructure in order to form an inclusive economy in interregional financial imbalances.

2.1 Hypothesis

During past few years, conditions in which passenger transportation is operating have change. Distribution of fund sources tilted towards self-sustaining. The needs of public subsidies (understood as costs that are not covered by fee revenue) at operating companies are subsidized by town hall budgets lay strain on to regional governments. In turn, town halls receive a modest amount of aid from the state (between 10% and 40%).

As noted by researchers in the area, the current legislation does not encourage or reward efficiency or solutions to reduce the needs of public subsidies. While there is agreement regarding the fact that the current model must be reformulated, empirical studies do not

provide enough information. Thus, we present the following question:

Q: Could basic parameters of financial flows and life cycle of individual resource elements of financial support be determined?

The goal of this research question is to identify the factors that influence public transport financing needs and their relationship to the different criteria identified in the literature. In addition, we aim to identify any existing correlations between these variables and public transportation service financing needs.

3. Materials and Methods

Financial support of passenger transportation in the regional road transport system is a complex, multifunctional and multistructural composition of forming resource elements of macro-, meso- and local level, regulated by economic, social, environmental policy and public financial instruments [26]. The methodological approach to assessing the formative resource elements of financial support for passenger transport in the region is based on the concept of developing the financial potential of the transport industry, which determines the interaction of various factors subordinated to the general financial mechanism and aimed at ensuring target parameters of profitable activities [27; 28]. At the same time, the dynamism of the financial environment usually causes a change in financing conditions and the choice of financial flows in the regional economy, which provide long-term financing of small and medium-sized businesses based on existing and potential sources of financial resources. Therefore, the compositional structure of the financial support of the road transport system should provide optimal financing and lending criteria in order to update the material and technical base of road transport enterprises and increase the financial potential [29; 30].

The structural elements of financial security form an internal harmony of redistribution of own and credit resources between individual objects of the regional road transport system, as it is a vector of integration direction of financial flows arising between road transport enterprises in the field of passenger transport [31; 32]. This proves the need to direct the search for the interdependence of tools and methods of managing these

flows between banking institutions, investors in the context of public-private partnership. At the same time, financial flows are the object of formation of resource elements of financial support at all levels of their distribution in the road transport system of passenger transport entities to establish effective links at the regional and local levels [33]. It should be emphasized that the presence of close links between the financial flows of individual transport companies at the local level and financial flows at the regional level, complement each other, ensure the development of basic parameters of financial flows. Thus, at the regional level, effective tools for monitoring, control, analysis and forecasting of financial flows, allow state regulation of certain activities of road transport enterprises in the field of passenger transport, determine the development of economic, environmental and transport policies of the regions, set strategic guidelines of road transport system in the state. It should be noted that the same approaches are valid for the local level, i.e., allow trucking companies to operate effectively in harsh external and internal environments [34; 35].

The system interrelation of the matrix of financial flows of the road transport system reflects the flow of financial resources from the banking sector to the road transport industry, as well as changes in the forms of financing investment projects, through the synchronization of financial flows [3]. This approach is quite effective, as it clearly demonstrates the redistribution of resource elements of financial support between individual groups of enterprises engaged in passenger transport at the regional and local levels, identifying changes in economic orientations of entities in public-private partnerships [36; 37]. Table 1 shows the factors-changes of the basic parameters of financial flows, which change under the influence of the parameters of their movement in the regional and local space of financial support of passenger traffic. It should be noted that the scale of financial flows should correspond to the scale of financial support for passenger transport, its spatial branching in the regional road transport system and the level of diversification of the development of road transport enterprises. However, the outpacing pace of their movement can lead to imbalances and destabilization of resource elements of financial security.

Table 1. Dependence of the directions of change of financial flows basic parameters on change of parameters of their movement

Parameters of financial flows movement		The direction of change of financial flows basic parameters				
The direction of change	Amount	The direction of change	Amount	The direction of change	Amount	The direction of change
Parameter name	↑	↑	↑	↑↓	↑↓	↑
Scale	↑	↑	↑	↑	↑	↑
The level of integrity	↑	↑	↑	↑	↑	↑
The level of transparency	↑	↑	↑	↑	↑	↑
The level of flexibility	↑	↑	↑	↑	↑	↑
The level of openness	↑	↑↓	↑↓	↑↓	↑↓	↑
The level of intensity	↑	↓	↓	↓	↓	↓

At the same time, the change in the scale of financial support for passenger traffic through the movement of financial flows should correspond to the growth of the market value of the trucking company as an object of investment. The basic parameters of financial flows should change at an appropriate rate. The change of these parameters should correspond to both the cycle of financial support of passenger transportation at the local level and the cycle of strategic direction of financial flows in the road transport system of the region. Otherwise, there is an imbalance in the number of financial resources that are necessary for the effective functioning of the transport industry as a whole. Forecasting events (i.e., changes in the volume of passenger traffic that affect the scale of financial flows) at the regional level to achieve the projected value of the financial security indicator, is consistent with the criterion of optimal financing FEI [38] (financing efficiency index), which in our opinion, is expedient to consider as an indicator of efficiency of financing of the transport enterprises providing passenger transportations at local and regional level [38] (Eq. 1):

$$\left\{ \begin{aligned} FEI &= \frac{\sum_{i=1}^n \sum_{j=1}^m x_{ij} \times d_j}{\sum_{i=1}^n \sum_{j=0}^m (f(x_{ij}) \times d_j + \gamma(x_{ij}) \times \lambda(x_{ij}) \times d_j + x'_{ij} \times d_j)} \rightarrow \max \\ \sum_{i=1}^n x_{ij} &= FR_j \\ \sum_{j=0}^m x_{ij} FV_i & \end{aligned} \right.$$

where: *FEI* – financial security indicator; *x_{ij}* – the amount of financial resources raised from the *i*-th source in the *j*-th period of time, monetary units; *f(x_{ij})_j* – the amount of direct payments for the use of financial resources attracted from the *i*-th source, in the *j*-th period of time, monetary units; *y(x_{ij})_j* – the sum of other payments related to the attraction of financial resources from the *i*-th source, the *j*-th period of time, the amount of which depends on the value of the financial resources involved, monetary units; *λ_{ij}* – the amount of other payments related to the attraction of financial resources from the *i*-th source, in the *j*-th period of time, the amount of which does not depend on the value of the financial resources involved, monetary units; *x'_{ij}* – the amount of repayment of borrowed financial resources raised from the *i*-th source, *j*-th period of time, monetary units; *d_j* – discount rate for the *j*-th period of time; *FR_j* – the need for financial resources in the *j*-th period of time, monetary units; *FV_i* – possible amount of financial resources from the *i*-th source, monetary units.

The formalized form of dependence of directions of basic parameters change of financial flows on change of parameters of their movement, considering forming resource elements of financial maintenance of passenger transportations is given in Table 2.

Table 2. Formalization of changes in basic financial parameters of financial flows of road transport enterprises in the cycle of financial support of passenger traffic in the region

The cycle of financial transactions	Basic parameters of financial flows				
	Amount	Direction	Speed	Regularity	Sources of support
Absence	Nominal is zero. Real – loss of possible income	Unspecified	Is zero	Is zero	Missing
Creation	They fluctuate with in signify limits	Incoming and outgoing, which are determined by the areas of investment	Increasing	Unregular	The number of available sources is limited but increasing
Exploitation	Stable: high; low	Incoming (income / receipts of financial resources) and outgoing (expenses / repayment of financial liabilities)	Stable	Regular	The number of available sources varies widely
Liquidation	Steadily decreasing	Incoming (residual income, liquidation value of activity) and out coming (servicing of liquidation operations)	Decreasing	Unregular	The number of available sources is rapidly declining

While maintaining the optimal combination of sources and methods of financing, it is very important to control changes in the market value of the transport industry, which are the main carriers of the population from one region to another. This is one of the main and difficult tasks in the field of attracting financial resources. It should be noted that when financing the economic growth of the entity, it is important to use the typical relationship between the parameters of financial security and the market value of the enterprise (Fig. 1).

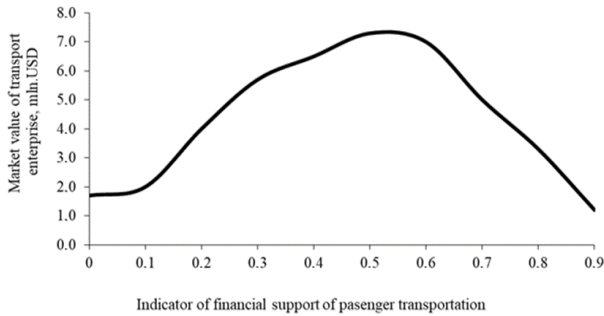


Figure 1. Dependence of the market value of the road transport enterprise on the parameters of financial support of passenger transportation

The increase in the market value of the road transport enterprise is due to external financing. However, having reached the maximum value, the formative parameters of financial security begin to decline due to the risk of bankruptcy of road transport enterprises, increase in the required dividend payments, increase in interest rates for the use of credit resources. When solving the problem of economic growth of road transport enterprises through investment projects, one should take into account various possible scenarios of sources of financing, which are realized through the synchronicity of financial flows and affect the market value of entities [39]. The cost of funding sources is calculated as a percentage according to the formula [39] (Eq. 2):

$$V_c = D_d S_d + D_a S_a \quad (2)$$

where: V_c – the cost of funding sources; D_d – the share of debt in total financial security; S_d – the value of debt obligations; D_a – the share of equity in financial security; S_a – cost of equity. The value of debt obligations (in shares) is calculated by the formula [39] (Eq. 3):

$$S_d = \frac{P}{100} - \frac{N}{100} \frac{R_f + 3}{100} \quad (3)$$

where: P – interest rate on the loan, %; N – income tax rate, %; R_f – interest rate of Nation bank of Ukraine refinancing taking into account tax benefits, %.

Along with the increase in the value of the road transport enterprise there is a decrease in the cost of borrowed funds and an increase in the cost of own resources. At the same time, the value $D_d S_d$ is minimized to the level of the most liquid financial resources in the

structure of own working capital, and the value $D_a S_a$ is maximized to the required share of net profit for self-financing, taking into account the payment of high dividends (higher than high deposit rates of banks). Fig. 1 shows $\max \uparrow$ the level of market value of the road transport enterprise, provided that the loan sources reach $\min \downarrow$ the level of excess in relation to own sources of financing. Further increase in the resource parameters of financial security leads to a disproportion between own and borrowed sources, reducing the financial stability of the enterprise, increasing the risk of financing [39].

The cost of funding sources may reflect the inequality between external sources and equity, then it is necessary to estimate the total weighted average cost. However, it should be borne in mind that the issuance of too many shares is impossible due to limited assets of the enterprise or unprofitable due to competition in the financial market at the risk of losing control over the payment of dividends and other factors [40]. Therefore, when attracting resources for financing and economic growth of the road transport enterprise, it is necessary to choose the option that realizes the minimum cost of borrowed funds and the maximum cost of equity [39] (Eq. 4):

$$V_c = \text{opt} V_{ci} = (\min(D_d S_d) + \max(D_a S_a))i, \quad (4)$$

where: V_{ci} – the i -th variant of formation of sources of financing of the enterprise.

Restrictions on the most profitable sources of financing can be an obstacle to achieving the minimum cost of borrowed funds. A project is profitable if its profitability exceeds the average optimal cost of financing the enterprise, otherwise – a project that is profitable, but below-average profitability, may adversely affect the increase in total debt of the enterprise, reducing its financial stability. Thus, the optimal structure of financial support for passenger transport in the road transport system and the ratio of internal and external financing methods should be determined by the basic parameters of financial flows that form the maximum market value of the enterprise [41]. For an enterprise with a stable financial flow, significant income and market assets, the share of debt financing may be high in the total amount of financial security. Conversely, an enterprise with an unstable financial flow, specific assets, should use a conservative policy regarding the share of debt financing, ensuring the dominance of its own sources and domestic financing.

The proposed methodological approaches to the formation of external sources of financing of road transport enterprises in the field of passenger transport are carried out in stages. At the first stage, the need for funding in the whole transport sector of the region is calculated. The second stage determines the amount of credit resources to cover the need for fixed and tangible current assets. You can use formula (5) [41]:

$$A_p = optA_p = (\max R_{tca}^{nca} - \max n R_b^{tca} - \max o wn R_b^{tca} - \max o wn R_b^{nca} - \max R_{profit}^{tca} - \max R_{profit}^{nca}) + P_{reduction} \tag{5}$$

where, $A_p = optA_p$ – the required amount of loans involved; $\max R_{tca}^{nca}$ – the maximum need for lending of fixed assets per year; $\max R_{tca}^{tca}$ – the maximum need for lending for tangible current assets per year; $\max o wn R_b^{nca}$ – the maximum need for fixed assets at the beginning of the period; $\max o wn R_b^{tca}$ – the maximum need for tangible current assets at the beginning of the year; $\max R_{profit}^{tca}$ – replenishment of tangible current assets at the expense of the profit of the transport enterprise; $\max R_{profit}^{nca}$ – replenishment of fixed assets at the expense of the profit of the transport enterprise; $P_{reduction}$ – reduction of accounts payable.

The financing efficiency model will have the right to life only under the condition of stable economic development of the road transport industry in the financial market, which determines the value of financing sources redistributed between road transport entities in the form of active (mobile) financial potential instruments [29]. The proposed model of effective financing can be used in the long run to calculate the future development of passenger traffic by road transport enterprises in the region. The main emphasis is on the analysis of the dependence of profitable activities or business activities of entities, using as factors the amount of government financial support, the amount of short-term and long-term bank loans and the number of financial resources [42] (Eq. 6)

$$I_{fs} = \sqrt[4]{f_{fr} \times f_{lbt} \times f_{sbl} \times f_{pfs}} \tag{6}$$

where: I_{fs} – an integrated indicator of the level of financial security of passenger traffic in the region; f_{fr} – efficiency of use of financial resources; f_{lbt} – efficiency of long-term bank loans; f_{sbl} – efficiency of short-term bank loans; f_{pfs} – the effectiveness of public financial support.

Given the peculiarities of regulating the financial support of passenger transport in the region's road transport system, especially in the case of bringing the level of financial capacity of road transport enterprises to a stable state, under the influence of external and internal factors, we believe that the formation of new methodological tools for financing the industry will allow to implement programs of economic development at the meso- and local levels and increase the share of own investment sources in public-private partnership.

3. Results and Discussion

The strategic priority of the economic policy of Ukraine is to improve the functioning of the road transport sector, which on the one hand is an indicator of socio-economic and political development of the state, and on the other – an important tool for integrating the Ukrainian road

transport system into international transport systems. However, insufficient state funding for the industry, unsystematic reforms and a number of other factors have led to negative trends in the development of this segment. Trends in the operation of road transport (including buses) play an important role in Ukraine, as this area of activity provides transportation of passengers who do not own or for some reason do not use their own transport. Thus, the share of passenger transportations by road in 2019 amounted to 35.7% of passenger turnover (40.1% in 2012), in the second place – rail transport (28.2% in 2019 and 38.5% in 2012). The importance of passenger turnover of air transport has significantly increased: over the last 8 years – from 8.4% to 20.5% (Figs. 2-3). In any case, road transport together with public transport has larger passenger turnover 50%. The share in the structure of passenger transportations by metro, tram and trolleybus transport is growing – from 12.8% in 2012 to 15.6% in 2019. The structure of traffic depending on the number of passengers confirms the dominance of road transport: 43.4% in 2019 and 54.4% in 2012, for tram transport – 14.5% in 2019 and 10.4% in 2012, trolleybus – 22.8% and 17.6%, metro – 15.5% and 11.1% respectively. That is, in general, the sphere of municipal road transport in 2019 accounted for about 96.2% passenger transportations (93.6 % in 2012).

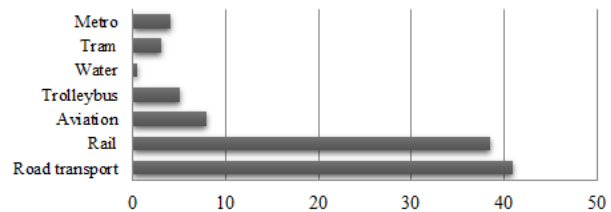


Figure 2. The share of road transport in the structure of passenger turnover in Ukraine, 2012

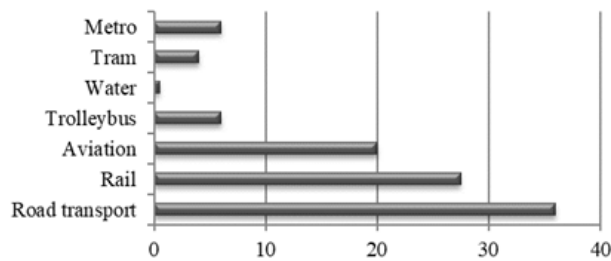


Figure 3. The share of road transport in the structure of passenger turnover in Ukraine, 2019 [43; 44]

Figs. 4-5 shows a reduction in passenger traffic since 2014. The largest declines were observed in the crisis of 2015-2016, when Ukrainian society adapted to the new challenges of the armed conflict. In 2019, for the first time in recent years, as with the quantitative indicator of passenger traffic, we see an increase in passenger turnover.

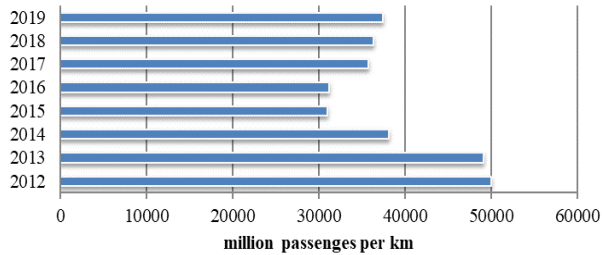


Figure 4. Passenger turnover of road transport in Ukraine, million passengers per km

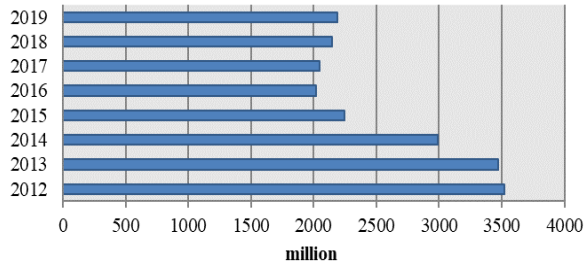


Figure 5. Number of passengers transported by road transport in Ukraine, mln. [43; 44]

The indicator of passenger turnover is an indicator of the level of development of the road transport system in general and its infrastructure. In addition, the efficiency of passenger transport by road depends on the level of

quality of service by other types of public transport - metro, trams and trolleybuses. It should be noted that in Ukraine passenger transportations for the period of 1980-2019 decreased for road transport (buses) – in 3.7 times, trams – in 2.6 times, trolleybuses – in 2.2 times. Instead, metro transportations have increased – in 1.7 times [45].

A powerful mechanism for financial support of passenger transport by road is manifested through taxation (tax rates, tax benefits). Because the road transport industry is directly related to not only the provision of transportation services, but also the ownership of vehicles, fuel consumption. Therefore, the taxation of various aspects of purchase, use, sale, disposal of vehicles, and the provision of transportation services has its own specifics and provides budget funding for the road transport industry. In particular, due to the functioning of the State Road Fund, the processes of decentralization of financial regulators of road transport are being strengthened, – guaranteed financial support of the road industry as a whole and improved financing of local road repairs; the fund is replenished at the expense of excise duties and taxes from oil products, fuel and cars [46]: in 2018 the fund received 50% from these excises and fees; in 2019 – 75%. Fig. 6 shows the structure of revenues and the purpose of redistribution of mobilized funds of the State Road Fund.

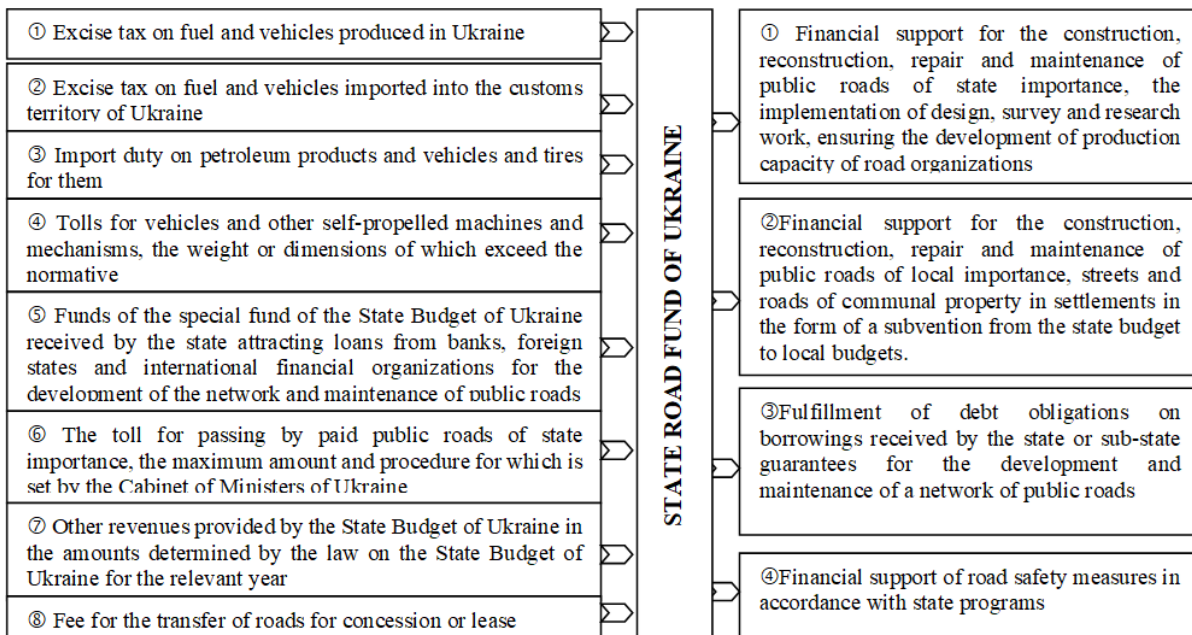


Figure 6. The structure of revenues and the purpose of redistribution of funds of the State Road Fund of Ukraine [46; 47]

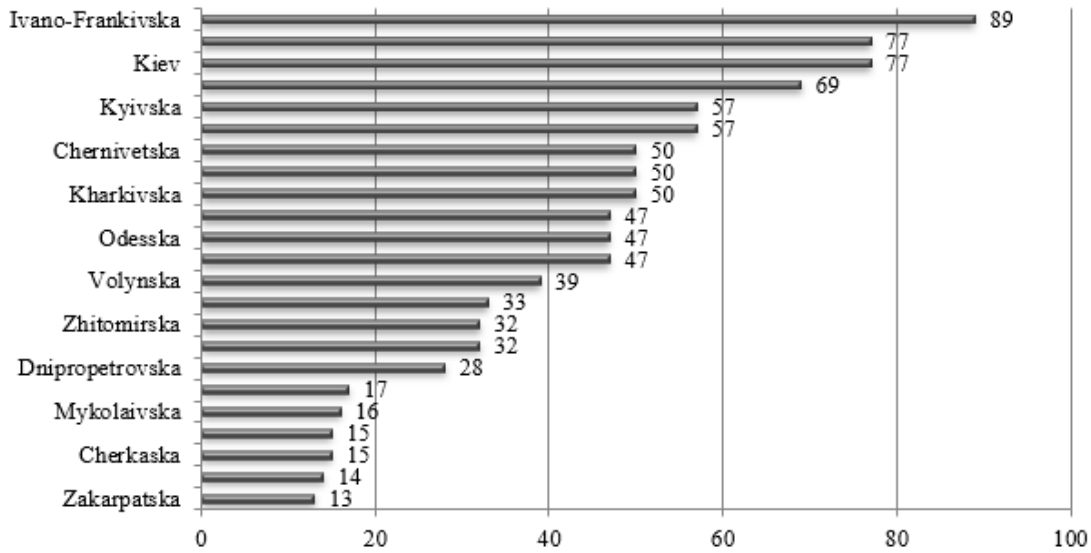


Figure 7. Use of funds of the State Road Fund in the regions of Ukraine, % [33; 39; 40]

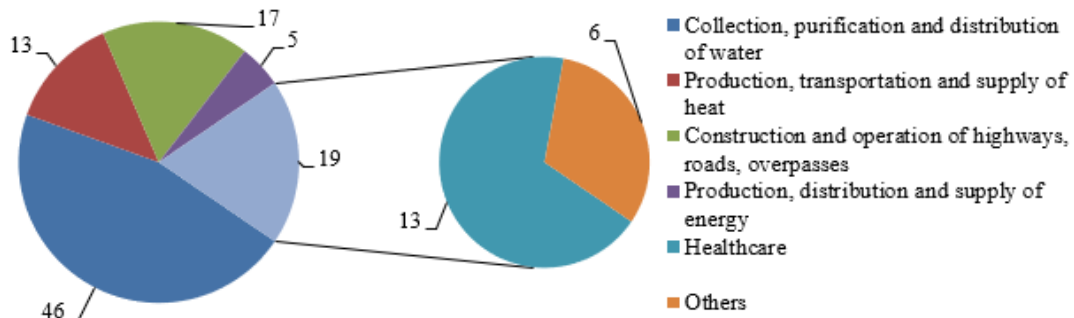


Figure 8. Share of implemented public-private partnership projects by business sectors in Ukraine in 2019, % [46; 48; 49]

Through the application of these measures, funds received from fuel, car, and road use can be allocated to support the workable condition of roads of national, and local importance. Financing of State debts with security measures implementation would be significant part of the State Road Fund recovery process. Effective functioning of the State Road Fund allows redistribution of financial resources for the operation of transport infrastructure between the regions of the country [22]. Among the regions that effectively use the state funds are Ivano-Frankivsk, Khmelnytsky, Kyiv, Vinnytsia, and Chernivetska regions; the worst results were shown in Zakarpatska, Rivnenska, Cherkaska and Poltavska regions (Fig. 7). Public-private partnership in the field of road transport provides a number of advantages of cooperation for government agencies and businesses in the field of innovation, technology services, logistics and financial support, environmental issues. Thus, in this context in 2019 17% projects for the construction, operation of highways, roads, overpasses, tunnels and subways and their infrastructure was implemented (Fig. 8).

It should be noted that the development of venture

financing in Ukraine is closely related to public financial instruments, regulates the road transport system of the state and regions in the stock market, and provides the road transport market with financial innovations and innovative accelerations. Therefore, the implementation of innovative ideas in the field of alternative sources of financial support for the transport industry and passenger transport will help solve the problem of irrational use of financial resources in the high-tech sector, implementation of risky investment projects of road transport enterprises, new technologies and expansion of promising innovative activities.

The components of this model are, first, the development and implementation of a national program for the development of the industry (with indicators of investment climate assessment, return on payback or profitability, financial justification of expenditures, etc.) by initiating and creating a favorable institutional infrastructure, existing mechanisms of state support projects of the road transport industry at the macro level: 1) co-financing of newly created road transport enterprises with a clear description of projects for regional

development programs in the form of grants and soft loans, including the creation of working prototypes; 2) provision of credit and guarantee support (participation in the share capital through public-private venture funds, specialized project companies (SPV – special project vehicle) to facilitate access to bank financing); 3) support of exclusively specialized road transport enterprises-innovators (whose activity corresponds to the priority directions of industry development) and enterprises engaged in their implementation and commercialization (first of all, those entities that invest their own assets in other enterprises). At the local level, effective venture financing of investment projects of road transport enterprises today requires careful analysis and evaluation of business models, strategies, calculations of the effectiveness of value growth and capitalization of financial assets in the stock market.

The investment portfolio of venture funds provides a discrete movement of financial flows in certain time intervals, according to the principle of discrete financing of agricultural development. At the same time, the process of venture financing of investment projects of entities in accordance with the stages of the innovation cycle is uneven, both at different stages of its implementation and in different time periods. However, the transition from one stage to another, more developed proceeds abruptly (from the moment of the decision on the need for further funding of the project). Accordingly, the risk of return on financial assets of enterprises is associated with a high degree of uncertainty about the potential profit of both the venture investor and the industry. The process of ensuring the minimum risk of return on financial assets of enterprises in the investment portfolio of venture funds is carried out at three levels [50]:

- 1) in the process of choosing organizational forms of risky investments (diversification of the investment portfolio, joint financing, creation of joint venture funds and limited financial partnerships, formation of the institution of professional managers);
- 2) in the process of selecting investment projects for venture financing (determination of project evaluation criteria based on content analysis of the business plan, decision-making processes and deadlines; coordination and formation of market share of venture funds in projects with high growth potential);
- 3) in the process of dividing financial flows by stages of venture financing of investment projects, the main part

of investments in risky financial assets of road transport enterprises (approximately 2/3) falls on the first three stages of venture financing, but they bring the highest rate of return in case of successful implementation. This allows increasing the market value of enterprises.

The methodological approach of formation of strategy of a cycle of financial maintenance of passenger transportations in road transport system of the region, considering the system of financial flows of road transport enterprises, which is directed on optimization of their market value with internal and external limiting parameters, is offered. Thus, in the development of joint public-private partnership projects in terms of venture financing of road transport enterprises, all flows can be divided into three main groups of financial transactions, which represent: A_f – system-forming flows, B_f – system-providing flows and C_f – potential flows. Each of the groups of financial transactions can be in four financial cycles ($f = 0, 1, 2, 3$) identical to the cycle of financial security of the enterprise: absence ($f = 0$), implementation ($f = 1$), operation ($f = 2$) and liquidation ($f = 3$). These financial cycles correspond to the characteristics of the basic parameters of financial flows of the road transport enterprise. Accordingly, there are many scenarios that can be accepted for a group of operations, leading to system-forming ($U_1=\{A_f\}$), system-providing ($U_2=\{B_f\}$) and potential ($U_3=\{C_f\}$) financial flows, which together form the current value of financial support of the object of venture financing (Eq. 7):

$$W_{i,t} = U_1 + U_2 + U_3. \quad (7)$$

In accordance with the variation of the cycles of financial transactions, a certain set of possible scenarios of venture financing of the investment project is formed, which determine the corresponding cycle of financial security (Table 1), and, accordingly, the basic characteristics of financial flows. In addition, each scenario of venture financing corresponds to the parameters, namely: the minimum required number of financial resources, the maximum possible input and output financial flows that characterize a particular group of financial transactions, taking into account the basic parameters of financial flows.

Table 3. Possible options for the strategy of financial flows, due to the initial cycle of financial support of the road transport enterprise in venture financing of investment projects

Current strategy $W_{i,t}$	Preliminary strategy $W_{i,t-1}$	Future strategy $W_{i,t+1}$
$W_0 = A_0 + B_0 + C_0$	$W_0, W_{21}, W_{24}, W_{33}, W_{36}$	W_0, W_1, W_2, W_3, W_4
$W_1 = A_1 + B_0 + C_0$	W_0	$W_5, W_6, W_9, W_{10}, W_{21}, W_{22}, W_{25}, W_{26}$
$W_2 = A_1 + B_0 + C_1$	W_0	$W_7, W_{11}, W_{12}, W_{27}, W_{28}$
$W_3 = A_1 + B_1 + C_0$	W_0	$W_{13}, W_{14}, W_{29}, W_{30}, W_{33}, W_{34}$
$W_4 = A_1 + B_1 + C_1$	W_0	$W_{15}, W_{19}, W_{20}, W_{31}, W_{32}, W_{35}, W_{36}$
$W_5 = A_2 + B_0 + C_0$	$W_1, W_5, W_8, W_{17}, W_{20}$	$W_5, W_6, W_9, W_{10}, W_{21}, W_{22}, W_{25}, W_{26}$
$W_6 = A_2 + B_0 + C_1$	W_1, W_5, W_{17}	$W_7, W_8, W_{11}, W_{12}, W_{23}, W_{24}, W_{27}, W_{28}$
$W_7 = A_2 + B_0 + C_2$	$W_2, W_6, W_7, W_{18}, W_{19}$	$W_7, W_8, W_{11}, W_{12}, W_{23}, W_{24}, W_{27}, W_{28}$
$W_8 = A_2 + B_0 + C_3$	W_6, W_7, W_{18}, W_{19}	W_5, W_9, W_{21}, W_{25}
$W_9 = A_2 + B_1 + C_0$	W_1, W_5, W_8	$W_{13}, W_{14}, W_{17}, W_{18}, W_{29}, W_{30}, W_{33}, W_{34}$
$W_{10} = A_2 + B_1 + C_1$	W_1, W_5	$W_{15}, W_{16}, W_{19}, W_{20}, W_{31}, W_{32}, W_{35}, W_{36}$
$W_{11} = A_2 + B_1 + C_2$	W_2, W_6, W_7	$W_{15}, W_{16}, W_{19}, W_{20}, W_{31}, W_{32}, W_{35}, W_{36}$
$W_{12} = A_2 + B_1 + C_3$	W_2, W_6, W_7	$W_{13}, W_{17}, W_{29}, W_{33}$
$W_{13} = A_2 + B_2 + C_0$	$W_3, W_9, W_{12}, W_{13}, W_{16}, W_{17}$	$W_{13}, W_{14}, W_{18}, W_{29}, W_{30}, W_{33}, W_{34}$
$W_{14} = A_2 + B_2 + C_1$	W_3, W_9, W_{13}	$W_{15}, W_{16}, W_{19}, W_{20}, W_{31}, W_{32}, W_{35}, W_{36}$
$W_{15} = A_2 + B_2 + C_2$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}$	$W_{15}, W_{16}, W_{19}, W_{20}, W_{31}, W_{32}, W_{35}, W_{36}$
$W_{16} = A_2 + B_2 + C_3$	$W_{10}, W_{11}, W_{14}, W_{15}$	$W_{13}, W_{17}, W_{29}, W_{33}$
$W_{17} = A_2 + B_3 + C_0$	$W_9, W_{12}, W_{16}, W_{17}$	$W_5, W_6, W_{13}, W_{17}, W_{21}, W_{22}$
$W_{18} = A_2 + B_3 + C_1$	W_9, W_{13}	$W_7, W_8, W_{23}, W_{24}, W_{36}$
$W_{19} = A_2 + B_3 + C_2$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}$	$W_7, W_8, W_{23}, W_{24}, W_{36}$
$W_{20} = A_2 + B_3 + C_3$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}$	W_5, W_{21}, W_{36}
$W_{21} = A_3 + B_0 + C_0$	$W_1, W_5, W_8, W_{17}, W_{20}, W_{21}, W_{24}, W_{33}, W_{36}$	$W_0, W_{21}, W_{22}, W_{25}, W_{26}$
$W_{22} = A_3 + B_0 + C_1$	$W_1, W_5, W_{12}, W_{17}, W_{21}$	$W_{23}, W_{24}, W_{27}, W_{28}$
$W_{23} = A_3 + B_0 + C_2$	$W_6, W_7, W_{18}, W_{19}, W_{22}, W_{23}, W_{34}$	$W_{23}, W_{24}, W_{27}, W_{28}$
$W_{24} = A_3 + B_0 + C_3$	$W_6, W_7, W_{18}, W_{19}, W_{22}, W_{23}, W_{34}, W_{35}$	W_0, W_{21}
$W_{25} = A_3 + B_1 + C_0$	W_1, W_5, W_8, W_{21}	$W_{29}, W_{30}, W_{33}, W_{34}$
$W_{26} = A_3 + B_1 + C_1$	W_1, W_5, W_{21}	$W_{31}, W_{32}, W_{35}, W_{36}$
$W_{27} = A_3 + B_1 + C_2$	$W_2, W_6, W_7, W_{22}, W_{23}$	$W_{31}, W_{32}, W_{35}, W_{36}$
$W_{28} = A_3 + B_1 + C_3$	$W_2, W_6, W_7, W_{22}, W_{23}$	W_{29}, W_{32}
$W_{29} = A_3 + B_2 + C_0$	$W_3, W_9, W_{12}, W_{13}, W_{16}, W_{25}, W_{28}, W_{29}, W_{32}$	$W_{29}, W_{30}, W_{33}, W_{34}$
$W_{30} = A_3 + B_2 + C_1$	$W_3, W_9, W_{13}, W_{25}, W_{29}, W_{32}$	$W_{31}, W_{32}, W_{35}, W_{36}$
$W_{31} = A_3 + B_2 + C_2$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}, W_{26}, W_{27}, W_{30}, W_{31}$	$W_{31}, W_{32}, W_{35}, W_{36}$
$W_{32} = A_3 + B_2 + C_3$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}, W_{26}, W_{27}, W_{28}, W_{30}, W_{31}$	W_{29}, W_{33}
$W_{33} = A_3 + B_3 + C_0$	$W_3, W_9, W_{12}, W_{13}, W_{16}, W_{25}, W_{29}, W_{32}$	W_0, W_{21}
$W_{34} = A_3 + B_3 + C_1$	$W_3, W_9, W_{13}, W_{25}, W_{29}$	W_{23}, W_{24}
$W_{35} = A_3 + B_3 + C_2$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}, W_{26}, W_{27}, W_{30}, W_{31}$	W_{24}
$W_{36} = A_3 + B_3 + C_3$	$W_4, W_{10}, W_{11}, W_{14}, W_{15}, W_{18}, W_{19}, W_{20}, W_{26}, W_{27}, W_{30}, W_{31}$	W_0, W_{21}

For example, the scenario $W_{30} = A_3+B_2+C_1$ is significantly different from the scenario $W_{31} = A_3+B_2+C_2$, because in the first case of liquidation financial transactions that provide system-forming financial flows, it is necessary to find financial resources for additional activities, and in the second case the enterprise has already formed the basis for changing the guidelines for the synchronous movement of financial flows, which provide additional resources that can move to the status of system-providing and potential. Accordingly, the intensity of the cycle of financial support of the road transport enterprise is higher in the second

case, which provides the entity with more reliable financial stability than in the first case. It should also be noted that the speed of financial flows depends on the inertia of venture financing operations, taking into account the direction of flows. For example, in the case of system-forming financial flows, the resource elements of financial support react slowly, while potential flows are more affected by management decisions. Thus, the strategic movement of financial flows is aimed at maximizing the market value of the road transport enterprise and can be represented as follows [44] (Eq. 8):

$$\begin{cases} \Delta V_t(\xi_{t-1}) = \max\{f_t(\xi_{t-1}, w_{i,t}) + \Delta \overline{V}_{t+1}(\xi_t)\} \\ 0 \leq IR_t(w_{i,t}) \leq \xi_{t-1} \\ \Delta V_t(\xi_0) = \max\{f_t(w_{i,0})\} \end{cases} \text{ for } t = 1, 2, 3, \dots, T \text{ при } w_i \in \{U_i\} \quad (8)$$

where: $\Delta V_t(\xi_0), \Delta V_t(\xi_{t-1})$ – increase in the market value of the enterprise due to the decision in steps t and $t-1$, monetary unit; $\Delta \overline{V}_{t+1}(\xi_t)$ – the total maximum increase in the market value of the enterprise in the future, due to previous, current and possible decisions, monetary unit; $f_t(\xi_{t-1}, w_{i,t})$ – the function of the financial flow of the i -th type in the t -th period, which is due to the initial cycle of financial potential ξ_{t-1} ; IR_t – the necessary investment to implement the strategy $w_{i,t}$ in t -th period, monetary unit; $\{U_i\}$ – a set of financial flows that form a type of strategy $\{w_{i,t}\}$, which depends on the initial cycle of financial security (previous cycle, which determines the possible version of the strategy in the future).

Determining the growth of the market value of the enterprise is justified by the following provisions. At the beginning of the activity, i.e. at zero cycle, the enterprise receives a loss of PL_t , which is equal to the difference between the required investments in the t -th period (IR_{ij}) and lost possible income in the period $t+1$ ($PI_{(t+1,j)}$), which is defined as follows [44] (Eq. 9):

$$f_t(w_{i,0}) = PL_t = \sum_{j=1}^3 \left(\frac{IR_{tj}}{(1+\eta_{in,t})^t} - \frac{PI_{t+1,j}}{(1+\eta_{in,t+1})^{t+1}} \right) \mu_j \text{ for } \begin{cases} \mu_j = 0, \rightarrow U_j = 1, 2, 3 \\ \mu_j = 1, \rightarrow U_j = 0 \end{cases} \quad (9)$$

where: $\eta_{in,t}, \eta_{in,t+1}$ – coefficient that takes into account the change in the value of money over time in the t -th and $t+1$ period, the share of units; μ_j – a variable that is reflected in the adopted strategy ($w_{i,0}$) the absence of a cycle of financial transactions for investment activities ($U_j=0$), or the creation, operation or liquidation of the j -th type of activity ($U_j=1$).

If in the strategy of financial support of the road transport enterprise $w_{i,t}$ all financial operations are different from zero, then the net financial flow for the period t is [51] (Eq. 10):

$$f_t(\xi_{t-1}, w_{i,t}) = \sum_{j=1}^3 \frac{(TR_{jt} - NDT_{jt} - TOL_{jt} - LA_{jt})(1-\tau) + NWC_{jt} \frac{\eta_{in,t}}{(1+\eta_{in,t})^t}}{(1+\eta_{in,t})^t} \quad (10)$$

where: TR_{jt} – income (net income, interest income, speculative income, etc.) from the implementation of the j -th type of activity in the t -th period, monetary units; NDT_{jt} – indirect taxes that must be paid when carrying out the j -th type of activity in the t -th period, monetary units; TOL_{jt} – total operating costs associated with the implementation of the j -th type of activity in the t -th period, monetary units; LA_{jt} – other costs arising from the

implementation of the j -th type of activity in the t -th period, monetary units; τ – the rate of income tax on the j -th type of activity in the t -th period, the share of units; NWC_{jt} – net working capital involved in the implementation of the j -th type of activity in the t -th period, monetary units.

The amount of net working capital (NWC_{jt}) in terms of synchronicity of financial flows can be defined as follows [51] (Eq. 11):

$$NWC_t = CA_{t-1} + OF_t^{CA} - IF_t^{CA} \pm S_{nc,t} - (CL_{t-1} + IF_t^{CL} - OF_t^{CL}) \quad (11)$$

where: CA_{t-1} – current assets formed in the period $t-1$ and involved in the implementation of the j -th type of activity, monetary units; OF_t^{CA}, IF_t^{CA} – respectively, out coming and incoming financial flows that serve the formation of current assets involved in the implementation of the j -th type of activity in the period t , monetary units; $\pm S_{nc,t}$ – change in current assets, which occurs without the occurrence of appropriate financial flows (barter, revaluation, etc.), monetary units; CL_{t-1} – current liabilities formed in the period $t-1$ and involved in the implementation of the j -th type of activity, monetary units; IF_t^{CL}, OF_t^{CL} – respectively, incoming and out coming financial flows that form current liabilities in period t and are involved in the implementation of the j -th type of activity, monetary units.

The algorithm for determining the market value of the enterprise is divided into two parts: in the short term and in the long term (terminal) period. It should be emphasized that when applying the optimization dynamics as a short-term perspective is set period ($l=1, 2, 3, \dots, t$), i.e., the period for which certain goals are defined and the basic parameters of financial flows of the enterprise are outlined. As an indefinite period, the optimal value of the future perspective is chosen $m=t+1, \dots, \infty$. Thus, the market value of the enterprise for each t -th period will be [51] (Eq. 12):

$$\overline{V}_t(\xi_{t-1}) = V_t'(\xi_{t-1}) + V_t''(\xi_{t-1}) \quad (12)$$

where, $V_t'(\xi_{t-1})$ and $V_t''(\xi_{t-1})$ – the market value of the enterprise at the end of period t in the terminal period, which depends on the cycle of financial security in the period $t-1$, i.e., on the set of selected groups of operations on venture financing and synchronous movement of financial flows in the previous stages, monetary units. Thus, the objective function (8) takes the form [51] (Eq. 13):

$$\left\{ \begin{aligned} \Delta V_t(\xi_{t-1}) &= \max \left\{ \begin{aligned} &\sum_{j=1}^3 \frac{(TR_{jt} - NDT_{jt} - TOL_{jt} - LA_{jt})(1 - \tau) + NWC_{jt} \frac{\eta_{in,t}}{(1 + \eta_{in,t})}}{(1 + \eta_{in,t})^t} \\ &+ \left(\sum_{t=p}^p V_t^-(\xi_{t-1}) + \bar{V}_t^-(\xi_{t-1}) \right) - \left(V_1^-(\xi_0) + \bar{V}_1^-(\xi_0) \right) \end{aligned} \right\} && \text{for } t = 1, 2, 3, \dots, T \\ & && \text{at } w_i \in \{U_i\} \\ 0 \leq IR_t(w_{i,t}) &\leq \xi_{t-1} \\ \Delta V_t(\xi_0) &= \max \left\{ \sum_{j=1}^3 \left(\frac{IR_{t,j}}{(1 + \eta_{in,t})^t} - \frac{PI_{t+1,j}}{(1 + \eta_{in,t+1})^{t+1}} \right) \mu_j \text{ for } \begin{cases} \mu_j = 0, \rightarrow U_j = 1, 2, 3 \\ \mu_j = 1, \rightarrow U_j = 0 \end{cases} \right\} \end{aligned} \right.$$

Accordingly, the projected value of the enterprise for the near future of the settlement period will be $V_t'(\xi_{t-1})$ [44] (Eq. 14):

$$V_t'(\xi_{t-1}) = \sum_{l=1}^t \sum_{j=1}^3 \frac{(TR_{l,j} - NDT_{l,j} - TOL_{l,j} - LA_{l,j})(1 - \tau) + NWC_{l,j} \frac{\eta_{in,l,j}}{(1 + \eta_{in,l,j})}}{(1 + \eta_{in,l,j})^l} + NWC_0 = \sum_{l=1}^t \sum_{j=1}^3 \frac{(TR_{l,j} - NDT_{l,j} - TOL_{l,j} - LA_{l,j})(1 - \tau) + (CA_{t-1} + OF_t^{CA} - IF_t^{CA} \pm S_{nc,t} - (CL_{t-1} + IF_t^{CL} - OF_t^{CL})) \frac{\eta_{in,l,j}}{(1 + \eta_{in,l,j})}}{(1 + \eta_{in,l,j})^l} + CA_0 + CL_0, \quad (14)$$

$$V_t''(\xi_{t-1}) = \sum_{j=1}^3 \left((TR_{t,j} - NDT_{t,j} - TOL_{t,j} - LA_{t,j})(1 - \tau) \left(1 + \frac{IR_{t,j} - A_{t,j}}{(TR_{t,j} - NDT_{t,j} - TOL_{t,j} - LA_{t,j})(1 - \tau)} \right) \right) \times \frac{\left(1 - \frac{\Delta v_{t,j}(FA_{t,j} + CA_{t,j} + CL_{t,j})}{\sum_{j=1}^3 (TR_{t,j} - NDT_{t,j} - TOL_{t,j} - LA_{t,j})(1 - \tau)} \right)}{(\eta_{in,t} - \Delta v_t)(1 + \eta_{in,t})^t} \quad (15)$$

Accordingly, the cycle of financial security is at the final stage of the short term of the settlement period (ξ_t). That is, in the t-th period the enterprise is able to determine the relative level of business activity. Any further development of the enterprise is possible only under the condition of constant investment of a certain amount of net financial flow from venture financing operations of investment projects. The corresponding investment rate is set, which is defined as the ratio of net investment (the difference between total investment and depreciation) and total incoming financial flows of the enterprise for the relevant period. As a result, the interpretation of the assessment of the market value of the enterprise in the long run, which meets the requirements of optimization dynamics and is based on previous cycles of financial security with possible options for the movement of financial flows takes the following form [51] (Eq. 15).

Where, $FA_{t,j}$ – non-current assets formed at the end of period t and involved in the implementation of the j-th type of activity, monetary units; $A_{t,j}$ – depreciation of non-current assets formed at the end of period t and involved in the implementation of the j-th type of activity, monetary units; $\Delta v_{t,j}$ – set the desired relative growth rate of the enterprise in the long run, the share of units.

When calculating the basic parameters of financial flows, it should be taken into account that the initial cycle of financial security (ξ_0) for each road transport enterprise is individual. If we consider the actual data of individual road transport enterprises of Ivano-Frankivska, Khmelnytska, Vinnytska, Chernivtska regions, as well as the city of Kyiv, we can say that each business entity is

characterized by a certain initial strategic position of financial support for passenger transport in the road transport system of these regions, which determines the directions of their further development (Table 3).

During 2017-2018, the return on investment in the surveyed enterprises (except for enterprise No.4) was significantly higher than the inflation rate. In 2019, the situation changed, only enterprise No.1 ensured efficient investment of financial resources, with a significant growth rate of inflation (30.51% compared to inflation in 2019 – 24.9%). However, it should be emphasized that the weighted average price of sources of financing of these enterprises, which can be used as a discount rate for financial flows, was significantly lower than the average level of rates on deposits in 2019 – 11.2%) and on loans – 23.4%.

According to the analysis of the financing structure of the surveyed enterprises, the largest share (up to 90%) in the structure of current liabilities is occupied by short-term loans, for which there is no timely payment of interest. At the same time, dividend payments were made only by the enterprise No. 1 (profit distribution rate in 2019 – 0.004%, No. 2 – 1.5%, No. 5 – 0.56%). Accordingly, for the investor, the value of these enterprises varies widely. Taking into account the above-mentioned features of the functioning of road transport enterprises, as well as the proposed method of optimizing the dynamics of the market value of entities, based on the data of Table 3, we calculated the input parameters of financial flows at time $t = 0$, i.e., determined the actual state of financial support of the studied group of enterprises ξ_0 (Table 4).

Table 3. The initial cycle of financial support of passenger transportation in the regional road transport system of Ukraine on the basis of venture financing

Indicator	Year	Road transport enterprise					
		No.1 (Ivano-Frankivsk region)	No.2 (Ivano-Frankivsk region)	No. 3 (Khmelnitsky region)	No. 4 (Vinnitsa region)	No. 5 (Kyiv)	No. 6 (Chernivtsi region)
Net income, million EUR	2017	1 877.4	117.4	149.5	655.9	1 119.2	16.0
	2018	2 939.4	188.8	171.8	610.6	1 488.1	18.9
	2019	3 483.8	256.7	855.6	632.0	2 304.9	20.3
Profit before payment of interest and taxes, million EUR	2017	35.8	2.2	- 9.1	- 33.9	97.9	4.4
	2018	170.7	15.0	2.7	- 64.3	159.6	6.2
	2019	765.2	13.3	32.1	- 88.3	454.7	6.3
Net capital investment, million EUR	2017	-5.41	-4.17	1.87	47.44	17.36	-0.032
	2018	-23.74	-1.12	11.48	79.63	137.46	-0.065
	2019	7.35	-1.84	28. 8	86.35	234.88	-0.077
Financial resources invested, million EUR	2017	1 106.6	108.1	66.3	1 229.8	735.4	40.5
	2018	1 722.7	123.8	129.7	1 174.9	1 098.7	38.9
	2019	1 852.3	147.8	161.1	1 087.4	1 755.3	41.0
Weighted average price of funding sources, %	2017	0.14	0.51	0.0	0.38	3.26	0.0
	2018	0.45	0.35	0.12	0.44	3.36	0.0
	2019	0.47	0.57	0.05	0.38	2.17	0.0
Profitability of investment, %	2017	1.88	2.01	- 13.99	- 2.95	10.75	8.08
	2018	6.64	9.83	2.07	- 5.14	10.29	11.9
	2019	30.51	7.90	12.19	- 8.09	20.99	11.4
Investment rate, %	2017	-25.9	-192.2	-20.2	- 130.9	21.9	- 1.0
	2018	-20.7	-9.2	427.0	- 131.9	121.6	- 1.4
	2019	1.3	-15.7	145.0	- 98.2	63.8	- 1.6
Profitability of net cash flow, %	2017	-12.84	7.31	11.76	-256.51	0.67	-115.70
	2018	0.77	-81.26	-71.32	-106.26	0.55	2.18
	2019	1.45	2.01	-407.99	-6.69	-10.62	7.13

Table 4. Calculation of the market value of road transport enterprises at time $t = 0$ (cycle of financial security ξ_0), million EUR

Indicator	Road transport enterprise					
	No.1	No.2	No.3	No.4	No.5	No.6
$V_0^I(\xi_{-1})$	966.1	52.7	-1.2	-846.0	390.4	17.2
<i>While maintaining the average rate of business activity and inflation</i>						
$V_0^{II}(\xi_{-1})$	5 132.9	243.8	-4.4	-995.7	2 553.8	32.9
$\bar{V}_0(\xi_{-1}) = V_t(\xi_0)$	6 099.0	296.5	-5.7	-1 841.7	2 944.2	50.1
<i>Business activity rates = average rates for previous years, inflation rate – 30%</i>						
$V_0^{III}(\xi_{-1})$	3 244.4	161.8	-1.1	-520.8	1 737.1	24.9
$\bar{V}_0(\xi_{-1}) = V_t(\xi_0)$	4 210.5	214.6	-2.3	-1 366.8	2 127.5	42.1
<i>Business activity rates +5% from the average level, inflation rate – 30%</i>						
$V_0^{IV}(\xi_{-1})$	3 283.5	165.3	-0.1	-495.4	1 777.3	25.7
$\bar{V}_0(\xi_{-1}) = V_t(\xi_0)$	4 249.6	218.0	-1.3	-1 341.4	2 167.7	42.9

As a result of calculations, the dependence of the parameters of the initial cycle ξ_0 on internal (established rates of business activity) and external (inflation rate) factors was determined. According to the calculation, depending on the incoming financial flows, the influence of internal and external factors on the real cycle of financial security (ξ_0) for each road transport enterprise is significantly different. Therefore, the synchronicity of financial flows, which is acceptable for one enterprise, may negatively affect another enterprise. To determine the optimal market value of road transport enterprises, four scenarios were considered:

Scenario 1 – the enterprise remains the part of the car holding, the rate of withdrawal of financial resources is maintained;

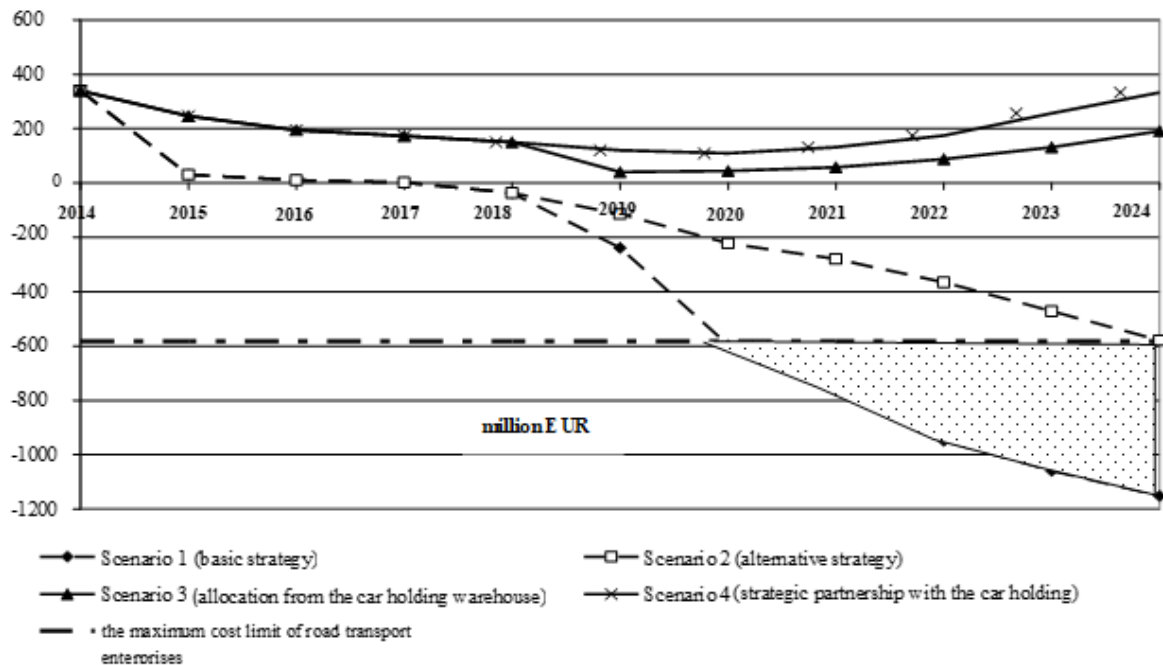
Scenario 2 – the enterprise remains the part of the car holding, but the withdrawal of financial resources is exclusively in the form of payment for the use of funding sources (including sources obtained in the process of redistribution by internal calculations) at the average market rate of return of the investment project;

Scenario 3 (hypothetical) – enterprises acquire the status of independent entities and conduct independent activities (operating, financial, investment), dividends are

planned at the level of the average market rate of return of the investment project, taking into account the projected level of inflation;

Scenario 4 (hypothetical) – enterprises acquire the status of independent entities, maintain a strategic public-private partnership with the holding in the field of supply of materials, participation in equity, joint financing of an investment project for the development of new equipment (investment obligations under the strategic plan of the holding for 2020-2020 amount to 52.4 million EUR); carries out independent activity (operational, financial, investment), dividends are planned at the level of the average market rate of return of the investment project taking into account the forecast level of inflation.

The first two options are included as alternatives to the strategic plan of the car holding for 2019-2024. The third and fourth options are developed by the author and are hypothetical. Assumptions about the rate of change of the main indicators of market value optimization of road transport enterprises are based on operating forecasts for 2019-2024. Forecasts of financial and investment activities of the enterprise are formed on the basis of extrapolation of business activity of enterprises in the past and the projected level of inflation (Fig. 9).



Scenario	2019	2020	2021	2022	2023	2024
1	-239.1	-597.3	-762.4	-949.0	-1059.3	-1151.7
2	-114.3	-222.1	-280.0	-365.9	-472.2	-579.6
3	40.0	44.3	56.9	87.8	131.3	190.9
4	120.1	109.3	131.3	174.7	256.0	334.7

Figure 9. Scenarios of the optimal market value of road transport enterprises in the cycle of financial support of passenger transportation in the region for 2019-2024, million EUR

As can be seen from the graph, when choosing the first scenario, which is accepted by the car holding as the base, the market value of road transport enterprises from 2019 begins to decline rapidly. It should be noted that if the value of enterprises decreases below the threshold level (597.3 million EUR) for the car holding it does not make sense to support their further activities. In addition, the first option demonstrates that in 2020, while maintaining this scenario, the synchronicity of financial flows of enterprises will be eliminated altogether. The second scenario, which is declared in the strategy as an alternative, allows to temporarily suspend the negative financial flow of the marginal value of enterprises [52]. The study of the third scenario shows that while maintaining a strategic alliance between road transport enterprise and the car holding, "fair" (according to the authors) conditions for the distribution of financial flows are established. Unfortunately, with the gradual growth of market value, enterprises do not reach the level of business activity in the terminal period, with which they became part of the car holding. Accordingly, the fourth scenario of financial support of passenger transportation by enterprises in the regional road transport system synchronizes the movement of financial flows and is the most optimal for the economic development of entities in the industry. Since the beginning of the global crisis and after the COVID-19 epidemic, the funding of the transport system was entrusted to the regional authorities. A large amount of resources were spent on maintaining the policy of preferential transportation adopted by the Cabinet of Ministers. Together with a decrease in funds received by regional offices, this led to a critical situation. The proposed strategies make it possible to flexibly adjust the measures that contribute to maintaining and improving the current situation. Modernization of the Ukrainian transport sector requires significant investments. These investments require the mobilization of significant resources, both from the state side and from private investors. This can only be realized when international partners and the private sector are convinced that investment decisions are made in a rational and transparent manner. Most of the problems can be solved through a systematic approach to project cycle management and through the use of modern methods and techniques widely used internationally to identify, define, prioritize, prepare, implement and evaluate investment projects. This is the main objective of the EU-funded Technical Assistance Project to improve the management of the infrastructure investment project cycle.

4. Conclusions

Regulation of road transport is a complex process that involves a significant number of institutions - both public and private. Their systematic and consistent cooperation

with the rooting of progressive trends in the development of the sphere forms a proper financial and institutional environment, complemented by cultural and value-mental characteristics. For Ukraine, institutional support for the development and regulation of the road transport sector needs to be improved. The existing institutional framework requires qualitative improvement and anti-corruption practices. This can be achieved through further processes of decentralization of regulation in this area, dissemination of the practice of using the funds of the State Road Fund and active promotion of projects at the level of international organizations. This complex process requires strengthening the positions and levers of influence of business entities (road transport enterprises, other commercial institutions) on public authorities. Public-private partnership should be an important mechanism in this. This mechanism in the current situation is a real scenario for solving numerous problems of financial support for the development of road transport in the country.

Our proposed scenario of financial flows in venture financing of investment projects aimed at the development of the transport system of the regions of Ukraine can be used for vertically integrated structures, taking into account the effect of combining basic parameters of financial flows and life cycle of individual resource elements of financial support, this will help stabilize the situation and will give it a positive momentum in the future. This is because the financial flows that are system-forming for one entity and are potential for another. As a result of their joint use, the effect of increasing the total cost of the integrated structure is created.

REFERENCES

- [1] V. A. Balin. State regulation of the market of motor transport services in Poland, *Aspects of Public Administration*, Vol. 5-6, No. 88-96, 2014.
- [2] V. A. Balin. The main directions of adaptation of state regulation of admission to the market of motor transport services in Ukraine to the standards of the European Union, *Aspects of Public Administration*, Vol. 8, 32-41, 2014.
- [3] N. V. Bezbakh, V. V. Brahinskyi. Public-private partnership in the implementation of transport infrastructure projects, *Economy and State*, Vol. 8, 115-118, 2011.
- [4] O. V. Boiko, Z. P. Dvulit. Sustainable development of the transport system of Ukraine, *Scientific Herald of NLTU of Ukraine*, Vol. 23, No. 18, 94-103, 2013.
- [5] L. A. Bychikova. Tendencies of development of the sphere of transport services, *Bulletin of the Khmelnytsky National University (Economics)*, Vol. 6, No. 2, 33-37, 2011.
- [6] K. V. Davtian. Theoretical bases of functioning of international transport corridors and their role in the

- economy of Ukraine, *Business Inform*, Vol. 12, 151-155, 2012.
- [7] D. V. Dmytryk. Formation of strategy of development of transport enterprise, *Problems of Increasing the Efficiency of Infrastructure*, Vol. 39, 2014. Online available from <http://ecobio.nau.edu.ua/index.php/PPEI/article/viewFile/504/488>
- [8] O. V. Dymchenko. Substantiation of tendencies of development of enterprises of city electric transport in the context of European integration processes in Ukraine, *Beketov Kharkiv National University of Municipal Economy. Series: Economic Sciences*, Vol. 113, 3-9, 2014.
- [9] D. A. Ilchenko. Mechanism of state regulation of passenger automobile transport complex, *Mechnikov Bulletin of Odessa National University*, Vol. 22, No. 3(56), 48-53, 2017.
- [10] N. V. Ivanova, T. V. Hanieieva. Peculiarities of development of ecologically safe transport as a component of city infrastructure, *Agrosvit*, Vol. 24, 41-45, 2018.
- [11] O. V. Zakharova. Theoretical approaches to determining the nature and properties of the world transport system, *Visnyk of Mariupol State University, Series: Economics*, Vol. 1, 21-25, 2011.
- [12] V. O. Zhavoronkov. Theoretical principles of diagnostics of transport infrastructure of the region: institutional approach, *Theoretical and Practical Aspects of Economics and Intellectual Property*, Vol.1, No. 2, 28-32, 2013.
- [13] O. O. Zhelezniak, L. M. Oleshchenko. Determination of the cost of passenger-transport process, *Actual Problems of Economy*, Vol. 11, 218-226, 2012.
- [14] M. Forster. Review of the Use of Geographical Information Systems in the Marketing and Planning of Logistics Services, *Heriot-Watt University, Edinburgh*, 2000.
- [15] K. G. Ingram, Z. Liu. Motorization and the provision of roads in countries and cities, *World Bank Policy Research Working Paper*, Vol. 1842, article number 40, 1997.
- [16] B. S. Kerner. *The Physics of Traffic: Empirical Freeway Pattern Features, Engineering Applications, and Theory*, Springer-Verlag Berlin Heidelberg, Berlin, Heidelberg, 2004.
- [17] B. S. Kerner. *Introduction to Modern Traffic Flow Theory and Control: The Long Road to Three-Phase Traffic Theory*, Springer-Verlag Berlin Heidelberg, Berlin, Heidelberg, 2009.
- [18] W. Laurance, G. Clements, S. Sloan. A global strategy for road building, *Nature*, Vol. 514, No. 7521, 262-262, 2014.
- [19] P. Ovchar. Institutional and functional basis of the transport system, In: *Science and society: Collection of Scientific Articles*, Edizioni Magi, Roma, 2017.
- [20] P. Ovchar, S. Holubka. Financial aspects of national automobile transport, *Financial and Credit Activities: Problems of Theory and Practice*, Vol. 1, No. 24, 95-103, 2018.
- [21] P. Ovchar. The need in regulation of automobile transportation in the national economy system, *Economics and Finance*, Vol. 3, 75-78, 2018.
- [22] S. M. Shkarlet, I. O. Khomenko, V. V. Kontseva. Actual problems of formation and funding of the state road funds, *Scientific Bulletin of Polissia*, Vol. 3, No. 11, 16-20, 2017.
- [23] C. Winston. *Transportation and the United States Economy: Implications for Governance*, Brookings Institution, Washington, 2015.
- [24] L. Kostygova, E. Sidorova, N. Vikhrova. Modern clusters and assessment of their innovative development, *Entrepreneurship and Sustainability Issues*, Vol. 7, No. 1, 603-614, 2019.
- [25] Y. Kostyukhin. Conceptual provisions of sustainable development of socio-economic systems (on the example of an industrial enterprise), *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM*, Vol. 19, 131-138, 2019.
- [26] Y. Frolova, T. Sakulyeva, K. Hammam. The relationship between corporate responsibility and the performance of the company, *Opcion*, Vol. 36, Special Edition 27, 1134-1150, 2020.
- [27] S. N. Amirgalieva, V. V. Ostapenko, I. N. Tereshchenko. Invariant sets in the discrete game of retention, *Cybernetics and Systems Analysis*, Vol. 41, No. 2, 284-288, 2005.
- [28] A. Lapidus, I. Abramov. Systemic integrated method for assessing factors affecting construction timelines, *MATEC Web of Conferences*, Vol. 193, 05033, 2018.
- [29] D. V. Topchiy, A. I. Shatrova. Formation of a basic management strategy for a construction organization in the implementation of projects of redevelopment of major urban areas, *International Journal of Mechanical Engineering and Technology*, Vol. 9, No. 4, 539-547, 2018.
- [30] R. Sultanbekov, M. Nazarova. The influence of total sediment of petroleum products on the corrosiveness of the metal of the tanks during storage, *E3S Web of Conferences*, Vol. 121, 01015, 2019.
- [31] S. G. Fadyushin, E. A. Vereshchagina, Y. V. Pafnuteva. Assessment of the decisions made by the marine vessel navigator, *IOP Conference Series: Materials Science and Engineering*, Vol. 918, No. 1, 012074, 2020.
- [32] L. Obolenskaya, E. Moreva, T. Sakulyeva, V. Druzyanova. Traffic forecast based on statistical data for public transport optimization in real time, *International Review of Automatic Control (IREACO)*, Vol. 13, No. 6, 264-272, 2020.
- [33] O. M. Sumets M. O. Kyzym, P. S. Syromyatnikov, O. V. Kozureva, O. O. Tsvirko. Financial flows in logistics systems of production enterprises, *Financial and Credit Activity: Problems of Theory and Practice*, Vol. 3, No. 30, 165-175, 2019.
- [34] A. M. Borges, T. N. Sakulyeva, Z. S. Tulenbayev, B. Z. Kozhageldi, R. A. Karabassov. Exogenous and endogenous factors of innovative development of the oil and gas corporations, *Journal of Environmental Management and Tourism*, Vol. 11, No. 5, 1231-1239, 2020.
- [35] A. Lapidus, N. Cherednichenko, V. Smotrov. The impact of technology installation of injection mortar systems for a long term behavior of anchor connections, *Procedia Engineering*, Vol. 153, 371-377, 2016.

- [36] D. Topchiy, A. Tokarskiy. Formation of hierarchies in the system of organization of state construction supervision in case of reorientation of urban areas, *Communications in Computer and Information Science*, Vol. 1046, 134-143, 2019.
- [37] S. G. Fadyushin, E. A. Vereshchagina, A. B. Kayak. The human navigation element as a statistical parameter in the information aspect, *IOP Conference Series: Earth and Environmental Science*, Vol. 459, No. 3, 032079, 2020.
- [38] F. Harrison. *The Managerial Decision-Making Process*, Houghton Mifflin Company, Boston, 1999.
- [39] L. O. Vdovenko. Mechanisms of bank lending in the agricultural sector, FOP Korzun D. Yu, Vinnytsia, 2013.
- [40] O. O. Nepochatenko. Organizational and economic mechanisms of lending to agricultural enterprises, UVPP, Uman, 2007.
- [41] N. A. Hnyp. Formation of the financial potential of the enterprise by funding sources, *All-Ukrainian Scientific and Production Journal Innovative Economy*, Vol. 5, 270-274, 2011.
- [42] N. Trusova. Systemic factors of projected financial potential of business entities, *Economic Annals*, Vol. 161, No. 9-10, 61-65, 2016.
- [43] Passenger transportation. *Transport*, 2012, Online available from <https://ukrstat.org/en>.
- [44] *Transport and Communications of Ukraine*, 2019, Online available from <https://ukrstat.org/en>.
- [45] A. N. Dunets, I. B. Vakhrushev, M. G. Sukhova, M. S. Sokolov, K. M. Utkina, R. A. Shichiyakh. Selection of strategic priorities for sustainable development of tourism in a mountain region: Concentration of tourist infrastructure or nature-oriented tourism, *Entrepreneurship and Sustainability Issues*, Vol. 7, No. 2, 1217-1229, 2019.
- [46] State Road Fund: decentralized financing of roads, 2018, Online available from <https://www.dw.com/uk/market-road-fund-decentralized.../a-4200003>.
- [47] The challenge. Sustainable road transport, 2020, Online available from https://www.unescap.org/sites/default/files/roadprice_ch1.pdf.
- [48] Rating of regions by road repair costs, 2018, Online available from <https://news.finance.ua/ua/news/-/431690/miu-opublikovalo-rejtyng-oblastej-za-vydatkami-na-remont-dorig-infografika>.
- [49] State Agency for Infrastructure Projects of Ukraine, 2018, Online available from <https://www.kmu.gov.ua/ua/uryad-ta-organi-vladi/derzhavne-agentstvo-infrastrukturnih-proekti-v-ukrayini>.
- [50] N. V. Trusova, N. S. Tanklevska, O. S. Prystemskyi, O. V. Hryvkivska, N. O. Advokatova. Determinants of the development venture financing of the subjects of agrarian market of Ukraine, *Asia Life Sciences*, Vol. 21, No. 1, 377-398, 2019.
- [51] N. V. Trusova. Financial flows and organizational and economic relations: sanctuaries and patterns, *First Independent Scientific Bulletin*, Vol. 2, 14-21, 2015.
- [52] A. G. Belousov, E. A. Abramova. *Experimental Development of Integrated Matrices of Financial Flows*, Interprax, Moscow, 2003.