



Gintautas LABANAUSKAS

**SUBSTANTIATION OF INVESTMENTS
INTO DEVELOPMENT OF THE PRIORITIZED
OVERLAND TRANSPORT INFRASTRUCTURE
IN LITHUANIA**

Doctoral Dissertation Summary
Social Sciences, Economics (04S)

1728-M

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

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VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETAS

Gintautas LABANAUSKAS

**LIETUVOS SAUSUMOS TRANSPORTO
INFRASTRUKTŪROS PRIORITETINĖS
PLĖTROS INVESTICIJŲ PAGRĮSTUMO
METODINIS VERTINIMAS**

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Introduction

During the last several years till the beginning of the global financial crisis Lithuania's economy was rapidly growing as per high percentage of GDP, growing sales and profitability of the industrial sector. These indicators speak about Lithuanian industry and different business areas being capable of adjusting to the complicated international market environment. Important factors leading to a faster and stable growth of the country's economy are implementation of modern technologies, renovation of companies, introduction of new operation processes as well as expeditious investment possibilities and communication system effective functioning.

Nowadays continuously intensifying processes of economic, social and political globalization necessitate foundation of large transport companies and integration of the existing transport systems of different countries into one global system thus forming international transport corridors that ensure faster movement of vehicle flows (as well as material goods, i. e. cargoes) between different countries, the entire process being based on application of modern logistic know-how for cargo carriage.

Integration of Lithuania's transport network into a common European transport system would be a good opportunity to attract additional transit flows and to warehouse cargoes in the logistic centres or terminals, at the same time creating rational transit transport policy and implementing one of the main principles of the European Union internal market – the principle of bilateral recognition which ensures free trade and mobility of goods. Evaluation of current situation and tendencies on the market shows that development of missing connecting chains, transport terminals and logistic centres is one of the main areas within our present national transport system which requires maximum potential of the country to capacitate handling of international cargo flows, etc. Changes in the international business market demand not only modernization of the current infrastructure by implementing intended development projects but also application of modern technologies for the management of transport and cargo flows by employing new chains of transport network, transport terminals and logistic centres that in the nearest future would ensure competitive ability of Lithuania on the international business market.

Having recognized the importance of transport infrastructure in the context of global environment, in this dissertation the effect of the prioritized infrastructure subjects is studied with the view of the impact of the infrastructure subjects on the country's economy, i. e. the effect of new chain centres and terminals as practicable business tools that help building up *economic value* of Lithuania as the State, and at the same time highlighting theoretical and methodical assumptions for the development of the missing network links.

Problem Formulation

The problem being researched can be defined as enunciation of methodical basis of research of effect of missing objects inside the transport network (connecting transport chains, logistic centers and transport terminals) on the economic development of Lithuania, and application of this methodological basis validating investments.

Relevance of Research

Presently, advance of the economy, development of countries and welfare created is depended on how they integrate in globalization processes, implementation and application of global technologies, cooperation and interchange of raw materials and production. Integration of logistics centers and transport terminals into the transport system pays the key role in these processes. It has an influence to successful economic development of the state because it directly participates in international interchange of raw materials and production (goods) and stimulates international cooperation.

Therefore on purpose to reveal main factors determining attraction of the countries in organizing the process of international cargo carriage and modeling development of transport system and state economy, it is necessary to fulfill the complex evaluation of validity of building of missing links of the infrastructure, the role of logistic centers and transport terminals in order new transport links would be loaded enough.

Objective and Tasks of Research

The objective of the research is to analyze the hypothetical significance and influence of new transport chains on business as well as enunciation of theory based economic assumptions and methodical solutions for the development of prioritized infrastructures and inter-terminal carriages.

Implementation of the objectives generates the following tasks:

1. To analyse various scientific approaches (technological, environmental, political, legal, economic, social aspects) towards missing transport links logistic centres and transport terminals as a uniform process for the development of the country's economy and as a constituent part of transport system development.
2. To perform the systemic analysis of the economic conditions and the development determining factors (legal, technical, political, etc.) for the development of the transport chains and terminals.
3. To substantiate the principals of evolution of risk of investments into the missing subjects of the national transport infrastructure.

4. To perform the systemic analysis of the economic conditions for the development of transport chains and terminals and to study their impact (legal, technical, political, etc).
5. To estimate a potential influence of the subjects of transport infrastructure, also economic quantitative and qualitative changes in cargo flows on the transport sector and an overall national economy.

Research Methodology

With the aim to analyze theory based assumptions of transit and internal transport flow formation, in this dissertation the comparative scientific publication analysis, based on the principle of systematization, has been approached.

The method of logical-analytical analysis has been mainly applied. It has been done due to multi-planned nature of the subject under analysis and because of incomparability of factors such quantitative methods – multi-criteria analysis employing theory based data of the two main topics – efficiency evaluation of the external missing chains, logistic centres, transport terminals and verification of hypothesis.

Scientific Novelty

The methodology of investments reasoning in missing objects of transport infrastructure is created, considering enhanced investments risk, gradual development of infrastructure links and transport attraction of missing objects.

Practical Value

1. Methodical basics for evaluation of the risk related to lack of investments into missing subjects of transport infrastructure (Rail Baltica, infrastructure connections with public logistics centres) has been formulated.
2. Methodical basis for adapting models of classic investments into transport infrastructure while evaluating investments into hypothetical subjects of the infrastructure has been worked out.
3. Methodic principles for substantiating the development of transport terminals and infrastructure has been formulated.

Defended Propositions

1. Methodology comprising technical, legal, economical, investments risk and organizational aspects is created, referring to which the validity of investments into the missing infrastructure links is grounded.

2. The task of modal redistribution of loading and transport flows may be achieved only by building the missing transport links and developing the net of logistic centers and transport terminals.
3. Assessment of investigation and possible economical effect to quantitative changes of transit flows through territory of Lithuania of new elements of road and railway net, logistic centers and transport terminals.

Structure of Dissertation

The dissertation comprises introduction, three chapters and general conclusions, bibliography, the list of the author's publications and annexes.

The work is comprised of 126 pages, the text includes 33 numeric formulas, 23 schemes and 13 tables. The dissertation was written referring to 136 sources of literature.

The first chapter analyses Lithuanian and foreign scientific approaches towards the evolution of transport system, the prospects of infrastructure development, principals of integration into the EU transport system, provides hypothetical scheme of actions that influence multimodal cargo carriage. The second chapter deals with the impact of transport infrastructure on the effectiveness of social-economic development of the country.

The third chapter is dedicated to the analysis of long-term planning of transport terminals in Lithuania, the process of establishing the system of transport terminals. The chapter also provides the analysis of economical effectiveness when integrating transport terminals and logistic centers into the national transport system.

The final part of the dissertation provides the summary of the results.

1. Theoretical Analysis of Transport System Functioning

Active and well-developed foreign trade guarantees high level of economy in each country. To ensure sustainable trade relations a state needs to have well-developed transport networks, because when entering into a contract such factors as transportation conditions, delivery time and carriage costs are always under consideration.

Today it is evident that the main movers of the market are modern transport networks and high-quality transport service. If not for them, the economy would not grow so fast. This axiom reveals one more important moment whilst establishing logistic centres and transport terminals – reciprocity between modernization and development of transport infrastructure and formation of logistic centres' network.

Having analysed theory based aspects of combined and intermodal cargo carriage it is true to say that the development of Lithuania as the country of

“transit and logistics“ must be supported by theoretical assumptions on the integrated development of transport infrastructure, combined and intermodal cargo carriage as well as on logistic centres and terminals that find their expression within paradigm environment by the theories a) of total expenditure and customers’ service and b) of surplus value.

Risk management is one of the key issues when planning investments into intermodal transport infrastructure. Investment decision-making requires thorough analysis of the problem both, on the national and international scale, and only then the most rational decision (project) can be made with the view of the effective risk lowering, i. e. seeking the least possible costs.

The main cause of the risk while investing into transport infrastructure is uncertainty conditioned by the following factors:

1. Instability of international economy which is not easy to predict.
2. Lack of accuracy and information on the overall processes of international intermodal carriage that strongly limits resources (finance, timing and others) and decision-making opportunities.

Uncertainty related to possible absence of objective information that is either not full or lacking thorough research of the market from the point of view of economic, political or any other aspects.

The aim of the risk evaluation when investing into infrastructure is to safeguard against disastrous losses and to minimize the amount of the capital lost. Assessment of infrastructure development risk may be divided into the following constituents:

- project being economically provided with a certain profit guarantee;
- ensuring positive social effect;
- ensuring community’s support and solution of political problems.

When making the quantitative and economic assessment of the risk the theory of chances and mathematic statistics are most commonly used methods because they are denoted to describe an event or a process in case of ambiguous possibilities.

It is worth mentioning that in practice when making analysis of a certain subject – an enterprise, a project or alike, the issues of risk assessment and management are often confused in-between the subject’s risk, i. e. possibility to sustain loss because of such risk factors as the costs of fuel, inflation, interest rate, etc and the riskiness of actions. Such factors as currency exchange rates, the degree of inflation and others are considered to be the external risk factors.

The risk itself to a great extent depends on the subject’s ability to manage the risk and to conform to the riskiness of the risk action. One may consider ten percent to be nothing more than lower profits, the other may take it for the ban-

krupcty alarm with all its consequences. Therefore it is worth remembering that a subject – be it a transport company, a working project, etc, is not intended to manage such factors as interest rate, currency exchange rate, riskiness of social or political situation but is tasked to solve local, technically nonetheless complicated task – to manage the problems related to a subject's risk or possible losses.

Both, for determining a possible value of probability distribution and for formulating the criteria of decision-making the methods specific for probability theory evaluations should be applied. Often the process of formulating the criteria for decision-making is not easy. Moreover, nowadays there is a great variety of software for solving tasks of stochastic programming and others that involve stochastic variables and limitations. For this work the computer program Simulacion 4.0, allowing with a sufficient accuracy and at a wanted system complexity to do criteria calculations, was used. Therefore now in most cases of stochastic process analysis conceptual problems rather than technical decision-making difficulties occur.

One of the most complicated problems among those of risk management when making concept based investments, including investments into transport infrastructure, is commensuring the efficiency and riskiness of the event or process under analysis, i. e. assessment of the value of stock dividends' increase that would justify acquisition of a more risky stock, or what should be the growth in mean profitability of the investment into a business to encourage taking a variable interest rate loan.

Solution of these problems is more advanced in theory and practice of investment decision-making. The studies of fundamental investment decision-making (H. Markowitz, 1952; W. F. Sharpe, 1963; J. Tobin, 1965; Ch. Vaughan, 1997) disclose the existence of the efficient line in the mean profitability-risk plane, which is measured by profitability standard deviation. The main characteristics of the efficient line is that its points – investment possibilities, measured against profitability-risk indicators, cannot be improved on account of reducing mean profitability or riskiness if the value of the collateral parameter for evaluation is not changed.

In practice we pretty often have to face the natural risk management problem when trying to find the optimum (rational) distribution of the capital for the risk management among different risk groups. Solution of this problem is one of the most complete theories of investment portfolios.

Computer programs created at Vilnius Gediminas technical university Faculty of Business Management have been used to solve stochastic programming targeting at establishing the optimal proportions of the risk management capital among the three risk groups (portfolios).

It is understandable that formation of quantitative risk management strategies requires a comprehensive and reliable system of information accumulation and generation. This process is intellectually and materially demanding but its effect would pay back once the risk is successfully managed.

It is very important that information system development receives a proper concern. In the theory of investment great attention is given to evaluation of the decision possibility (reliability) guarantee. As one of the measures for the information system development and cultivation of the investment criteria adequacy is classification of decision possibilities (A. Rutkauskas, A. Miečinskienė, V. Stasytė, 2008), taking into account possibility efficiency and reliability as well as the level of riskiness which depends on the riskiness of the processes under analysis (interest rate, currency exchange rate and alike) and on the ability of a subject – the recipient of the risk consequences to manage it.

2. Economic Aspects of Developing Chains of Transport Infrastructure

Level of the modern scientific-technological advancement requires radical changes in the society's attitude towards efficiency of social-economic measures designed for the development of the specific branches of material production and assessment of their functioning, and transport in particular. Currently, the choice of one possible alternative investment into development of infrastructure is often predetermined by personality and lobbyist practice instead of invoking the comparative theory of economic efficiency. Selection of the European level projects is often based on typical methods applied for the assessment of investments and economic efficiency of modern technology.

Consequently, assessment of objective integrated investments into public transport sector as a very specific branch of economy should necessarily be evaluated as multiple indicators affecting different spheres of community, and the final solution should be drawn when all multi-criteria indicators are well appraised.

Investment projects' efficiency according to the description given in the "Investment Guide", is a category reflecting a project's conformity to the goals and interests set by its participants.

The general scheme of the investment project efficiency consists of the two stages. In case of the transport infrastructure projects at the first stage general indicators of the project efficiency are estimated enabling to make an aggregated economic assessment of possible variants of the projected decision, the so called commercial efficiency. Evaluation of the commercial efficiency is carried out only in those cases when the project is considered to be of great value to the society. Evaluation of a possible financing scheme, revision of the investors' list as well as assessment of the financial possibility of the project imple-

mentation and its efficiency are carried out in the second stage. With the investment projects run by the State it is recommended for their evaluation to apply complex analysis.

Based on the EU methodical recommendations and the Lithuanian Manual for Road Investments the system of criteria indicators for evaluation of road and railway projects' efficiency have been set, comprised of:

1. Integral effect (E integr.) – the total of the discounted (given for a certain period of time) effects for the entire period of the project life cycle;
2. Profitability Index (PI) – ratio of the sum of diverse results and the present costs to the amount of investment;
3. Internal Rate of Return (IRR), i. e. a fixed discount rate over a certain period of time that makes the sum of the diverse results and the present costs be equal to the sum of the given investments;
4. Payback period depending on discounting- a minimum period of time from the start-up of the project implementation beyond the limits of which the integral effect becomes and remains positive;
5. Integral costs (IC) – the sum of the costs over the entire period of the project life cycle.

Solution of the optimized transport tasks with the view to onetime costs of investment into road and railway transport infrastructures for building connections with logistic centres and terminals (reconstruction, major repairs, etc) as well as cargo flows (by roads and railways) is very important when choosing the most economically rational criterion: „minimum integral costs“, meaning:

1. Investments made during the construction period (reconstruction and others) – KI;
2. Investments that are needed for the execution of the planned reconstruction works, to forward or to renew a technical road project (if any) during the accounting period of its operation – KR;
3. Investments into road or railway transport at the initial stage of the subject operation – KID;
4. Additional annual investments into road or railway transport to meet the yearly increase in the regional transport needs – KP;
5. The scope of community expenditures on redeeming of valuable lands to make implementation of road and railway projects possible – KL;
6. Value of circulating funds which conforms yearly production and consumption on the roads, i. e. in the state of „freeze in“ – KF.

The first two indicators of onetime costs (KI and KR) that in the investment road and railway projects indicate investments into construction (reconstruction) works are always well considered. The value of these indicators is assessed for each variant of transport tasks in accordance with an estimated value.

The third indicator (KID) – investments into road or railway transport that are necessary for performing cargo carriage at the start-up of the exploitation, and the recommended calculation could be made according to the equation:

$$K_{oa} = \frac{A}{Ta} \left(\frac{Qo}{qc\beta\gamma} t_{pr} + \sum_i \frac{P_{oi}}{vqc\beta\gamma} \neq t_n \right), \quad (1)$$

where:

A – comparative investments into units of transport means and a company's infrastructure for the region's one recorded automobile or van;

T_a – exploitation period of one unit of transport in hours within duration of one year;

t_{pr} – mean duration of outage of a transport unit in hours wasted for its loading in one voyage period;

Q – general size of carriage by roads or railway in tones within one year period;

t_n – loses sustained due to outage at the crossroads, railway crossings, and boarder crossings;

P_{oi} – annual turnover of cargo carriage by road or railway transport within one year period to the road or railway type, t/km;

i – number of road and railway types in a region;

v – technical velocity of a cargo transport on a certain type of roads, km/h;

q_c – mean nominal load of one transport unit in tons;

β, γ – run and load coefficients of transport units.

The size of space m² allotted for warehouses, logistic centres and other premises under construction is estimated according to the amount of loads in inventory:

$$F = \frac{q_1}{k\delta}, \quad (2)$$

where: k – coefficient of the useful storage place;

δ – loading rate per one square meter of the useful storage space (in tons per sq. m). Hence the investments into the construction of warehouses, logistic centres and other premises should be calculated as follows:

$$K_{is} = S_1 \frac{q_1}{k\delta} + S_2 q_2, \quad (3)$$

where: S₁ – mean construction costs of one sq. meter of a general warehouse;

S₂ – construction costs of a special-designed warehouse (refrigerated, for storing hazardous goods) per one ton of load.

Amount of the annual loss due to the increased need for circulating asset (K_n) which is conditioned by the need to accumulate load stores in case of seasonal or traffic constraints (road blockades, institutional actions – Latvia, Russia) when some roads are not used, is calculated dependent on the duration of outage defined by equation:

$$K_n = \frac{K_{vka} Q \Theta}{24}, \quad (4)$$

where: Q – total amount of the projected annual material resources, in tons;
 K_{vka} – mean costs of one ton of material goods in accumulated stocks;
 Θ – duration of the period when transport exploitation is stopped.

When comparing possible variants for transport- related problem solution it is important to project operating (running) costs that are comprised of:

- costs of yearly repair and maintenance of regional roads or railways (C_{tgc});
- costs of intermediate road repair, assigned to one year service between the repairs (C_{tgp});
- costs of yearly cargo carriage in each variant under comparison (C_{tper});
- public (external) losses due to traffic accidents (C_{tken});
- public (external) losses due to irregular traffic flows (C_{treg}).

Costs of yearly road or infrastructure connection repairs and maintenance may be determined, irrespective of traffic intensity and volume of carriage (because these costs compared to others are relatively low), by applying calculation normative or on the grounds of perennial statistical data.

Similarly the costs of yearly intermediate road or railway connection repair may be estimated.

Costs of yearly cargo carriage in each possible variant of road or railway connection construction (reconstruction) under comparison may be determined as to their component parts: drivers' salaries, including prepayments and extra-payments (C_{tat}), variable costs (C_{tkin}), fixed costs (C_{tpast}), taxes and charges (C_{tmok}), and are estimated by the equation:

$$C_{tper} = C_{tat} + C_{tper} + C_{tpast} + C_{tmok}. \quad (5)$$

However, estimation of one-time investments into labour resources necessary for the maintenance of different category roads or railways and for creating required transport infrastructure is not enough. Aside from the labour costs that include workers' salaries, it is necessary to estimate additional operating labour costs, related to formation of social funds, improvement of working conditions, etc. Therefore the list of operating costs for separate variants under

comparison will not be full without assigning additional operating costs for labour resources (C_{ldr}).

Hence, comparative economic evaluation of possible variants of investment project according to the criterion “minimum integral costs” should also include estimation of operating costs:

$$C_{tbendr.} = C_{tgc} + C_{tgp} + C_{tper.} + C_{tmok.} + C_{tpapild.} + C_{treg.} + C_{tdr} \quad (6)$$

Economy based grounding of the optimal choice from all possible variants when solving specific tasks of the transport sector, depends on the economic expedience of the constructed subject. The main factors of effective usage of investments become apparent in the process of solving the task of road or railway network development optimization.

3. Development of Transport Terminals and Efficiency Evaluation of Inter-Terminal Carriage

At the carriage interval up to 1500 km the inter-terminal system efficiency is rapidly increasing with an increase in the distance. In case of a comparatively short distances, making economies at international terminals does not redeem neither the costs of additional investments into terminals nor the costs of bringing in (in the existing systems such costs at short distances are rather low because of a big share of carriages made by automobiles).

The given graphs may be explained as follows:

At the interval from 1500 to 3000 km the inter-terminal system is more effective than the existing one but relative efficiency remains practically unchanged. This is due to two contra-direct factors: reduction in costs with the increase in distance in case of the inter-terminal system and reduction in costs due to the decrease in the share of direct carriage by automobiles in case of the existing systems.

Hence in any of the cases we may refer to the distance intervals that are objectively rational in substantiating establishment of the combined transport terminals. (logistic centres).

Based on the relationship discussed, different system parameters have been analysed for substantiation of terminal efficiency.

Distance of transportation. The impact of the bringing distance on the main carriage (Fig. 1) is tangible within the interval from 500 km to 1000 km. If the distance between the regions is bigger than 1500 km, the distance of bringing in – bringing out will further affect the correlation of costs even on comparison of the terminal variant with the existing system, the terminal variant would still seem a more acceptable one. If the transportation distance is bigger than 3000 km, values of bringing in – bringing distances practically will

be less influential on the decrease in general efficiency of the inter-terminal carriage as compared to the existing system.

Costs of loading units' handling. Costs of the comparable investments for one container handling inside the terminal make big difference only in the case of relatively short distances but even then they do not exceed 10% of the total costs in the inter-terminal system. Costs of handling in the terminal have no effect on the new carriage system efficiency.

Costs of investments. Investment costs for one loading unit handling in the inter-terminal system may have double approach (Fig. 2). On the one hand their extent reflects comparative costs of the infrastructure. On the other hand, if loading capacities at the terminal are not stable, this value may be considered as the indicator of the insufficient loading volumes as compared to the normative values.

The speed of carriage between the transport terminals is of a little influence. The speed of carriage between the terminals has a very slight impact on the total carriage speed.

The results obtained prove the statement that within the combined transport system the speed is not as important as accuracy in delivery time and attractive competitive tariffs.

Cost price of carriages between the terminals is highly decisive for the system efficiency and conditions not only the relative cost price of carriages but also the value of the “efficiency interval”, i. e. the distance at which the inter-terminal carriage becomes expedient.

With the view that the impact of the constituent parts of the investment on terminals' efficiency is rather low, we may conclude that all investments into know-how to raise up to the maximum the efficiency of the international carriage are sure to pay dividends.

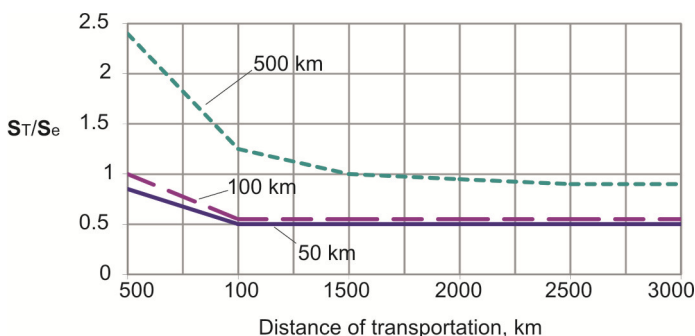


Fig. 1. Relation between the costs of bringing carriage S_T and the carriage in the case the existing system

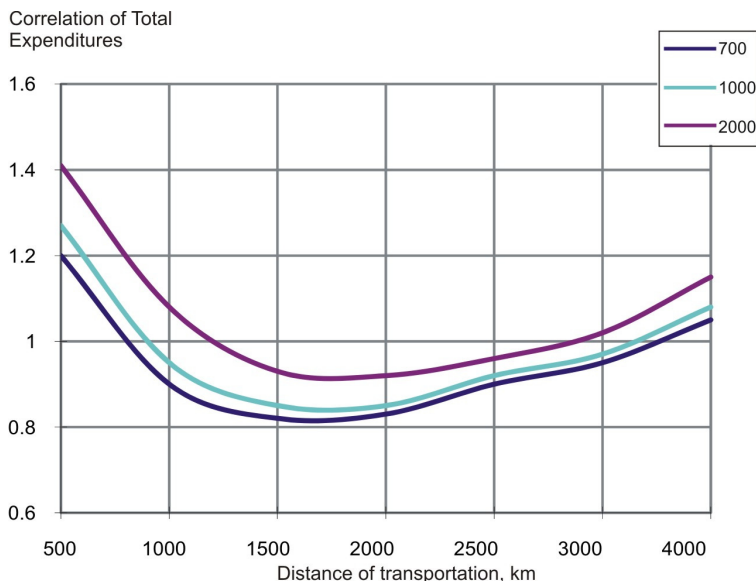


Fig. 2. Terminal investment efficiency for one loading unit
(1 carr. = 100 km, $S_{zkt} = 0.2$)

The analysis has shown that the main factor to determine the system efficiency, including the distance of highway carriage is the costs of loading units' carriage in-between the terminals. Its value depends on the intensity of cargo flows, carriage management as well as the level of the applicable know-how.

The terminal system under development should reduce the number of long-distance highway carriages. Based on the calculations, they can be economically grounded and able to compete with railways in the case when the distance between the points of bringing in and bringing out is no longer than 1000 km, and the distance between the nearest terminals is no bigger than 300–400 km or in case when there are no terminals in the region at all.

Increased usage of highway transport is possible through expanding inter-modal carriages where both modes of overland transport supplement one another. With railway network being inadequately developed intermodal railway-road transport service is required to sustain further development of transport services.

General Conclusions

1. The analysis of the international cargo carriage has revealed that ongoing changes in the overall international business sector require not only modernization of the existing infrastructure and implementing the main developmental projects of the country but also to apply modern transport and cargo flows' management technique by using transport terminals and logistic centres to ensure in the future competitiveness of Lithuania in the international business market.
2. During the research was stated, that the risk is one of the main issues when planning investments into intermodal transport infrastructure. The major causes of investment riskiness relate to international economy instability, lack of clearly defined and accurate information on the overall processes of international intermodal carriage, absence of objective information due to inconsequent market research as regards interpretation of economic, political and other aspects.
3. It is stated that at present for the evaluation of investments into the national transport infrastructure objects is used standard assessment methodology. For the evaluation of investments assessment to the transport infrastructure main objects must be used comparative multiple criteria methodology with reference to of transport sector development strategy.
4. It was identified that the investments in to the governmental transport infrastructure must be related with the transport development strategic programme and justified using the complex of multicriterion indicators.
5. Among the most objective and practically applicable methods the method of "multistage dynamic model approximation" or the method of "several statistical sections" is most commonly used for it allows estimating the total (integral) disposable and operative costs for all the enlisted transport infrastructure needs of the region (its road, construction and maintenance of stationary buildings, etc). The most optimal and objective results are depend on the precise determination of total cost value parameters at each of their statistical section.
6. It is determined that the main characteristics of the combined transport infrastructure must conform the level of aggregation which is projected in macroeconomic forecasts and programs and in compliance with the provisions of transport system infrastructural development. The characteristics of the combined transport infrastructure must be defined by the criteria of space, hierarchy and entrepreneurship.
7. The analysis of infrastructural objects of transport terminals demonstrates that in the context strategic planning of terminal development main objects are complexes of terminals in largest transport nodes

which fall in composition of distribution centres of international and national level. They play the role of the most important nodes of macro-logistic system and determine the development of international trade using the new underlying infrastructure chains.

8. Calculations made on the grounds formulated methods have shown that the main efficiency factor for the integration of transport terminals into the transport system is the distance and cost price of highway carriage. It is proved that when the distance of inter-terminal carriage is 500 km, 40,7% of all carriage expenses are delivery to terminal expenditures. They decrease significantly when the carriage distance increases (2000 km – 21,11%).
9. Calculations demonstrated that in case of international inter - terminal carriage, road transport can be optimally used and ensures performance of carriage in and out operation zone of terminals, also transportation of loading units by road can be used in the directions whereby carriage by railway is impossible or technologically inexpedient. This kind of carriage is most suitable when rendering intermodal services.
10. The role of public and private partnership (PPP) model when implementing financing programs of missing objects of transport infrastructure is more complementary than completely replacing investment sources.

Author's publications on the dissertation topic

Articles in scientific reviewed journals

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Articles in other publications

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5. Labanauskas, G.; Petružis, G. 2006. The Present and the Future of the Lithuanian Inland Waterways, *Scientific conferences at the General Jonas Zemaitis Lithuanian War Academy*, 24–30. ISBN 9955-423-57-9.

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LIETUVOS SAUSUMOS TRANSPORTO INFRASTRUKTŪROS PRIORITETINĖS PLĖTROS INVESTICIJŲ PAGRĮSTUMO METODINIS VERTINIMAS

Problemos formulavimas

Tiriamąją problemą galima apibrėžti, kaip trūkstančių šiuolaikiniame transporto tinkle objektų (jungiamųjų transporto grandžių, logistikos centrų ir transporto terminalų) poveikio Lietuvos ūkio plėtrai tyrimo metodinių pagrindų sudarymą bei jų pritaikymą, pagrindžiant investicijas.

Darbo aktualumas

Šiandieninėje aplinkoje ūkio pažanga, šalių raida ir kuriama gerovė priklauso nuo to, kiek jos įsijungia į globalizacijos procesus, pasaulinių technologijų diegimą bei taikymą, tarpusavio bendradarbiavimą, žaliavų ir produkcijos mainus. Šiuose procesuose logistikos centrų ir transporto terminalų integracijos į transporto sistemą procesui tenka vienas iš pagrindinių vaidmenų, turintis įtakos sėkmingai valstybės ekonominei plėtrai, kadangi tiesiogiai dalyvauja tarptautiniuose žaliavų bei produkcijos (prekių) mainuose, skatina tarptautinį bendradarbiavimą.

Todėl siekiant atskleisti svarbiausius veiksnius, lemiančius šalių patrauklumą, organizuojant tarptautinį krovinių vežimo procesą bei modeliuojant transporto sistemos ir šalies ūkio plėtrą, būtina kompleksiskai įvertinti trūksta-

mų infrastruktūros grandžių tiesimo pagrįstumą, logistikos centrų ir transporto terminalų vaidmenį, kad naujos grandys būtų pakankamai apkrautos.

Darbo tikslas ir uždaviniai

Disertacinio darbo tyrimo tikslas yra ištirti hipotetinę naujų transporto grandžių ir terminalų reikšmę bei poveikį verslui, suformuluojant teorines ekonominės prioritetinės infrastruktūros ir tarpterminalinių vežimų plėtros prielaidas bei metodinius sprendimus.

Siekiant įgyvendinti tikslus, formuluojami šie uždaviniai:

1. Apibendrinti įvairius mokslinius požiūrius (iš technologijos, aplinkosaugos, politikos, teisės, ekonomikos, socialinės aplinkos pozicijų) į trūkstamas transporto grandis, logistikos centrus ir transporto terminalus, kaip šalies ūkio ir transporto sistemos sudėtinės dalies plėtros viešiną procesą.
2. Atlikti transporto grandžių ir terminalų plėtros ekonominių sąlygų ir plėtrą lemiančių veiksnių (teisinių, techninių, politinių ir kt.) sisteminę analizę.
3. Pagrįsti investicijų rizikos į trūkstamus Lietuvos transporto infrastruktūros objektus vertinimo principus.

Tyrimų metodika

Analizuojant teorines tranzito srauto susiformavimo prielaidas, disertaciniame darbe naudojama sistemiškumo principu paremta lyginamoji mokslinės literatūros analizė.

Pagrindinis darbe taikomas metodas yra loginis-analitinis. Dėl didelio analizuojamojo objekto daugiaplaniškumo bei veiksnių nepalyginamumo kiekybiniai metodai, taikant daugiakriterę analizę, naudojant teorinius duomenis dviejų pagrindinių temų: išorinio trūkstamų grandžių, logistikos centrų, transporto terminalų poveikiui įvertinti ir hipotezėms patikrinti.

Darbo mokslinis naujumas

Sukurta investicijų į trūkstamus transporto infrastruktūros objektus kompleksiško pagrindimo metodika, įvertinanti padidintą investicijų riziką, etapinę infrastruktūros grandžių plėtrą ir trūkstamų objektų transportinį patrauklumą.

Praktinė reikšmė

1. Sukurti metodiniai pagrindai klasikinių investicijų modeliams į transporto infrastruktūrą adaptuoti, vertinant investicijas į hipotetinius infrastruktūros objektus (Rail Baltica, infrastruktūros jungtys su viešaisiais logistikos centrais).

2. Sukurti transporto terminalų įtakos vežimų naujomis infrastruktūros grandimis ekonominio pagrindimo vertinimo metodiniai pagrindai.
3. Suformuluoti investicijų į trūkstamus transporto infrastruktūros objektus rizikos vertinimo metodiniai pagrindai.

Ginamieji teiginiai

Disertacijoje ginamos nuostatos:

1. Sudaryta metodika, apimanti techninius, juridinius, ekonominius, investicijų rizikos ir organizacinius aspektus, kuria remiantis grindžiamas investicijų į trūkstamas infrastruktūros grandis pagrįstumas.
2. Modalinio krovinių ir transporto šrautų persiskirstymo uždavinys gali būti įgyvendintas tik nutiesiant trūkstamas transporto grandis ir plėtojant logistikos centrų bei transporto terminalų tinklą.
3. Kelių ir geležinkelių naujų tinklo elementų, logistikos centrų bei transporto terminalų tyrimo ir galimo ekonominio poveikio tranzitinių šrautų kiekybiniais pokyčiams per Lietuvos teritoriją vertinimo metodika.

Darbo struktūra

Disertaciją sudaro įvadas, trys skyriai, bendrosios išvados, literatūros sąrašas, autoriaus publikacijų sąrašas ir priedas.

Darbo apimtis yra 126 puslapiai, tekste panaudota 33 numeruotos formulės, 23 paveikslai ir 13 lentelių. Rašant disertaciją, panaudoti 136 literatūros šaltiniai.

Pirmajame skyriuje analizuojamas užsienio šalių ir Lietuvos mokslininkų požiūris į transporto sistemos evoliuciją, infrastruktūros plėtros perspektyvos, nagrinėjamos integracijos į ES transporto sistemą nuostatos, sudarinėjama hipotetinė veiksmų, sąlygojančių multimodalinius krovinių vežimus schema.

Antrasis disertacijos skyrius skirtas transporto infrastruktūros įtakos šalies socialinės-ekonominės plėtros efektyvumo didinimo analizei.

Trečiajame skyriuje nagrinėjamas transporto terminalų poreikio Lietuvoje ilgalaikis planavimas, transporto terminalų sistemos formavimo procesas, pateikiama transporto terminalų ir logistikos centrų integracijos į šalies transporto sistemą efektyvumo analizė.

Disertacijos pabaigoje pateikiamas rezultatų apibendrinimas.

Bendrosios išvados

1. Mokslinių požiūrių į tarptautinius krovinių vežimus analizė parodė, kad tarptautiniame versle vykstantys pokyčiai reikalauja ne tik modernizuoti esamą infrastruktūrą, realizuojant svarbiausius šaliai plėtros projektus,

bet ir taikyti modernias transporto ir krovinių srautų valdymo technologijas, įvertinančias transporto terminalų ir logistikos centrus panaudojimą, kurios ateityje užtikrintų Lietuvos valstybės konkurencingumą tarptautinėje verslo paslaugų rinkoje.

2. Atlikus tyrimus paaiškėjo, kad rizika yra viena iš pagrindinių problemų planuojant investicijas į intermodalinio transporto infrastruktūrą. Pagrindinė investicijų į transporto infrastruktūrą rizikos atsiradimo priežastis – nekonkretumas, susijęs su tarptautinės ekonomikos nestabilumu ir informacijos trūkumu apie visus intermodalinius tarptautinių vežimų procesus bei tam tikru neapibrėžtumu dėl objektyvios informacijos trūkumo, netinkamai ištyrus rinką ekonomikos, politikos ir kitais aspektais.
3. Nustatyta, kad Europinės reikšmės projektų atranka dažniausiai remiasi tipine investicijų ir naujos technikos ekonominio efektyvumo nustatymo metodika. Šiuo metu, renkantis vieną iš galimų alternatyvių investicijų į infrastruktūros plėtrą, vyrauja asmeniškumai ir lobistinė praktika ir nesivadovaujama lyginamąja ekonominio efektyvumo teorija.
4. Analizė parodė, kad investicijų dydžio į transporto kompleksą nustatymas turi būti susietas su transporto komplekso strateginės plėtros programa ir pagrindžiamas naudojant daugialypių rodiklių visumą.
5. Atlikus tyrimus nustatyta, kad vienas iš objektyviausių ir praktiniam naudojimui parankiausių metodų yra vadinamasis „daugiapakopės dinaminio aproksimacijos modelio arba „keleto statistinių pjūvių metodas“, kuriuo apskaičiuojamos suminės (integralinės) vienkartinės ir einamosios sąnaudos visiems įvardytiems regiono transporto infrastruktūros poreikiams (kelių, stacionariųjų statinių eksploatacija bei statyba ir t. t.) tenkinti. Gautų rezultatų optimalumas ir objektyvumas priklauso nuo visų sąnaudų reikšmių parametrų tikslaus nustatymo kiekviename jų statistiniame pjūvyje.
6. Nustatyta, kad pagrindinės kombinuotojo transporto infrastruktūros savybės privalo atitikti agregacijos lygį, kuris yra numatomas makroekonominėse prognozėse bei programose ir atitinka transporto sistemos infrastruktūros strateginės plėtros nuostatas. Kombinuotojo transporto infrastruktūros savybės turi būti apibrėžiamos erdviniais, hierarchijos ir verslo kriterijais.
7. Transporto terminalų infrastruktūrinių objektų analizė parodė, kad strateginio terminalų plėtros planavimo kontekste pagrindiniai objektai yra terminalų kompleksai stambiausiuose transporto mazguose bei patenkantys į tarptautinio ir nacionalinio lygio paskirstymo centrų sudėtį. Jie atlieka makrologistinės sistemos svarbiausių mazgų vaidmenį ir nule-

mia tarptautinės prekybos plėtrą, naudojantis naujomis prioritetinės infrastruktūros grandimis.

8. Skaičiavimai, taikant suformuotą modelį, parodė, kad pagrindiniai transporto terminalų įjungimo į transporto sistemą efektyvumo veiksniai yra magistralinių vežimų nuotolis ir savikaina. Įrodyta, kad esant tarpterminalinių vežimų nuotoliui 500 km, 40,7 % visų vežimo sąnaudų sudaro pristatymo į terminalą išlaidos, kurios ženkliai mažėja didėjant vežimo atstumui (2000 km – 21,11 %).
9. Skaičiavimai parodė, kad tarpterminalinių tarptautinių vežimų plėtos sąlygomis kelių transportas gali būti optimaliai panaudojamas ir užtikrina krovinių vežimą terminalų veikimo zonoje, taip pat kelių transportas gali būti naudojamas krovinių transportavimui tomis kryptimis, kuriomis vežimas geležinkeliais neįmanomas arba technologine prasme netikslingas toks vežimas labiausiai tinka teikiant intermodalines paslaugas.
10. Viešojo ir privataus sektorių partnerystės (*Public Private Partnership*) modelio vaidmuo, įgyvendinant transporto infrastruktūros trūkstumų objektų finansavimo programas, yra veikiau papildantis, o ne visiškai pakeičiantis investavimo šaltinius.

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OF THE PRIORITIZED OVERLAND TRANSPORT
INFRASTRUCTURE IN LITHUANIA**

**Summary of Doctoral Dissertation
Social Sciences, Economics (04S)**

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