Proceedings of the 11th International Conference "Reliability and Statistics in Transportation and Communication" (RelStat'11), 19–22 October 2011, Riga, Latvia, p. 140-150. ISBN 978-9984-818-46-7
Transport and Telecommunication Institute, Lomonosova 1, LV-1019, Riga, Latvia

SUBSTANTIATION AND EVALUATION OF INFRASTRUCTURE PROJECTS ON URBAN TRANSPORT AND COMMUNICATION SYSTEMS

Daiva Griskeviciene[1], Algirdas Griskevicius[2], Ausrine Griskeviciute-Geciene[3]

Vilnius Gediminas Technical University
Transport Management Department[1,2]
Plytines 27, Vilnius LT-10105, Lithuania
Ph.: (+370) 5 2370633
E-mail: [1] griskeviciene.daiva@gmail.com, [2]griskevicus.algirdas@gmail.com
Urban Engineering Department[3]
Sauletekio av. 11, LT-10223, Lithuania, Ph: (+370) 67109752
E-mail: [3] ausrine.griskeviciute@vgtu.lt

The survey of analysis and evaluation on urban transport and communication systems, subsystems on vehicles, passenger and freight transportations, special public services, pedestrian and bicyclists has been carried out. Every subsystem needs technical infrastructure, the set of informational and traffic control means. Moreover quantitative and qualitative development of transport infrastructure is necessary for appropriate operating of whole communication system. Unfortunately an increase in the level of automobilization, growing transport flows in urban territories and decreasing investment for the development of transport infrastructure are the main barriers for urban development. An uncontrolled increase in automobilization changed the character of the usage of urban territories, urban structure, stimulated the process of agglomeration and formed new problems.

Analytic analysis highlighted the influence of each subsystem on the sustainable development of whole urban transport and communication system by technical, traffic safety, social-economic, environmental and other specific aspects. Objects of technical infrastructure that should be treated as infrastructure of urban road transport system were identified. The results of analysis allowed determine features of separate objects necessary to evaluate and substantiate; assess and adjust separate stages, key principles and quantitative and qualitative criteria of project evaluation and substantiation on urban transport and communication system.

Keywords: sustainable development, urban transport and communication systems, social – economic aspect, environmental aspect, project substantiation and evaluation

1. Introduction

The majority of population lives in urban territories of Lithuania. Big cities are economic, social, spiritual, cultural and scientific march centres. Cities provide various opportunities for inhabitants. They create the great share of GDP.

During the process of global integration the number of citizens covering large territories in cities constantly increases. Problems of urban development are becoming relevant. Therefore general urban policy determining main directions for urban development is a complicated and integral part of general policy on state territorial planning and development. Environmental, economic, demographic, planning, technical, managerial and other factors have influence on complicated, multifunctional processes of urban development. The effect of these factors is usually methodologically assessed in three main aspects: economic, social and environmental. The cohesion of these aspects is the frame for sustainable urban development. Assumptions for sustainable development have to be regularized in planning documents. Local authorities as decision makers have to consider the requirements of territorial planning documents. This principle has to be adopted in the process of planning and implementation of the development of urban transport and communication systems.

One of the most important problems in the whole system of territorial planning is that there is no official methodology for determination of public infrastructure development trends and opportunities defined. The solutions of valid territorial planning documents partly determine the directions for development of separate cities and other urban territories, and also the necessity of modernization and development of technical infrastructure. In the context of territorial planning, in order to develop relevant public, and also transport and communication infrastructure, ensuring accessibility and availability, secure performance, in the same time avoiding negative impact to the environment and society, it is necessary to create

a determined and substantiated model of development on transport and communication systems infrastructure [7,8].

This article presents the scientific approach for creation or adaptation of theoretical model of substantiation on transport and communication infrastructure development.

2. Expert Survey. Methodology

In order to create theoretical model for the development of urban transport and communication systems infrastructure the expert survey has been carried out. Delphi method has been used for the survey. Delphi method is a qualitative method of forecasting. Delphi method has a lot of forms and is still being developed. This method is useful when in order to determine common decision or propose other alternatives, a panel of experts communicates. Therefore there are few stages of survey usually carried out. Delphi strategy recommends to survey 10-50 experts. The results of the survey do not depend on the size of panel, rather on experts' competence.

The aim of this questionnaire survey is to determine and to systemize the approach of qualified experts performing in the spheres of territorial planning, planning of transport and communication systems and working in public and private sectors. Two-stage survey has been carried out. The first-stage questionnaire was formed seeking to determine actual principle of the substantiation of urban transport and communication systems. Later on, systemized results were returned to a panel of experts for the assessment of the averages of first stage answers. The results were filled with the experts' comments and notes. In order to ensure equity the anonymity and the confinement of dominant influence was guaranteed [11].

Performing in the spheres of preparation, evaluation and organization of projects on urban and road transport and communication systems and territorial planning 55 experts were invited to participate in this research. Experts were chosen according to their qualification and practical working experience. 40 of invited experts accepted to participate in this research. Till the end of this survey 25 experts participated. According to the small number of official institutions performing evaluation of investment projects and also to recommendations of Delphi strategy it was concluded that this number of experts was sufficient for this survey to be reliable.

During the first stage, 16 questions about substantiation and evaluation of urban transport and communication infrastructure were presented. First 6 questions included general information about a concept of projects' substantiation, and urban transport and communication infrastructure. Other questions were more specific, concerning assessment of separate aspects and criteria used for theoretical model. For general questions the principle of marking the best answer was used. For specific questions the graduation system assessing a priority of answer was used: 1– not important; 2 – low importance; 3 – average importance; 4 – very important; 5 – no opinion about it.

This article deals with the results of first stage.

3. Assumptions for the Model of the Substantiation on Urban Transport and Communication Systems

In order to determine the importance of urban transport and communication systems infrastructure to territorial planning and to form development trends, development necessity must be substantiated. For this purpose development projects are being prepared. In order to easily describe principles of substantiation of Lithuanian urban transport infrastructure development, main problems must be determined [5, 6]:

- ✓ ***Urban transport infrastructure systems apply for the definition of public infrastructure***; Transport, social infrastructure and utility networks are often named as components of public infrastructure. However, such a description is not accurate, since the communication system operates in a specific urban area, which is influenced by various factors that may have no impact on other parts of public or social infrastructure. Generally transport system is recognized as an aggregate of pedestrian, passenger and vehicle means and necessary technical infrastructure, information and traffic regulations mean.
- ✓ ***Development of urban and rural transport and communication systems infrastructure is not separated;*** Generally urban and suburban (or road) transport systems are different. Key factors influencing on differences and similarities of urban and road transport systems are as follows:
  - technical infrastructure;
  - transport demand and possibilities;
  - transport modes;

- occupied area and space for transport needs;
- environmental, social – economic, financial and other impacts;
- system administration.

✓ ***Not all projects for substantiation and evaluation of transport systems infrastructure development in individual cities are prepared*;** the existing experience on project evaluation shows that in most cases the substantiation is carried out on those items, the development of which is provided by finance from EU funds, as required by EU legislation. The development of transport infrastructure funded by local government is validated with detailed plan or technical design, where necessity for substantiation of object development is not defined.

✓ ***Not all development of urban transport infrastructure objects is associated with solutions of spatial planning documents***; there is also a problem concerning correspondence to the requirements of basic regulations of spatial planning in order to prepare separate stages of transport infrastructure development projects. Basic objective for impact assessment on solutions is often ignored as guiding principles of one-day benefit. Therefore it is widely debated to improve the system of planning, consultation and development in the sphere of new forming solutions of spatial development in the country. However more progressive and developed countries experience these problems as well. Although they have more practice, they similarly form planning objects to strengthen transport sector.

✓ ***There is no uniform system for urban transport systems infrastructure projects' substantiation and evaluation*;** optimal effects can be expected only if basic solutions are adequately motivated. According to the Governments it is authorized to interpret assessing impacts of projects solutions. Since there is no basic definite methodology the effects of interpretations are experienced in various socio-economic, engineer-technical and natural environments inseparable from each other and having additional and continuing connections. Therefore if problem occurred in one sphere (environment), it can cause more negative short-term or long-term effects.

✓ ***The organization of common urban transport systems infrastructure development is not regulated****;* throughout legislation system of the Republic of Lithuania, today there is no regulation on public and social and transport infrastructure development in urban areas. The legislature has not adopted the law that complexly regulates the infrastructure of urban areas. The Land Law of the Republic of Lithuania, the Spatial Planning Law of the Republic of Lithuania, and the Construction Law of the Republic of Lithuania governs individual developmental stages of infrastructure in urban areas, but does not define a clear system, entities that organize and participate in the development of urban infrastructure, their rights, duties and responsibilities [1, 2].

✓ ***A large shortfall for the development in urban public infrastructure****;* in general the infrastructure development in urban areas is actually being funded by local government budgets and by budgets received and accumulated in funds of municipal urban development, i.e. by budgets of building legal and natural persons in accordance with individual funding agreements with the municipality. Current practice shows that the total of own funds is not sufficient for upgrading and developing urban infrastructure. Due to uncertain use of finances from local, state and private sectors in urban sustainable development, the opportunity to receive the EU financial support is more and more often used.

✓ ***Complex process for taking land for public needs***; current practice shows that property rights are restored in the planning documentation in planned streets and in areas of public infrastructure, aggravating land use for development of infrastructure in residential areas by that, as these areas has to be bought out from private owners or taken for public needs. One of the main reasons is unclear regulation of redeem ability of state-owned land. At present, the territories where transport infrastructure development is planned are not considered as redeemable state-owned land, so after restoration of property rights in these areas, the land must be redeemed or taken for the needs of society, and compensated for the market price. However, in residential areas, especially in large urban areas, a great shortage of vacant state-owned land is already present. Everything is more complex due to the fact that administration of state-owned land is yet not transferred to municipalities [8].

Due to existing problems in the development of urban infrastructure, main steps of project substantiation model of development on urban transport and communication systems infrastructure are formed and presented for expert evaluation (Fig. 1).

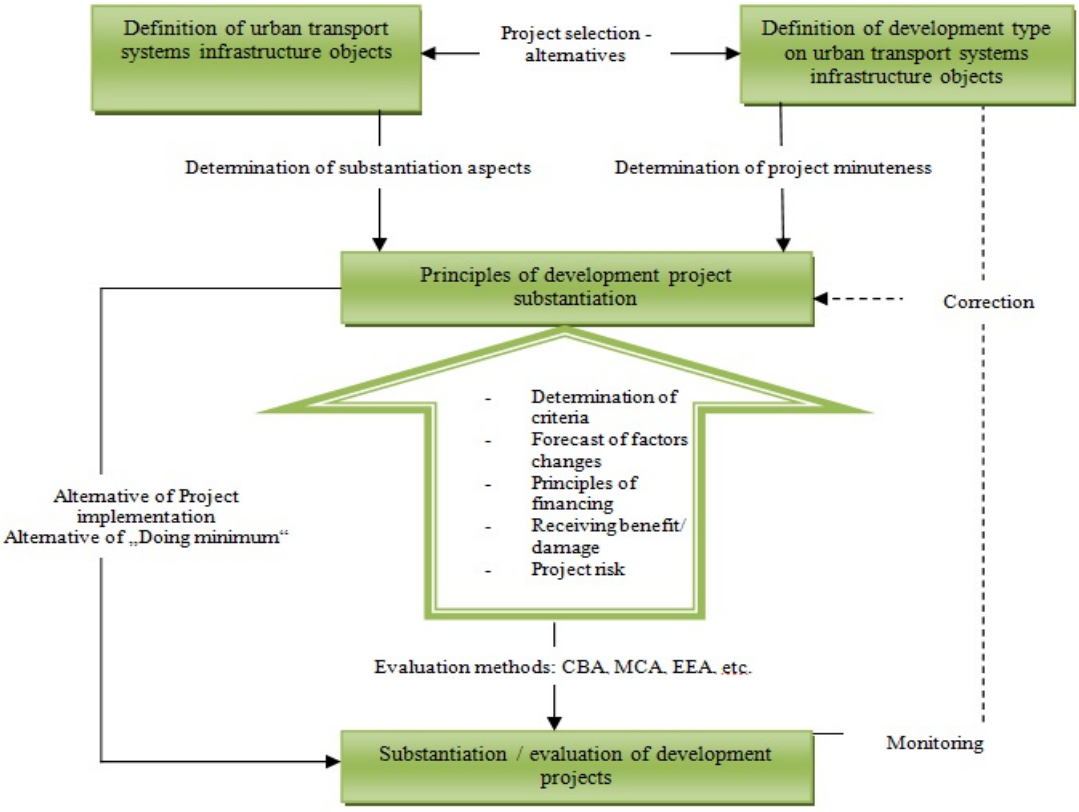


Figure 1. Main steps of project substantiation model of development on urban transport and communication systems infrastructure

The first step. Currently, existing legislation in urban sustainable development areas provides only abstract definitions on urban transport systems infrastructure. However, in order to implement for the principles of sustainable development, it is necessary to accurately identify and define the objects that should be allocated to transport infrastructure. In accordance to the number and types of urban spaces of functional transport systems and subsystems and other features, authors have systemized infrastructure groups of urban transportation systems and proposed them for expert assessment (Table 1).

Table 1. Objects of infrastructure of surface transport and communication systems [4]

Objects of technical and information infrastructure of surface transport and communication systems
General communication network (streets, roads, parking lots, paths, territories of transport service, etc.)
Main nodes (all level crossings, pedestrian/ cyclist passages, squares, etc.)
Public Transport infrastructure (route network, rail transport lines, PT traffic lanes, stations, depots, platforms, final nodes, stops, etc.)
Traffic regulation and control means (traffic regulation system with centres (traffic-lights, traffic control devices, variable electronic signs, pedestrian. cyclist passage switches, pavement signing, etc.), Park and Ride system, informational system with centres (display panels, external screens, stock tickers, etc.)
Traffic safety means (traffic watch systems (traffic flows measurement devices, traffic detection cameras, etc.), safe traffic providing systems (speed limiting devices, prominent pedestrian/ cyclist passages, safety islands, boxes, safety mirrors, road reflectors and blinking footprint, etc.), pedestrian, calm traffic zones, etc.
Environmental means (noise isolation systems, mounds, road pavement, accumulation and clearing of surface water, bio-barrage, greening, premise protection from noise, etc.)

The second step. For determination of necessity to develop urban infrastructure transport systems there is need to define the concept of development and to identify which types or stages of development need substantiation. For that reason, authors have systemized infrastructure types of urban transportation systems and proposed them for expert assessment (Table 2).

Table 2. Kinds of land transport and communication infrastructure object development [4]

Kinds of land transport and communication systems infrastructure object development
Maintenance of object
Overhaul of object
New construction of object
Reconstruction of object

The third step. In the scientific literature few specific concepts related to the implementation of development projects are available. Often, definition of project evaluation and project substantiation are equated, therefore it is important to find out whether these concepts can be aligned with each other. In addition, it is necessary to establish whether substantiation/evaluation of urban transport systems infrastructure development projects must be broken down into separate phases. Table 3 shows conceptions and stages of project substantiation/evaluation.

Table 3. Conceptions and stages of Project substantiation/evaluation [4]

Conceptions
Project substantiation
Project evaluation
Stages of project substantiation/evaluation
Only feasibility study
Only investment project
Feasibility study and investment project

The terminology used in Table 3 is officially defined in the legislation of the Republic of Lithuania. The conception of Project Substantiation is defined as the evaluation of expedience of development of the object (repair, construction, reconstruction) in different aspects. The conception of Project Evaluation is defined as a systematic and objective determination of suitability, usefulness, efficiency and utility of the project which is planned to implement or has been implemented. Usually project substantiation/ evaluation consist of several separate stages. Feasibility study is a wider concept and is defined as an analysis of alternative object development solutions and substantiation of the most optimal alternative variant in different aspects. An investment project is substantiation of implementation of a certain variant of the object development in the economic and other aspects.

Another important question is to find out what approaches should be included in substantiation of urban transport systems infrastructure development projects. In common structural approach, all projects of communication systems in urban infrastructure development are alike because they share a certain structure, each has a well-defined objective and reachable result, and each project requires certain resources (technique, energy, raw materials and human resources). These resources are always limited so rational use of them is one of the major problems in project implementation. In terms of feasibility, transport systems infrastructure development projects also distinguish in the fact that object's development (construction, reconstruction, etc.) and object's duration of operation is relatively long, and the implementation of a project requires a significant capital.

In Lithuania, there is no official methodology for urban transport systems infrastructure development substantiation, for identification of main substantiation/evaluation dimensions, authors used the experience of foreign countries and current road transport infrastructure development reasoning techniques and recommendations. Authors have systemized infrastructure groups of urban transport systems and separate criteria that influence necessity for object development [3,9]. Table 4 shows main attitudes on Project substantiation/evaluation.

Table 4. Main attitudes of project substantiation/evaluation [4]

Main attitudes of project substantiation/evaluation
Strategic *(describes need and necessity of the development)*
Social *(describes the efficiency of the development to users – publicity)*
Economic (*describes economic benefit/ damage to users – publicity*)
Financial (*describes financial benefit/ damage and input of separate financial sources to total investment*)
Technical (*describes implementation of project according to technical requirements*)
Safe traffic (*describes influence of project on improvement of traffic safety*)
Environmental (*describes negative/positive influence of project on environment*)
Use of land (*describes influence of project on sustainable land use*)

The rationale of transport systems infrastructure development is often associated with the received economic benefit; due to this many of the criteria must be numeric (monetary value). But not all important criteria (e.g. strategic, social and environmental aspects) can be placed in numeric (monetary) form. In order to determine this, tests are performed and in accordance with specific procedures a numerical value for certain criteria is established. Depending on their composition or method for determining the monetary value, the results on project evaluation can be very different. For example, presently, for the evaluation of projects that were prepared for getting financial support from the EU funds, Cost-Benefit Analysis (CBA) was used. This method has a certain level of universality and helps with evaluating factors having no monetary value. However investment projects implemented in cooperation with the State are assessed by using Multi-Criteria evaluation method (MCA). A result of these methods is the evaluation of the efficiency of alternative investment projects according to the selected evaluation criteria that shall reflect both the investment project of implementing a subject as well as the interests of the State [9, 10, 13].

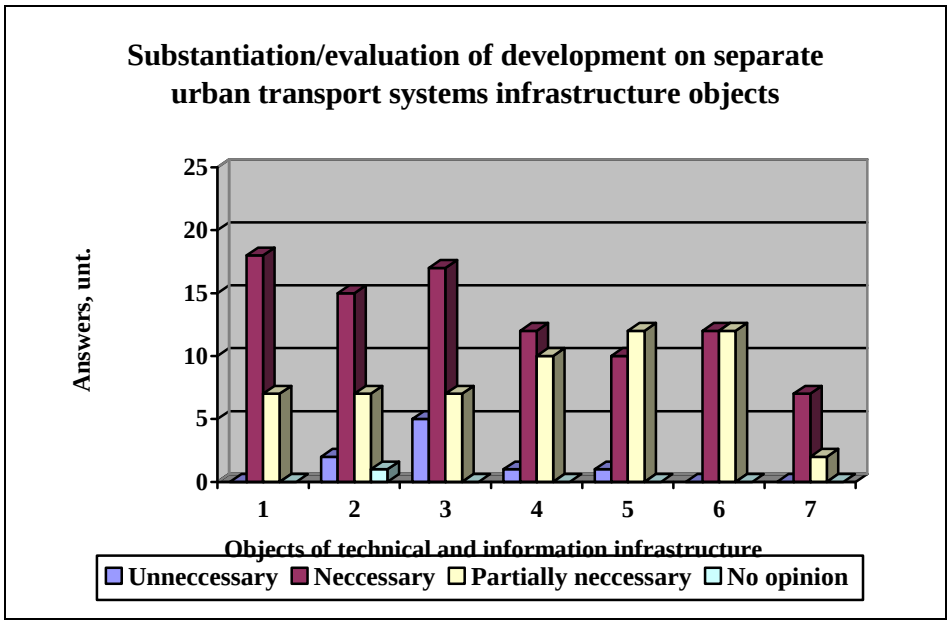
It also have an important part in the need for substantiation when comparing the alternative projects and identifying the level of project's implementation need, social, environmental and other aspects that define the qualitative value of the project. Identification of values of the separate criteria affect the identification of project's impact factors and targets, prediction on variation, identification and management of project risk types. In order to determine which urban transport systems need quantitative (financial) or qualitative factor values for infrastructure development, authors have systemized typical criteria of individual grounding aspects and proposed them for expert assessment. In the next section expert evaluation of the first phase of the initial preliminary results is provided.

4. Expert Survey. Tentative Results

Initial data from expert evaluation showed that the project evaluation and project substantiation is usually regarded as terms with equal value (70 percent of experts).

Substantiation/evaluation linkage of a project of urban transport systems infrastructure development with the planning stages led to dispersal of experts' answers. 40 percent of experts pointed out that project substantiation/evaluation should be associated with each planning stage. Systemization of expert's results showed that only 50 percent of experts associate project substantiation/evaluation with technical designing and most – 70 percent experts – with special territorial planning.

Systemized experts' evaluation results related to substantiation of urban transport infrastructure development project, it became clear that it is necessary to prepare the substantiation of project development for all general communication network (70 percent of answers) and part of the network (30 percent of answers), for all main nodes infrastructure (60 percent of answers) and their part (30 percent of answers), only 10 percent of experts pointed out that substantiation for development of main nodes is not required (Fig. 2).

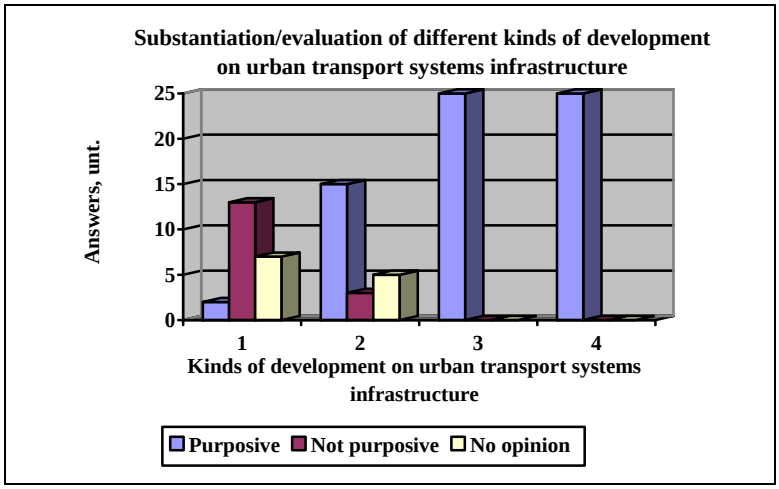


Objects of technical and information infrastructure: 1 – General communication network, 2 – Main nodes, 3 – PT infrastructure, 4 – Traffic regulation and control means, 5 – Traffic safety means, 6 – Environmental means, 7 – other (logistics)

Figure 2. Systemized experts' evaluation results related to substantiation of separate urban transport infrastructure development projects

As Figure 2 shows, for necessity to substantiate public transport (PT) infrastructure development projects 70 percent of experts were in favour, 30 percent of experts needed this for a part of the infrastructure, and 10 percent stated that the substantiation for the development of PT infrastructure is not required. The need of substantiation of traffic regulation and control and traffic safety development projects was presented for 50 percent of experts, 40 percent were in favour of necessity for substantiation of part measures, and 10 percent of experts pointed out that the substantiation for the development of traffic regulation and control means, and traffic safety means are not required. Substantiation for the development of environmental means is necessary, experts divided equally for development substantiation of all and part of measures. 30 percent of experts further noted that the rationale of development of logistics centres infrastructure is also necessary.

In evaluation of types of urban transport systems infrastructure development, all the experts pointed out that for the reconstruction of facilities and construction of new facilities the substantiation must be carried out. 60 percent of experts noted that the substantiation is appropriate for major repairs of facilities, and only 10 percent of experts noted the appropriateness of the substantiation of the maintenance facilities (Fig. 3).

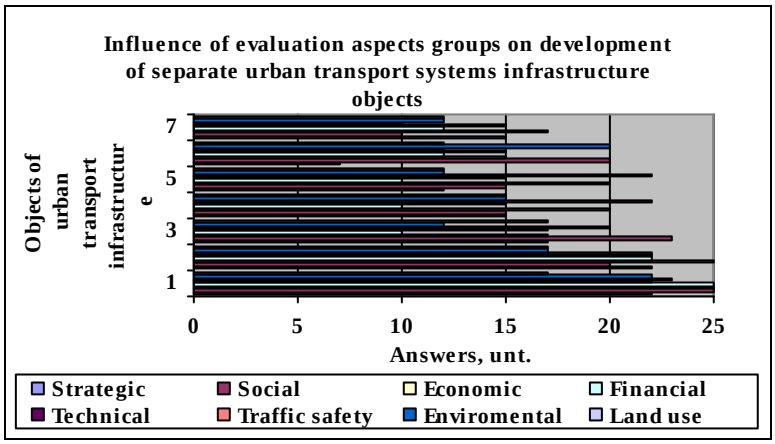


Kinds of development on urban transport systems infrastructure: 1 – Maintenance of object; 2 – Major repairs of object; 3 – New construction of object; 4 – Reconstruction of object

Figure 3. Systemized experts' results related to substantiation/ evaluation of different kinds of development on urban transport systems infrastructure

Evaluating of stages of urban transport systems infrastructure development projects, all experts were for preparation of both feasibility studies and investment projects for the development of general communication network and main nodes infrastructure. 60 percent of experts have noted that the feasibility study and investment project should be prepared for the development of PT infrastructure, traffic regulation and traffic control means and traffic safety means, environmental means. 20 percent of experts pointed out that for the development of PT infrastructure, traffic regulation and control, and traffic safety means, environmental means, the preparation of a feasibility study would be sufficient, 10 percent of experts pointed out that for PT infrastructure, traffic regulation and control means, and traffic safety means, environmental means, it would be sufficient to prepare the investment project. One expert further noted that feasibility study and investment project should be developed only for major projects, as for small projects such implementation process is too expensive.

Evaluating the influence of transport systems infrastructure development on substantiation of urban transport systems infrastructure, it was noted that it is appropriate to substantiate the development of groups of urban transport systems infrastructure at least in part of aspects groups. In addition it has been noted that no new approaches were provided by the experts. Most attention was brought to substantiation of the general communication network development as follows: 91.25 percent of experts noted that the substantiation should include all assessment aspects. 86.25 percent of experts pointed out that all the groups need to be included in substantiation of the development of the main nodes: in this case the least responses were collected for environmental and land use aspects. The least attention was received for development substantiation of traffic safety means (58.75 percent of experts) and environmental means (57.5 percent of expert): in most of these cases, most answers fell for traffic safety, environmental and technical aspects, least – for strategic and financial aspects. For substantiation of PT infrastructure development most evaluations were collected for social, technical and economic aspects (Fig. 4).



Objects of technical and information infrastructure: 1 – General communication network, 2 – Main nodes, 3 – PT infrastructure, 4– Traffic regulation and control means, 5 – Traffic safety means, 6 – Environmental means, 7 – other (logistics)

Figure 4. Systemized experts' results related to the influence of evaluation aspects groups on development of separate urban transport systems infrastructure objects

Evaluating the importance of separate aspects, it is noted that any aspect has been associated with the development of urban transport systems infrastructure and it is appropriate to incorporate them into substantiation of separate transport systems infrastructure development. Systemized expert answers show that economic aspect (82.85 percent of answers) and the traffic safety aspect (78.57 percent of answers) were the most popular, least – the land use aspect (57.14 percent of answers). Figure 5 shows systemic percentage distribution of substantiation aspects groups of urban transport systems infrastructure development projects.

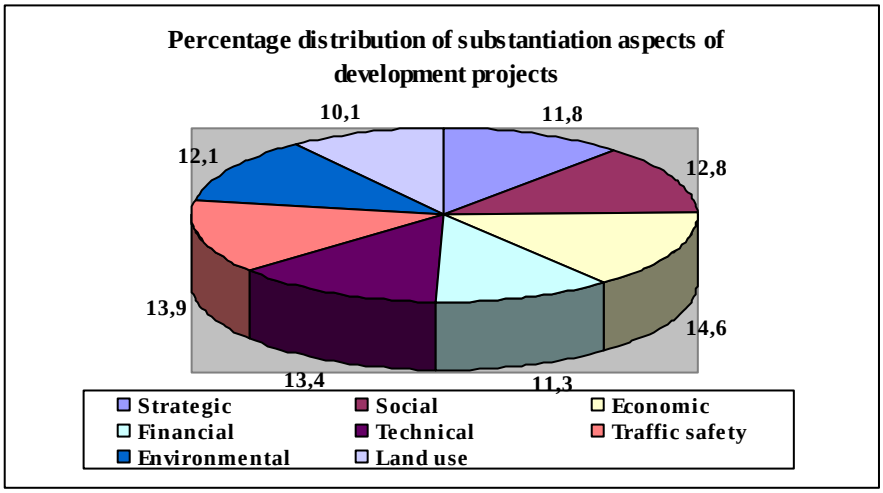


Figure 5. Percentage distribution of substantiation aspects of urban transport systems infrastructure development projects

Figure 5 shows that percentage distribution of substantiation aspects is quite equal in all experts' answers: a significant difference cannot be excluded. This proves that all traditional aspects used in transport infrastructure development substantiation are important and have to be included in general substantiation/ evaluation system. The determination of values of separate criteria can have influence on increase or decrease of relevance of one or another aspect. For this detailed statistics the researches have to be carried out.

Systemized initial results of expert evaluation have proved that criteria for the substantiation of urban transport systems infrastructure development can be separate as follows:

- Strategic aspect: 90 percent of experts noted that these criteria have most influence on substantiation of general communication network and PT infrastructure development, lower influence on substantiation of main nodes infrastructure development. The most important criteria marked – compliance with strategic goals of regional development raised by local level institutions; International/ state/ local level demand for development of object.
- Social aspect: 90 percent of experts have noted that all presented criteria are equally important for substantiation of general communication network and PT infrastructure development. As for main node infrastructure development impact on living environment, impact on inhabitant mobility and impact on employment are the most important criteria (80 percent of answers). Impact on human health is important criterion for the development of traffic regulation and control means and traffic safety means and environment means (50 percent of answers).
- Economic aspect: 80 percent of experts have noted that these criteria have most influence on substantiation of genera communication network and PT infrastructure development, 40 percent of experts noted that these criteria are important also for substantiation of traffic regulation and control means and traffic safety means development. Vehicle operating cost and travel time costs economies are marked as the most important criteria. Criterion of determination of project benefit/ damage caused inequality between answers: 50 percent of experts noted, that this criterion has low importance, other 50 percent of experts – big important.
- Financial aspect: 70 percent of experts have noted that these criteria have most influence on substantiation of PT infrastructure development, less influence on substantiation of traffic regulation and control means and traffic safety means development. The most important criterion marked – input of financial support received.
- Traffic safety aspect: all experts noted that these criteria have most influence on substantiation of traffic regulation and control means and traffic safety means development. The most important criterion marked – impact on accident types, impact on decreasing of number of casualties, impact on decreasing of number of injured people, impact on accident place and date.

- Technical aspect: 80 percent of experts noted that these criteria have most influence on substantiation of same general communication network, main nodes and PT infrastructure development. The most important criterion marked – compliance of technical solutions with solutions of territorial planning document; impact on the implementation of alternative technical solutions; impact on selection of optimal variant.
- Environmental aspect: 80 percent of experts noted that these criteria have most influence on substantiation of environmental means, also general communication network and main nodes development. The most important criterion marked – impact on air pollution in territory, impact on natural recreation environment, impact on protected natural territories.
- Land use aspect: all experts noted that land use criteria have influence on substantiation of all group of urban transport systems infrastructure development. The most important criteria marked – impact on neighbouring ground, impact on sustainable use of ground, impact on Necessity of land taking for public purposes.

Detailed research data on importance identification of separate criteria of project substantiation and identification of systemized results, with the use of statistical data methods, in order to determine values of different important criterion and to form a module for substantiation of urban transport system infrastructure development, will be presented in the next article.

5. Conclusions

1. During the process of global integration the number of citizens covering large territories in cities constantly increases. Problems of urban development are becoming relevant. Therefore general urban policy determining main directions for urban development is a complicated and integral part of general policy on state territorial planning and development. One of the most important problems in the whole system of territorial planning is that there is no official methodology for determination of public infrastructure development trends and opportunities defined.
2. In order to create theoretical model for the development of urban transport and communication systems infrastructure the expert survey has been carried out. Delphi method has been used for the survey. The aim of this questionnaire survey is to determine and to systemize the approach of qualified experts performing in the spheres of territorial planning, planning of transport and communication systems and working in public and private sectors. Two-stage survey has been carried out. The first-stage questionnaire presented in this article was formed seeking to determine actual principle of the substantiation of urban transport and communication systems.
3. Due to existing problems in the development of urban infrastructure, main steps of project substantiation model of development on urban transport and communication systems infrastructure are formed and presented for expert evaluation: definition of urban transport systems infrastructure objects; definition of development type on urban transport systems infrastructure objects; determination of key aspects and criteria for project substantiation.
4. The rationale of transport systems infrastructure development is often associated with the received economic benefit; due to this many of the criteria must be numeric (monetary value). But not all important criteria (e.g. strategic, social and environmental aspects) can be placed in numeric (monetary) form.
5. The results of initial have showed that all traditional aspects of substantiation of transport infrastructure development are important and have to be included in general substantiation/ evaluation system. The determination of values of separate criteria can have influence on increase or decrease of relevance of one or another aspect. When comparing the alternative projects and identifying the level of project's implementation need, social, environmental and other aspects that define the qualitative value of the project, also play important roles in the need for substantiation. Identification of values of the separate criteria affect the identification of project's impact factors and targets, prediction on variation, identification and management of project risk types. For this detailed statistics the researches have to be carried out.

References

1. Asensio, J., Roca, O. Evaluation of Transport Infrastructure Projects beyond Cost-Benefit Analysis. An Application to Barcelona's 4th Ring Road, *International Journal of Transport Economics,* Vol. XXVIII, No 3, October 2001, pp. 387-403.
2. Bivainis, J.; Butkevičius, A. Methodologic aspects of evaluation of state budget programmes, *Journal of Business Economics and Management,* Vol. 4(1), 2003, pp. 53–61.

3. Eliasson, J., Lunderg, M. Do Cost-Benefit Analyses Influence Transport Investment Decisions? Experiences from the Swedish Transport Investment Plan 2010-2021. *Proceeding of European Transport Conference 2010.* Glasgow, Scotland, UK, 2010. 25 p.
4. Griskeviciute-Geciene, A. *Questionnaire survey of assessors/organizers/customers of projects of communication system infrastructure development working for public institutions and in the private sector of the Republic of Lithuania*. Vilnius, Lithuania, 2011. 14 p.
5. OECD publication, Report of the European Conference of the Ministers of Transport. 2001. *Assessing the Benefits of Transport,* 215 p.
6. OECD publication. 2008. Report of International Transport Forum. *The Wider Economic Benefits of Transport: Macro-, Meso- and Micro-economic Transport Planning and Investment Tools.* 208 p.
7. Silva, A.B., Ribeiro, A. An Integrated Planning for Cities to Promote Sustainable Mobility. *Proceedings of European Transport Conference 2009.* The Netherlands, 2009. 14 p.
8. Lithuanian Real Estate Development Association. Work group publication. *Sustainable Territorial Development in Planning and Urbanity.* Vilnius, Lithuania, 2008. 110 p.
9. Tamošiūnienė, R., Šidlauskas, S., Trumpaitė, I. The multicriterial evaluation method of the effectiveness of the investment projects, *Business: Theory and Practice,* Vol. 7(4), 2006, pp. 203-212.
10. Turskis, Z., Zavadskas, E.K., Peldschus, F. Multi-Criteria Optimization System for Decision Making in Construction Design and Management, in Engineering Economics, *Economics of Engineering Decisions,* Vol. 1 (61), 2009. pp. 7-17.
11. Ustinovičius, L., Zavadskas, E.K. *Statybos investicijų efektyvumo sistemotechninis įvertinimas (In Lithuanian). [Decision support system in construction]. Monograph.* Vilnius: Technika, 2004. 219 p.
12. Vergauwen, B. Ex-post Analysis of an Infrastructure Project in the Port of Antwerp. *Proceedings of European Transport Conference 2010.* Glasgow, Scotland, UK. 2010. 24 p.
13. Zavadskas, E.K., Kaklauskas, A., Peldschus, F., Turskis, Z. Multi-attribute assessment of road design solutions by using the COPRAS method, *The Baltic Journal of Road and Bridge Engineering*, Vol. 2, No 4, 2007, pp. 195-203.