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URBAN TRANSPORT SYSTEM AUDIT: REVIEW OF METRIC SYSTEM, METHODS AND PROBLEMS

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Urban transportation systems can be evaluated in various ways reflecting different perspectives concerning users, modes, land use, transport problems and solutions, as well as the means of measuring transport activity and the type of the used performance indicators.

As concerns the user the transport system is characterized by the following properties of transport system: mobility, accessibility and reliability. There exist various approaches and methods for estimating the given characteristics. Several indicators and the indices describing properties of the transport system that can be calculated by means of various approaches and methods are described in the article.

The purpose of the given article is the review of existing methods of the city transport system performance estimation from the user's point of view as well as the evaluation of mobility, accessibility and reliability. The article mentions the problems, which arise in the process of estimating the urban transport system's efficiency.

Keywords: transport system, performance measures, reliability, mobility, accessibility, data

1. Introduction

The purpose of each transport system is to satisfy the requirements of inhabitants for travelling. Everywhere the transport systems should support the relative balance between the speed of movement, on the one hand, and accommodation of habitation and visited objects, on the other, i.e. should provide connectivity, unity of city as those [1]. All urban transport systems are aimed at the direction of fuller satisfaction of needs of the population, however, social and transport mobility of the population is non-uniform and speed of development of transport system in the different countries is various due to different conditions of economy and a level of social development.

Management and planning of the urban transport system demands the exact representation both of the requirements of the population for trips and of the system in general.

Researchers and managers are interested in the concrete, quantitatively certain answers to questions to what extent the transport system of the concrete city is developed today. How is it he developing? Is it meeting the demands of the population? What are the results of its comparison to the transport systems of other cities?

The question of comparison requires the development of the methodology of comparison. To compare, it is necessary to consider the distinctions of cities as to population, topography, development of economy, ethnic structure of the population and many other things [1].

At the end of the last century there appeared the new term – the urban transport audit. The urban transport audit is the estimation of conformity of the urban transport system and its subsystems to the purposes of strategy of the city development and requirements of the population [2]. The urban transport audit is a combined process, the analysis and the complex estimation of the information on transport system and its subsystems with the purpose of developing the recommendations on the perfection of their working capacity.

To carry out the audit of the transport system it is a necessary to observe the general principles of audit:

- conformity of the reports on transport systems of cities to the certain standard;
- accuracy of the reports on transport systems;
- conformity of the transport systems of cities to norms, specifications, criteria and acts;
- conformity of the parameters of profitability and the efficiency to the established criteria [2].

The urban transport audit, as well as any other audit, has some chains (algorithms) of consequent steps in the basis [2] (see Fig. 1):

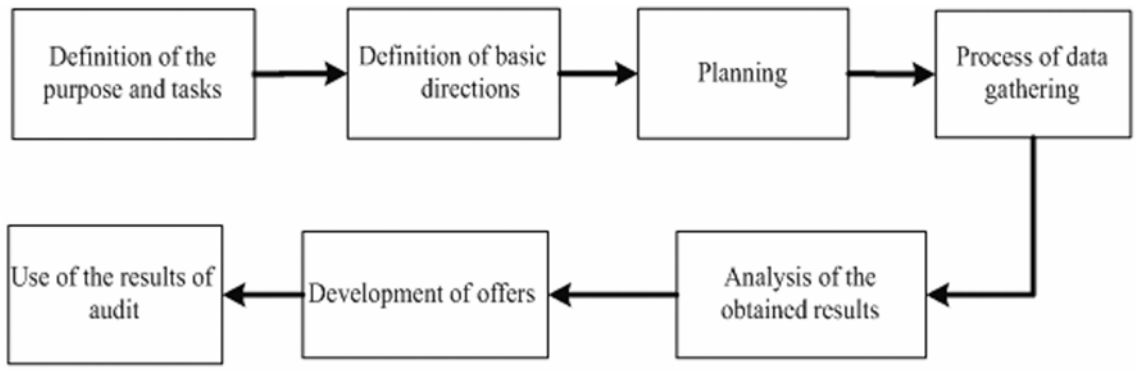

Figure 1. Procedure of audit

1. Definition of the purpose and tasks of audit should be established.
2. Definition of the basic directions: carrying out the inspections, calculations and analysis of the parameters describing the working capacity of subsystems.
3. Development of the plan of carrying out the audit: definition of the information on the financial and regular resources, a technique of inspections.
4. Organization of the work: gathering materials and carrying out inspections, grouping the received data.
5. Analysis of the obtained results: revealing the positive and negative sides and their reasons, revealing the prime directions of increasing the working capacity of the urban transport system.
6. Working out the offers on the development of the urban transport system.
7. Use of results of audit for the work of municipal bodies.

Thus, one of the main moments is gathering and processing the necessary data about the urban transport system. At first, it is necessary to develop methodology of data gathering for successful systematic realization of this sequence of actions. Also, the essence of the data, their quantity and the measurement moments depending on the indicators of the development of transport system, will be designed and analysed. So, definition of such set of the indicators reflects the level of development of the urban transport system, being one of the key problems of audit of the transport system.

For reviewing the different approaches to decision of the urban transport system problem some developed countries was choose at first, for example, in the North-American continent: in the United States of America and in Canada. In Australia and New Zealand the indicators and indices of performance of the urban transport system are developed as well and will be reviewed also. Last years the urban audit has been widely used in Europe, few research projects that concerned have been fulfilled [7-9].

2. Different Approaches to the Estimation of the Urban Transport System

The urban transport system can be estimated from the various points of view: from the point of view of traffic, of the mobility of the population, of the availability and land-use (see Fig. 2).

Thus, it is possible to distinguish between the following ways of measurement:

- **Traffic-based** measurements evaluate the motor vehicle movement;
- **Mobility-based** measurements evaluate the person and freight movement;
- **Land-use-based** measurements evaluate the efficiency of land-use;
- **Accessibility-based** measurements evaluate the ability of people and businesses to reach desired goods, services and activities.

The urban transport systems can be evaluated in various ways reflecting different perspectives concerning estimation objects, measurement of the transport activity and the type of performance indicators used, data sources, transport problems and solutions (Table 1).

Table 1. Different approaches to the estimation of the urban transport system

Approach	Main object	Measures	Data source	Problems	Solutions connected with
Traffic	vehicles movement	motor vehicle registrations; drivers' licences; traffic volumes; traffic speeds; roadway level of service, congestion delay, parking supply, vehicle operating costs and crash rates.	Traffic count	congestion, risk, cost	increase road and parking capacity, roadway traffic speeds, vehicle ownership and the affordability of driving
Mobility	movement of people or goods	person-miles; ton-miles; travel time; trip mode; travel speeds; transit vehicle speeds	Household Travel survey; Traffic count	constraints on physical movement	motor vehicle system capacity and speed; road and parking facility improvements; transit and ridesharing improvements; high-speed trains, aviation and intermodal connections
Land use	location of the attraction point	density; locating different types of activities; non-motorized conditions; work connection	Land-use surveys	congestions, pollution of the environment	more accessible land use; parking development; location of the attraction point; pollution of the environment
Accessibility	ability to reach desired goods, services, activities	time, money, discomfort and risk (the generalized cost) required to reach opportunities.	Household Travel survey; On-board survey; Interviews;	cost, barrier, risk that prevents people from reaching desired opportunities.	traffic improvements; mobility improvements; mobility substitutes; more accessible land use.

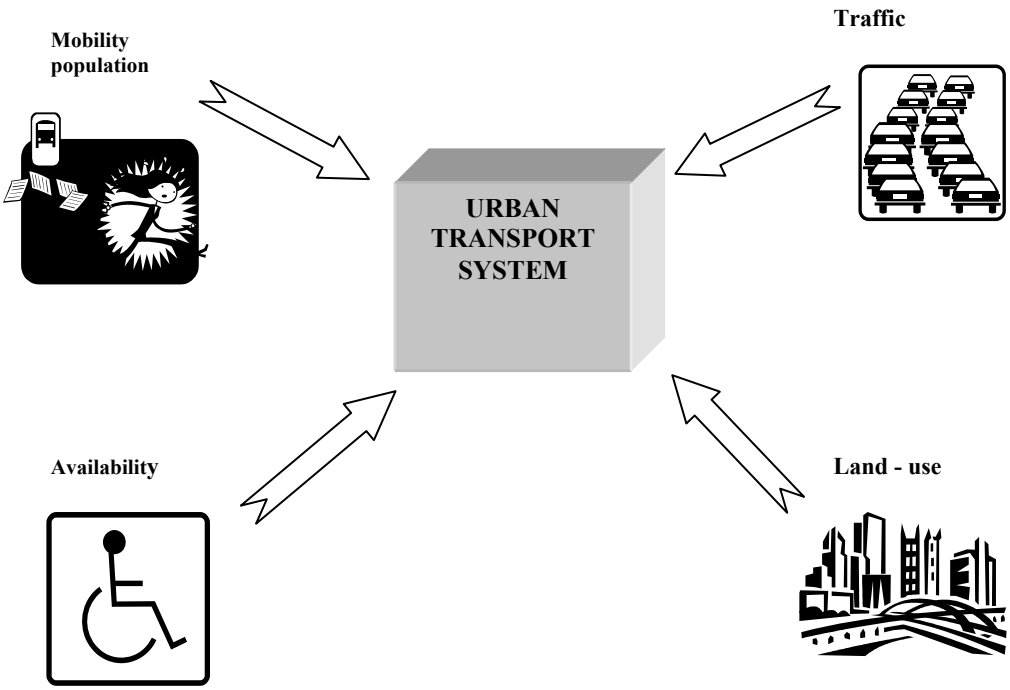

Figure 2. Different points of view on the estimation of the urban transport system

3. USA: Urban Mobility Report

The results of the urban transport system audit in the USA are published annually in the document - Urban Mobility Report [4], which uses data from federal, state, and local agencies to develop estimates of congestion and mobility within an urban area. The audit procedures have been developed by the Texas Transportation Institute. This methodology yields a quantitative estimate of the urbanized area mobility levels, utilizing generally available data, while minimizing the need for extensive data collection. The methodology primarily uses the Federal Highway Administration's Highway Performance Monitoring System (HPMS) database, with supporting information from various state and local agencies. The HPMS database is used because of its relative consistency and comprehensive nature. State departments of transportation collect, review, and report the data annually. Since each state classifies roadways in a slightly different manner, Texas Transportation Institute reviews and adjusts the data to make them comparable and then state and local agencies familiar with each urban area review the data.

The methodology consists on the determination the values which are divided on the constant values, variables and the main performance measures of the mobility:

1. *National Constants* - values used in all urban areas to estimate the effect of congestion. National Congestion Constants include: Vehicle Occupancy, Working Days Percent of Daily Travel in Peak Periods, Average Cost of Time, and Commercial Vehicle Operating Cost.
2. *Urban Area Constants and Inventory Values* - in addition, four urbanized areas or state specific values were identified and used in the congestion cost estimate calculations: Daily Vehicle-Miles of Travel, Population and Peak Travellers, Fuel Costs, Truck Percentage.
3. *Variables and Performances Measures* are presented in Table 2.

The basis for calculation all of these variables is connected with time spent on trips, speed of trips and the delay. The infrastructures of cities as well as the trips made on foot are not considered. Public, individual and the truck transport are considered as a single whole. The given report does not include the purpose of trips and requirement for trips, so the concepts of availability of the transport system and mobility of the population are not considered. Parameters of safety of the transport system are not included also. The transport system is examined only from the point of view of the traffic

Table 2. Variables and Performance Measures from the Urban Mobility Report of the USA

Variable and Performance Measure	Descriptions
Roadway Congestion Index (RCI)	the measure of vehicle travel density on major roadways in the urban area
Percent of Daily Travel in Congested Conditions	the ratio of daily traffic volume to the number of lane-miles of arterial street and freeway—to estimate the length of the peak period.
Travel Speed	the average speed for each element of the road system - is multiplied by the amount of travel on that set of roads
Travel Delay	the amount of the extra time spent in travelling due to congestions
Incident-Related Travel Delay	used to estimate incident delay
Annual Person Delay	the measure of the extra travel time endured by persons who make trips during the peak period
Travel Time Index	illustrates the comparison of the peak period travel time to the free-flow travel time
Wasted Fuel	the wasted fuel due to vehicles moving at speeds slower than free-flow during the peak period travel
Congestion Cost	combines the cost due to travel delay and wasted fuel to determine the annual cost due to congestion resulting from incident and recurring delay.
Percent of the Congested Cost	the percentage of travel in each urban area that is congested both for peak travel and daily travel

4. Canada: Urban Transport Indicators

In Canada for the first time the urban transport system investigation was fulfilled in 1994 on the basis of the data of 1991. The given survey was carried out by the Transportation Association of Canada (TAC). In 1999 TAC conducted a survey of 18 Canadian cities and by tabulating and interpreting the results regarded some 30 indicators measuring progress in achieving sustainable transportation. Indicators were subdivided into two groups: Quick Facts on Conventional Transit Service и Quick Facts on Specialized Transit Service [5].

Quick Facts on Conventional Transit Service: Number of Transit Systems Reporting, Number of Service Routes, Ridership (Regular Service Passengers), Boarding, Total Vehicle Kilometres, Total Vehicle Hours, Total Direct Operating Expenses, Total Operating Revenues, Total Employees, Energy Consumption, Diesel Fuel (million L), Bio-Diesel/E-Diesel (million L), Electricity (million kwh), Natural Gas (million m^3), Active Revenue Vehicles, Buses, Light Rail Vehicles, Heavy Rail Vehicles, Commuter Rail Vehicles.

Quick Facts on Specialized Transit Service: Number of Transit Systems Reporting, Rider-ship (Total Passengers), Total Vehicle Kilometres (dedicated service), Total Vehicle Hours (dedicated service), Total Operating Expenses, Total Operating Revenues, Active Revenue Vehicles, Total Employees.

Nowadays the Canadian system of the estimation of the transport system performance includes some approaches. The urban transport system is examined both from the point of view of the traffic, and from the point of view of expenses. But the greatest role in calculation of indicators is played by data on transit of passengers.

The estimation system of the urban transport system in Canada does not have measures of the delay and the congestions; influence on environment, there is no information about incidents. The used indicators do not open a current condition status of the urban transport system and only consider the urban transport system as transit transport system.

5. Australia: Austroads National Performance Indicators

Austroads National Performance Indicators reports benchmarking performance data for the road system and road authorities in Australia and New Zealand [6]. In 1993, Austroads defined the role and key outcomes of the road system, and from this sought to develop and implement a rigorous set of national performance indicators for the road system and road authorities. The indicators were selected following the exhaustive process of consultation with stakeholders including the road transport industry. They represent the economic, social, safety and environmental performance of the road system and road authorities. The printed reports were first published in 1995; the first web report has appeared in 2002. Austroads Council endorsed a full review of the National Performance Indicators, which were completed in January 2005. Indicators are subdivided into 10 groups:

1. *Road safety.* The Road Safety Performance Indicators measure road safety performance. They are based on the levels of serious road traumas - persons killed, persons hospitalised and serious injury crashes. The indicators measure safety in terms of rates per population and rates per travel. The former reflects the relative health risk to the community while the latter the risk based on travel exposure. The indicators also include the estimates of the costs of serious casualty crashes to the community per capita and per million vehicle-kilometre bases.
2. *Registration and licensing.* User Transaction Efficiency - monitor operational efficiency of maintaining registers of drivers and vehicles.
3. *Asset management.* It represents two kinds of indicators. The first – Road Maintenance Effectiveness – monitor cost effectiveness of road authorities' maintenance function. The second – Smooth Travel Exposure – to monitor whether roads are providing acceptable travel conditions. The proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads
4. *Environmental.* Include *Greenhouse Gas Emissions, Total Road Transport Greenhouse Gas Emissions, and Traffic Noise Exposure.*
5. *Object assessment.* Includes the following indicators: Return on Construction Expenditure – monitor the predicted community benefits from the road transport and traffic authority programs; Achievement Index – monitor the ability to predict community benefits and road authority costs; Non-Road Interventions – a summary of the economic returns from any non-road interventions involving major changes to policy, legislation or gazetted regulations so that the community, having the confidence in these interventions, possessed positive community outcomes.
6. *Travel speed*: Actual Travel Speed (AM, PM, Off Peak, AllDay), Nominal Travel Speed, Congestion Indicator, Variability of Travel Time.
7. *Lane occupancy rate*. Lane Occupancy Rate (Persons, Freight) (AM, PM, Off Peak, AllDay), Car Occupancy Rate
8. *User cost distance*. The purpose of those indicators is to provide the guidelines and outline procedures in providing the various users cost distance performance indicators on behalf of all States and Territories. *User Cost Distance Performance Indicators* show the cost of the users travelling and moving freight per unit of distance travelled. The data for the passenger's car indicator is provided by the NRMA. The other indicators are based on the data collected in the shadow shop surveys and represent the estimated cost of moving freight on the representative network.
9. *User satisfaction index* – the purpose of those indicators is to provide a qualitative measure of road users' perceptions of the performance of the road system
10. *Consumption of road, transport, freight and fuel* – the purpose of those indicators is to provide the indicator showing road transport consumption levels and changes over time. This indicator has the goal of understanding the extent of road-based transport need in socio-economic activities. Road transport consumption is graphed for separate periods in time to indicate changes and trends in road transport consumption.

In comparison to the considered approaches to the estimation of activity of the transport system accepted on North American continent, the urban transport system in Australia has been analysed fully. The indicators specifying the conditions of the traffic indicators of safety and satisfaction of the population are added, the influence on the environment and the cost of service of transport system is considered as well.

6. Europe: Urban Audit

The Urban Audit, launched by the European Commission in June 1998, aims to gather the comparable information and data at city, wider city ('Wider Territorial Unit' or conurbation) and sub-city levels. The overall aim is to provide a self-sustaining and dynamic information tool, to inform urban policy issues at the Europe Union (EU), national and city level. The end product will enable an assessment of the state of Europe's cities, providing the access to comparable information on participating cities in Europe, as well as facilitating the exchange of information amongst cities [7].

The 58 cities included into the Urban Audit pilot phase were identified by the European Commission. The largest cities (by population size within their administrative boundaries) within the EU member states have been included. The main exceptions to this principle are: the exclusion because of their large scale of London and Paris; and, in order to ensure a good geographical spread across the EU and to cover a significant percentage of the population in each country, some cities from the smaller EU countries were included even though they have smaller populations than some of those cities not included from the larger countries [7]

As it has already been mentioned above, the Urban Audit aims to provide information at three spatial levels (Table 3).

Table 3. Spatial levels provided in the Urban Audit

Level	Description
Core City	administrative definition, as the basic level (Label "A)
Larger Urban Zone (LUZ)	is an approximation of the functional urban zone centred around the town/ city
Sub-City District (SCD)	is a subdivision of the city according to strict criteria (5 000 – 40 000 inhabitants in each sub-town / city district).

The selection of participating / cities and the definition of the composition of the LUZ and the SCD in terms of spatial units need to respect certain criteria set by DG REGIO and statistical quality in general:

- the participating cities in each country should represent about 20% of the population in that country;
- the participating cities should reflect a good geographic distribution within the country (peripheral, central);
- coverage should reflect more medium-sized cities than was the case in the UAPP (medium-sized towns / cities having a population of between 50 000 – 250 000 inhabitants, large towns/cities with >250 000);
- there should be comparability of data to enable comparative analysis between towns/cities;
- data should be available [8].

This "sampling" procedure for the Urban Audit project was closely and specifically designed by Eurostat, DG REGIO, the NSOs and the cities in the countries. The final selection of participating cities in the Urban Audit has been a compromise between all aspects.

The indicators cover 5 fields:

- socio-economic aspects,
- participation in civic life,
- training and education,
- environment,
- culture and leisure.

A full list of indicators is defined within the 21 domains and has been produced for the Core Cities, Sub-City Districts and Larger Urban Zones. In most cases, the data obtained from Censuses, different administrative and statistical registers and national and local databases are used in a given country or a spatial unit.

Three data collection modes are distinguished: direct, indirect and mixed. Using sample surveys only allows a partial coverage of the population, whilst a Census provides the full coverage of the whole of the target population. Under this two-way classification, four special cases (or options) seem relevant

in the context of the Urban Audit: sample survey data using direct data collection, combined use of sample survey data and register data, Census data using direct data collection and Census data using indirect data collection methods. In many cases, different combinations of these data sources have been applied depending on the spatial unit of interest and the target variable.

A series of products have resulted from the Urban Audit:

- The *"Urban Yearbook"* of European Cities summarises the information available on the participating cities. The main objective of the "Urban Yearbook" is to enable comparisons to be made between cities. Scores for individual indicators are presented for all the cities where data are available. Thus, comparisons can be made quickly between all the cities in the areas of particular interest [7, 8, 9].
- The *Individual City Audits* present information and scores for indicators in each city included in the Urban Audit. The Individual City Audits are aimed at city officials interested in the situation of their own city and of other participating cities. The summaries provide direct comparisons with other cities. They present information through tables, maps and commentaries on a specific city, its WTU or conurbation and sub-city areas.
- The Urban Audit *Web Site* allows users to access results and products from the Urban Audit. It includes a general presentation of the Urban Audit, the indicators and their definitions, as well as the Individual City Audits of the cities that have already taken part in the Urban Audit. Those interested in the urban issues more generally are also able to consult the extensive bibliography and resource material posted on the site, and to find links to other relevant web sites that may be of interest to urban experts and policy-makers.

The overall purpose of the Urban Audit is to enable an assessment of the state of individual EU cities and to provide the access to comparative information from other EU cities. It is intended to facilitate the exchange of information amongst cities.

One of areas of Urban Audit is connected with an estimation of characteristics of transportation and refers to Travel Patterns. The systems of adhering data relevant to this domain vary. They are normally sample surveys on different categories of mode and purposes of travel. The list of 41 indicators is divided into 5 groups which are presented in Table 4.

Table 4. List of indicators

Groups	Name of indicators
Characteristic of journey to work/non work	Proportion of journeys to work by different modes
	Total number of journeys to work
	Proportion of journeys to work by public transport
	Average time of journey to work by different modes (minutes)
	Average distance per trip: journey to different purpose (km)
	Proportion of distance travelled for non work purposes (%)
Distance	Average distance per trip person (km)
	Annual distance travelled per person by all modes (km)
	Annual distance travelled per person by motorised transport (km)
	Annual distance travelled per person by rail/metro (km)
	Average distance from city centre to "centre" of sub-city area (km)
Number of trips	Total number of trips per year by residents
	Proportion of trips: journey to different purpose
	Average travel time by public transport to city centre (minutes)
Number of cars	Average number of occupants of motor cars
	Cars registered within the city boundary (per 1000 population)
Road accidents	Number of road accidents resulting in death or serious injury (per 1000 population)

Journeys to work, business, education, escort, shopping, personal business, social entertainment, holidays trips and walks are considered as trip purpose. Rail/metro, cars, buss, trams, bicycles, feet and other modes are considered as vehicles.

Variables requested in the Urban Audit for Travel Patterns domain can be informed in the following ways:

- the purpose of travel – sample surveys of individuals to determine purpose/mode and distance travelled during a given period (week or month). Ideally travel diaries would be maintained for a given period and checks made to verify estimates of distances travelled;
- the mode and other characteristics of journeys to work - either sample surveys or residents or of establishments (throughout the city or conurbation/WTU);
- the occupancy of private motor vehicles can best be measured by systematic road side surveys.

One result of the experience of the Urban Audit Pilot Phase was that the quality of the data needed to be improved. The experts entrusted with this work set-up ranges for indicators - where possible - against which the data were checked (Table 5). These ranges were just the first approach to the checking process and they have been reviewed. For some indicators it was not possible to set such ranges in advance but rather during data analysis. All the data were reviewed for anomalies. Together with the National Urban Audit Coordinators concerned, any anomalies were either validated or corrected [8].

Indicators and indices which are applied in the project consider urban transport system more from the point of view of mobility of the population that is a one-sided sight at so much complex and difficult system.

Table 5. Ranges applied to check the accuracy of indicators [8]

Indicators	Suggested ranges
Number of cars registered within the specified boundary per 1 000 population	20 ÷ 500
Road accidents resulting in death or serious injury per 1 000 population	0 ÷ 10
Proportion of in-commuters of persons employed in the city, %	2 ÷15
Proportion of out-commuters of persons employed living in city, %	2 ÷15
Total km driven in public transport per capita, km	0 ÷20

7. Approaches to the Analysis of the Urban Transport System in Russia

In Russia there is no uniform approach to the estimation of the urban transport system. One of the variant of indices set was offered by S.A.Vaksman and N. G. Kochnev; the set of indices, which characterized UTS, consists of 7 groups [10].

Table 6. Indices suggested by S. A. Vaksman [10]

Indices groups	Indices
Planning indices	• characteristics of the metropolitan area • supply indicators • private transport infrastructure indicators • public transport infrastructure indicators
Traffic indices	• passengers' cars per kilometre of road • total private passengers' vehicles per kilometre of road • total single and collective private passengers' vehicles per kilometre of road • passengers' car kilometres per kilometre of road etc

Indices groups	Indices
Financial indices	• financial transport cost • public transport operating cost recovery • public transport cost • charges on individual transport • overall transport cost • user's cost of transport
Transit indices	• public transport supply and service • private collective transport supply (taxes and shared taxis)
Mobility indices	• overall mobility • private mobility indicators • intermodal transport infrastructure indicators
Ratio of public and private transport	• public/private transport balance indicators • private transport supply
Indices of influences of transport on an environment	• transport energy indicators • air pollution indicators • transport fatalities indicators

Each group includes a set of indicators, total amount – about 100 indicators. The authors note that the given list of indicators fully reflects the valid condition of system from various aspects, grouping indicators in the basic directions.

8. Conclusions and Further Directions of Research

The most serious problem of the estimation of the performance of the urban transport system is the absence of the uniform standard approach to this question and absence of the terminological unity and high-grade statistical base. In different countries various approaches, terminology, methods and algorithms are used (Table 7).

Table 7. Approaches to the estimation of the urban transport system in different countries

Country	Object	Approach
USA	Traffic, congestion	Traffic-based
Canada	Transit	Accessibility-based
Australia	Traffic, Personal mobility Environmental User's satisfaction Object assessment	Traffic, mobility Accessibility-based
Russia	*Planning, Traffic Transit, Mobility Financial, Environment	Traffic, Mobility Accessibility Land-use-based
Europe	Mobility **Land-use **Environment	Mobility-based

* only are solved
**are indirectly connected with the transport system of city

Latvia as a member of the European Union has the common economic zone with the EU countries and accordingly has a set of economic relations with these countries. Therefore it should be guided firstly by the programs in the field of transport, which are realized by the EU countries.

To apply the experience of the European cities fully it is necessary to confirm the national program on gathering the information about the trips for calculations of the following indices and indicators:

- Mode of journey to work: rail/metro, bus, tram, car, cycle, walking;
- Characteristics of all travels of residents (purpose, distance and mode of travel);
- Number of cars registered within the specified boundary per 1000 of population;
- Road accidents resulting in death or serious injury per 1000 of population;
- Average number of occupants of cars.

For the complex estimation of the performance of the urban transport system of Latvia the following steps should be undertaken:

1. To choice the approach to the estimation of the performance of the urban transport system in Latvia (and first of all for Riga).
2 Development of the parameters system (indices and indicators) of the urban transport system performance, which will include:
    - planning indices;
    - traffic indices;
    - financial indices;
    - transit indices;
    - mobility indices;
    - accessibility indices;
    - reliability indices;
    - indices of influences of transport on the environment.
3. Development of the methods and tools on gathering the information:
    3.1. Development of the national program on data gathering about mobility of the population, availability of transport, reliability and safety of transport system and for this purpose the methodology of conducting the National Travel survey should be developed. The representatives of the inhabitants of all the areas (zones) of city and also of all suburbs should participate in such survey. The city of Riga and residential suburbs are divided into 143 statistical zones. For the account of movements of inhabitants of all zones, it is necessary to use cluster sampling method for the realisation of the sample for the survey, where each statistical zone being a cluster. 2 methods of data gathering can be offered: with the use of diaries of trips and the modern way of data gathering developing at present, with the use of the mobile personal GPS devices. Such survey will allow estimating the changes in mobility of the population.
    3.2. Development of the programs of the use of the technical devices for the constant monitoring and gathering data on the situation on roads (traffic count).
    3.3. Research and analysis of the technical and statistical documentation about the urban transport system. Here are included: technical road conditions, quantity of failures, quantity of victims on the roads, quantity of the registered cars, quantity of the registered driving licences, gassed conditions, etc.
4. Development of the centralized data storage.
5. Development of the methods of clearing, validation, estimation and analysis of the data.

The uniform approach should be developed for the estimation of the urban transport system and taken into account the main principles of the audit and algorithms of their conducting.

References

1. Kirzner, Ju.S. Hypercube of the conditions of urban passengers' transportation system. In: *Social and economic problems of town transport systems and areas of their influence development: Proceedings of the XII international scientific and practical conference.* Yekaterinburg, Russia, 2006. (In Russian)
2. Vaksman, S.A. Urban transport audit. In: *Social and economic problems of town transport systems and areas of their influence development: Proceedings of the XIII international scientific and practical conference*. Yekaterinburg, Russia, June 14-15, 2007. (In Russian)
3. Litman, Todd. Measuring transportation: traffic, mobility and accessibility. *Institute of Transportation Engineers (ITE) Journal*, Oct 2003.
4. Schrank, David, Lomax, Tim. The 2007 Urban Mobility Report, *the Texas A&M University System,* Texas Transportation Institute. September 2007.

5. URBAN TRANSPORTATION INDICATORS. The Canadian Urban Transit Association [cited 2008-08-15]; available – http://www.cutaactu.ca/en/node/135
6. Australian and New Zealand Road System and Road Authorities. National Performance Indicators – http://algin.net/austroads/site/index.asp
7. *Urban Audit. Towards the Benchmarking of Quality of Life in 58 European Cities, Vol.I: The Yearbook*. Luxembourg: Office for Official Publications of the European Communities, 2000.
8. *Urban Audit. Methodological Handbook*. Luxembourg: Office for Official Publications of the European Communities, 2004.
9. *Urban Audit. Towards the Benchmarking of Quality of Life in 58 European Cities, Vol. III: The Urban Audit Manual*. Luxembourg: Office for Official Publications of the European Communities, 2000.
10. Vaksman, S.A., Kochnev, N.G. Systematisation of the indicators of urban transportation systems. General results. In: *Social and economic problems of town transport systems and areas of their influence development: Proceedings of the XIII international scientific and practical conference*. Yekaterinburg, Russia, June 14-15, 2007. (In Russian)