transport system of the city; rational methods of management;
intellectual decision-making support system; concept of a sustainable development

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URBAN TRANSPORT SYSTEM MANAGEMENT IN THE CONTEXT OF REGION SUSTAINABLE DEVELOPMENT STRATEGY

Summary. The article deals with issues of ensuring the reliable and safe city transport system operation through the use of the rational management methods. To make evidence-based management decisions are encouraged to use worked out intelligent decision support system. It is shown that a comprehensive solution of the city transport system management contributes to the sustainable development of the region.

УПРАВЛЕНИЕ ТРАНСПОРТНОЙ СИСТЕМОЙ ГОРОДА В РАМКАХ СТРАТЕГИИ УСТОЙЧИВОГО РАЗВИТИЯ РЕГИОНА

Аннотация. В статье рассматриваются вопросы обеспечения надежного и безопасного функционирования транспортной системы города путем использования рациональных методов управления. Для принятия научно-обоснованных управленческих решений предлагается использовать разрабатываемую интеллектуальную систему поддержки принятия решений. Показано, что комплексное решение задачи управления транспортной системой города способствует реализации концепции устойчивого развития региона.

1. INTRODUCTION

The most important criterion of a sustainable development is achievement of strategic balance between people's activity and maintenance of the biosphere reproducing possibilities [1].

It is especially important for regional development, because a region is open difficult functioning socio-ecology-economic system which the internal factors caused by local government and external factors caused by the state economic and social policy influence.

2. SYSTEM APPROACH TO REGION SUSTAINABLE DEVELOPMENT

The sustainable development of a region assumes a system approach to consideration of the economic, social and ecological processes, constructed on the following system principles [2, 3, 4]:

1) the system should be in a vicinity of sustainable development trajectory where its main macroindicators are balanced;
2) there is an effective mechanism which is capable to hold system in the equilibrium condition;

3) resources of system are distributed between its elements effectively not to form antagonistic contradictions in it;
4) reliable information about its condition and the environment condition arrives into the system;
5) the reasonable decision is accepted taking into account current and possible future conditions of system, the past is perceived as experience;
6) in hierarchical system processing of information and decision-making are rationally distributed between all its elements;
7) the system is in harmonious relations with the environment;
8) mechanisms of continuity and variability of the system provide smooth adaptation to external conditions.

The assessment of current state of region development is carried out on the basis of indicators. Indicators of a sustainable development are criteria and parameters by means of which the level of development of a geographical region is estimated.

Taking into account a target directionality indicators of a sustainable development are divided in three categories, such as indicators of entrance influence, condition indicators, management indicators (fig. 1). The first indicators characterize human activity, processes and characteristics which influence a sustainable development. The second indicators characterize current state of various aspects of a sustainable development [5, 11].

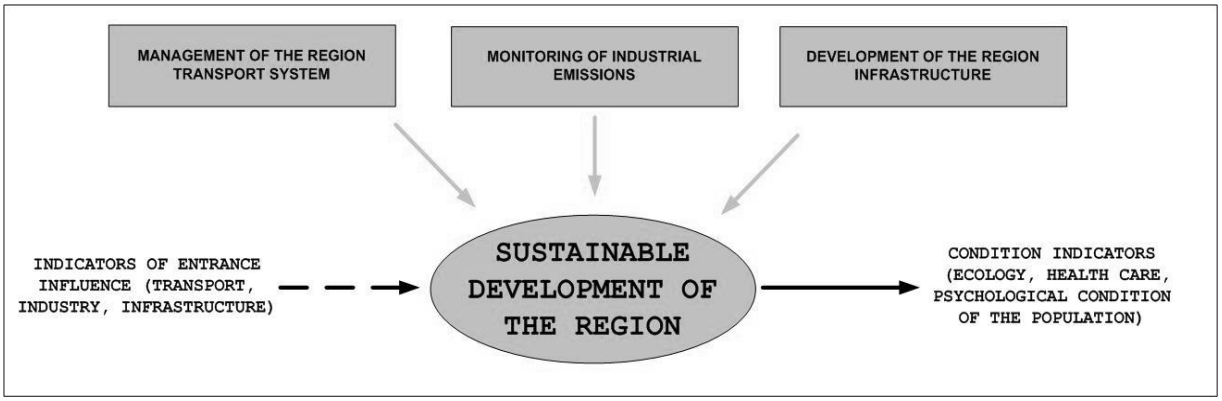

Fig. 1. Categories of indicators of region sustainable development
Рис. 1. Классификация индикаторов устойчивого развития регионов

3. MONITORING OF REGION TRANSPORT SYSTEM

Authors determined by the main indicator the management of transport system of the region and its influence on an ecological situation. Development of transport system should be provided with effective and ecologically safe projects and decisions for the balance between comfortable living conditions and careful attitude to nature. It is necessary to create and effectively to unite various transport systems for providing fast, safe and economic delivery of passengers and cargoes to the destination with the smallest impact on the environment [6 - 8, 12].

The development of the city is influenced mainly by a transport network.

Today the modern mechanism of management by the transport streams is required. This mechanism should allow carrying out monitoring, the analysis and optimization. The intellectual information system with imitating models and knowledge base can be such mechanism [9, 10].

For collection of information and its analysis it is required to count intensity of city roads traffic (vehicle fleet structure, average speed, quantity and engine type), quality of the road, a traffic light operating mode, level of atmospheric air pollution, incidence in the district of the city. For storage and the data analysis it is offered to use multidimensional data model in the form of a multidimensional cube (fig. 2).

Factors of an analytical cube are:
1. Model, brand and type of the engine of the vehicle.
2. Middle age of the vehicle.
3. Movement direction.
4. Movement average speed.
5. Length of jams.
6. Total of cars passing for an hour.
7. Volume polluting emissions (CO, NO_x, C_xH_y etc.).
8. Road accident quantity.

Then on the basis of this information the data massive on each investigation phase is formed.

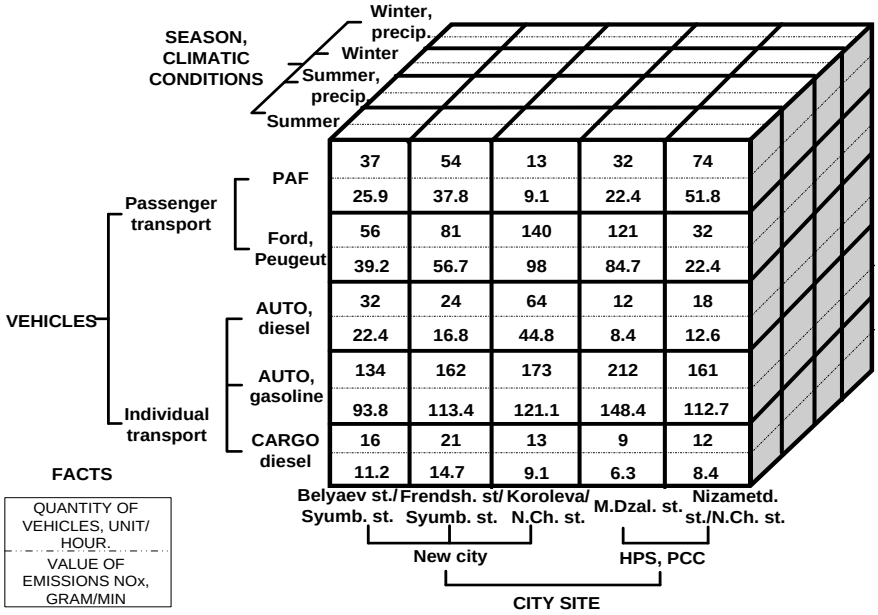

Fig. 2. Data multidimensional analytical cube of transport streams monitoring
Рис. 2. Многомерный аналитический куб данных мониторинга транспортных потоков

Information system was developed for maintaining databases in the form of information collection forms set in which groups of the factors having impact on a road situation are systematized, and also the general data necessary for the subsequent statistical analysis are specified (fig. 3).

The presented information system acts as service of information exchange with information systems of authorities, objects and subjects of a transport complex as city, and region as a whole. Such service will allow to use and accumulate effectively information on changes in transport system. The presented system at the initial stage (without use of imitating modeling) allows to solve the following problems:
- Collecting, analysis, validation and group of the data obtained from external systems.
- Visualization and storage of collected data.
- Calculation of correspondence matrixes on the basis of spatial socio-economic indexes.

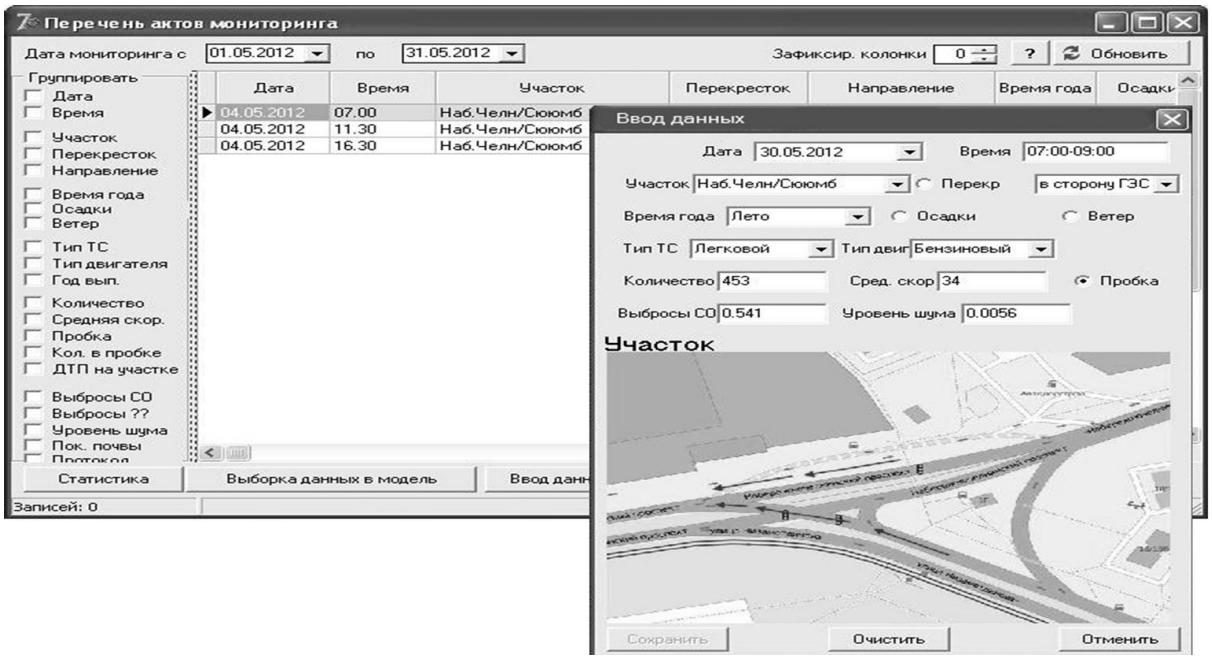

Fig. 3. The program module for collecting, storage and the analysis of monitoring data of transport streams
Рис. 3. Программный модуль сбора, формализации и анализа данных мониторинга транспортных Потоков

The formalized data are used in the imitative model to make experiments and to optimize region transport system indicators (fig. 4). Thus, the cycle of the region transport situation research in which imitating models allow to solve the following problems is formed:

1. Modeling of the city existing and predicted transport streams.
2. Modeling of roads all network and network of public transport lines.
3. Analysis and assessment of rules and intensity of movement.
4. Choice of movement optimum organization at an intersection and a capacity assessment for each option of movement.
5. The capacity and movement analysis in a zone of stops taking into account public transport priority.
6. Optimization of traffic lights work.

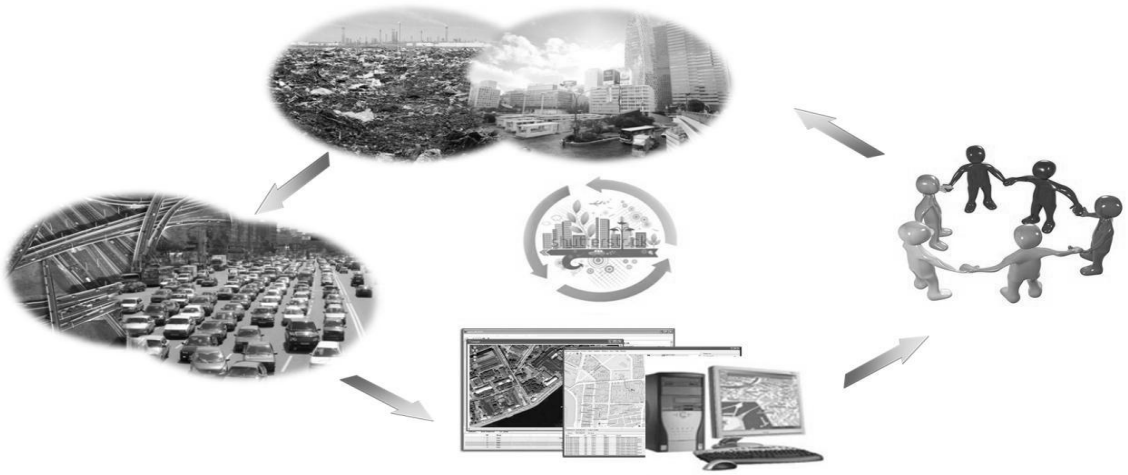

Fig. 4. Algorithm of information streams in the managment system of transport streams
Рис. 4. Алгоритм информационных потоков в системе управления транспортными потоками

4. CONCLUSION

Thus, for the solution of the region sustainable development objective authors developed structure and an intellectual kernel of decision-making support system. Basis of offered system the make algorithms of research of transport streams and information system of collecting, storage, formalization and the monitoring data analysis. The imitative model and knowledge base were developed for every road site of system. These model and base allows giving recommendations about optimization of transport streams (to change a traffic light operating mode, to repair the road, to construct alternative roads, to establish road signs, to change an arrangement of crosswalks).

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Received 12.11.2011; accepted in revised form 15.05.2013