



MEGACITY TRANSPORT

ANNA SINITSYNA AND KIRA SHINGAREVA SUMMARISE THE WORK EXPERIENCE AND CONCEPT FOR THE MOSCOW MEGACITY ROAD AND TRANSPORT COMPLEX.

Since 2000 a group of young scientists, postgraduates, and students led by Professor Kira Shingareva have been studying the “Problems of the Megacity Road and Transport Complex (case study Moscow),” a project of the economic and business chair of The Moscow State University for Geodesy and Cartography. During this period, research has been oriented toward Moscow parking space and some models and methods of transport component influence on the economic efficiency of the megacity industry were developed. The structure of megacity parking space was created using GIS, and partnerships with the main State organizations studying such problems were also established.

The concept development on the Megacity Road and Transport Complex (RTC) for the Moscow-wide GIS is planned as the next step and will be developed in coordination with the context of the uniform city GIS. The RTC GIS is being developed by megacity users namely by the Municipal Department of Internal Affairs, Moscow State Traffic Safety Inspectors and other interested ministries, departments and participants in traffic management.

Introduction

The group took part in the experiment of the “South-East Ray” area of Moscow. Work was conducted according to the Moscow Government Decree issued on August, 29-th 2000 year No.698 - “On the Conception for Organized and Legal Regulation of the Temporary Placing Accommodation System for Motor Transport Means at Moscow Territory” by leading experts of the Scientific Research and Project Institute of Moscow general plan and the Centre for Tele-automatic Traffic Regulation

of Russian Federation Internal Affairs Ministry. Some models and methods of transport component influence on economic efficiency of the megacity industry were developed.

Experience of parking placing in Megacities

Today, at the beginning of the 21st century (after almost half-century from the moment of the first steps in town-planning attempts for this problem solution, namely location of the motorcar parks), we can establish, that transport facilities and clusters including parkings, and later on will render more and more considerable influence on the design and building up of cities. The role of parkings in general architectural and spatial composition of multifunction clusters appears extremely crucial. It is connected, in particular with the fact, that the total building volume of parkings designed for an outlook, according to the estimation of some specialists, appears to be so considerable, that it exceeds the total amount of different kind public buildings taken together.

The municipal economy, and, especially that of large cities (megacities), sensitively reacts to the development of an automobile park. The problem of accommodation of buildings and constructions for storage of units of the automobile transport exerts an increasing influence on the solution of many problems of town-planning and architecture, beginning with the over-all plans of cities with the development of a detailed design up to the projects of separate buildings and constructions.

The practice of foreign experience demonstrates, that the problem of accommodation of parkings in megalopolises has no single universal solution. The diversity of particular town-planning situations generates

NO	TIME PERIOD	COUNTRY	MAIN FEATURE OF PARKINGS LOCATION
1.	Late 1940s-early 1950s o the 20 th century	France	Multi-storey ground parkings on the embankments of the Seine and in the suburbs of Paris
2.	1960s of the 20 th century	Austria	Buildings of parkings in the suburban areas in order to make the centre free
3.	1960s of the 20 th century	England	Buildings of underground parkings under public gardens and parks
4.	Late 1960s of the 20 th century	France	Erection of systems of underground parkings under streets and squares
5.	Middle 1960s of the 20 th century	Sweden	Buildings of parkings using natural overfall of terrain
6.	Early 1970s of the 20 th century	Canada the USA	Erection of parkings as one of the component in the multilevel (underground-ground-overground) public transport complexes

TABLE 1: Parking location (foreign practical experience).

the whole spectrum of optimum solutions.

The main ways of the parkings location solutions (used abroad) are given below in Table 1.

The main purpose of the general city parking location system is to provide the optimum conditions with respect to work, household activities, rest and travelling for the urban population, along with the simultaneous increase of free vacant spaces that enable the formation of healthy, comfortable and aesthetically attractive urban environments. The practice of foreign experience on the parking location scheme has revealed a number of factors which play a determining role in decision making for particular town-planning situations. Table 2, given below, contains these major factors classified into groups.

Collecting, analyzing and organising the determining factors (see Table 2) on the basis of modern GIS systems, makes it possible to create an optimization module of the parking locations. The scientific group mentioned above continues to investigate the Moscow parking system in other areas including, economics, social, architectonic and administration. The GIS structure and database is being developed and digital thematic maps are being compiled.

GIS-technologies are the base of the Megacity Road and Transport Complex GIS Concept. Modern GIS-technologies proved to be an effective tool for decision making related to practical problems for both the regional economy as a whole and the separate industrial enterprises, in particular. They represent a universal and standard method for providing the data management with associative connection to the spatial coordinates of objects and their characteristics. Using this technology, it is possible to create complex systems for decision making related to social, economic, organizational, ecological, architectural and town-planning problems.

The separate present Moscow elements of a uniform city GIS

Expansion of GIS technologies has begun with the creation of small, local systems for the

decision making processes that are related to refining the system. As a result, GIS is expanding into the territorial level (city, regional, etc.) where it is being used for development and operational purposes, including resource related areas (geological, agricultural, minerals, wood, water, etc.) and ecological applications for the separate branches of the national economy.

At present in Moscow the separate elements of a uniform city GIS have been created and are functioning:

- Tele-Automatic Traffic Control System (START),
- Ecological GIS of the Moscow Ring Highway (project Eco-MKAD),
- Pilot-project of Complex Automated Control System for positions and conditions of Transport Streams movement of the Moscow Ring Highway (SAK TP MKAD),
- Pilot-project of Complex Automated Control System for positions and conditions of Transport Streams movement and Traffic Management of the Dmitrovskoye Highway in Moscow (ASUD D) and,
- Parking Space monitoring is carried out according to the experiment *South-East Ray*. The Tele-Automatic Traffic Control System (START) was created in 1969 by the *Mosgortrans-NIIProect*. The Teleautomatic Movement Control of Traffic Center (TSTAU DT) is engaged in operation and development of this system which requires technical updating and improvement now. The pilot-project of SAK TP MKAD and the pilot-project of ASUD D" were created according to Moscow Government Updating Technical Program of the project START during 2004-2005. The Ecological GIS of the Moscow Ring Highway (Eco-MKAD) was developed by the Scientific GIS Centre of the Russian Academy of Sciences under the order of *Moscompriroda*.

The experiment *South-East Ray* was the first Moscow Government project of control, management and monitoring of City Parking Space and was initiated during 2000-2003. Some organizational and management models and methods of Parking Space were developed

and realized according to this experiment. The concept of the Megacity RTC GIS should be developed within the context of the Moscow City GIS and take into account that there is a plan to create the Uniform Centre of Control and Management Moscow Traffic according to Moscow Government technical requirements.

The main purpose of the Moscow RTC GIS

The main purpose of the Moscow RTC GIS is to develop the basis of the global city GIS structure including a number of technologies to maintain a safer and more effective functioning of the Moscow Megacity RTC with smaller numbers of traffic jams and a lowered ecological load on the environment. According to the main purpose and within the limits of the city RTS GIS concept the following tasks should be solved:

- Elements of automation for gathering, storing and processing the Megacity RTC information must be created,
- Opportunity for the geographical binding of collected data should be realized,
- Specialized software libraries must be developed for the solution of complex tasks and,

Opportunities for operative decision making related to questions of integration, storage and processing, analysis and display and updating for great volumes of spatial data need to be taken up.

The Moscow RTC GIS will make in order to increase the efficiency in the functioning and the further complex development of the Megacity RTC due to the application of modern management and control technologies on the basis that the tools providing a necessary level of efficiency relating to the reaction to road and transport incidents under normal conditions and in extreme situations.

The base map

A digital map of Moscow 1998 at a scale of 1:10.000 was used on the first stage of full field investigations during the period 2000-2003. Updating of information on the map is to be carried out during the subsequent stages.

Data Base

Development of the database was conducted according to the basic technical and economic aspects of RTC functioning (organizational, ecological, industrial, social, legal and economic). It also contains the developed classification of Megacity DB RTC GIS features. The basic directions of classification and several papers have been written describing the Megacity RTC functioning in previous investigations.

Industrial aspect. The megacity industry can be classified:

- Under the general characteristics (a kind of branch, e.g. city compiling and city serving);
- Under the name of various branch (food, microbiological, electric power, medical, chemical, glass, machine-building,

NO	FACTOR	LIST OF COMPONENTS
1.	Social	density of population; numbers of population; character of location; migration of population; dynamics of changes in social prerogatives and problems;
2.	City infrastructure	condition of street and road network; character of street and road network; transport network; ratio of public and private transport; ratio of ground, underground and fast transport;
3.	Architectural and town-planning	architectural and planning decisions; functional area formation; density of building up; character of building up; type of building up; distance from city kernel; parameters of street and road network (dimensions, intensity); art and aesthetic perception;
4.	Economical	investment policy; welfare standard of population;
5.	Ecological	noise standart; condition of water; condition of air; condition of soil.

TABLE 2: The factors playing the determining role in making decisions for the particular town-planning situation.

- polygraphic, metallurgical, wood and other industries);
- Under economic characteristics (dynamics of the city budget change in (%), influence of transport jams on an industrial output (%), prospects of city development);
- Under town-planning characteristics (a site including a kernel of city centre, the center itself, a median zone, periphery);
- Affinity to a street-high system (SHS) (to ring directions, to radial directions);
- Under the transport factor (the characteristic of transit streams in the center direction and in area direction, on days of a week, on seasons, on months, on day time).

Organizational aspect . The organizational aspect includes two basic directions namely space of SHS and parking space (PS).

SHS space is possible to classify under a level of development (It is something as a subject for the modernization, or recently modernized, or not a subject for modernization in view of its historical value), under characteristics of transport streams (Speed movement is free, movement is complicated, it is a transport jam;). Besides there is transport intensity; density; seasonal prevalence; monthly characteristics; daily characteristics (industrial); day time characteristics (transit), parking (The road is free, partially occupied under not authorized parking). Characteristics of PS include:

- An economic force (paid, free-of-charge);
- The architecturally-town-planning factor (situation in town, type, plane, architecture,

construction, the size, on a way of storage of transport, under the status);

- A social factor (type of parking objects, technical armament);

The ecological factor (emissions of harmful substances in an atmosphere, ground, water; parameters of noise; parameters of vibration; parameters of electromagnetic radiation).

Legal aspect. Legal aspect is available in view of administrative and legal factors, namely measures of punishment (fine, collecting, etc.), special modes of functioning of Megacity RTC separate elements (the governmental line, roads only for service using, a line of passenger transport movement, the federal status of a highway in city, etc.).

The economic aspect. The economic aspect includes technical and economic parameters of RTC functioning (presence of paid highways, incomes of functioning software, the over expenditure of vehicles gasoline because of transport jams, the over expenditure of time for movement in city, efficiency of cargo transportations, etc.).

The social aspect. The social aspect means the reduction of time spent by traffic participants during their way, decrease in breakdown susceptibility of traffic, reduction of psychologically negative and stressful situations by transport highways, maintenance with the high-grade information on a condition on roads of salvage and rescue services, city manage-

ments, participants of traffic and inhabitants of Moscow in real time.

Software

The RTC GIS for the megacity project uses ArcView GIS of version 9.0 from ESRI for the production and creation of the appendices focused on specific targets.

Inquiries structure

The creation of inquiry structure must include the development of information input techniques and techniques for operating with this information.

Processing and the analysis

Concentration of information resources in a Megacity RTC GIS and communication of the descriptive information on RTC functioning with objects on the map will allow for the creation of new communications. This will enable processing of the information simultaneously on several parameters and provide the capability to adjust statistics and analysis.

Optimization of decision-making

The proposed Megacity RTC GIS concept must help in accelerating and raising the efficiency of decision making procedures, and to provide answers for inquiries and functions of the spatial data analysis. It should also represent results of the analysis efficiently and quickly. The information demanded for decision-making should be represented in cartographical form with additional explanation texts, schedules and diagrams.

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