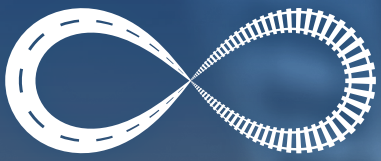

CETRA 2018

5th International Conference on Road and Rail Infrastructure
17–19 May 2018, Zadar, Croatia

Road and Rail Infrastructure V

Stjepan Lakušić – EDITOR

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DEVELOPMENT OF INTEGRATED TRAFFIC MANAGEMENT SCHEME (ITMS)

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Abstract

Moscow city is a dynamically developing city with dense buildings in the centre and a constantly increasing number of vehicles and passenger traffic. By 2014 the main transport problems of the city were the following: a) High pendulum movements of personal transport during peak hours (region-centre, centre-region), b) Low efficiency of Surface Urban Passenger Transport (SUPT): high traffic congestion, low priority and delayed movement of the SUPT, c) Chaotic parking in the city centre, sharply reducing the traffic capacity of the streets, d) Low level of safety for both pedestrians and drivers. Solving these and other tasks in the city, earlier we developed several projects to change the traffic organization, but the lack of an integrated approach to design and the introduction of local operational changes did not give the desired result. This approach to the development has identified a number of other problems: a) There is no tool for rapid access to project documentation, when analyzing situations in the street and road network, b) The process of monitoring the compliance of the project documentation with the existing, c) position of the object of road transport infrastructure, d) Reconciliation of documents by the interdepartmental structures is carried out through official correspondence without prompt interaction.

Keywords: Moscow city, surface urban passenger transport, traffic congestion, Moscow ring road

1 Introduction

In this regard, it was decided to develop a set of measures throughout the city, with a unified approach to design, allowing to consider Moscow street and road network as a single object, thereby to introduce integrally and simultaneously a number of measures to change the traffic organization such as:

1) organisation of separated lanes for public transport;
2) the introduction of one-way traffic;
3) ordering of the parking space;
4) proposals for locally-reconstructive measures (widening of the driveway part, sidewalks, organization of parking bays, security islands;
5) development of cycling infrastructure (cycle lanes and cycle tracks);
6) the organization of parking lots for taxi and cargo transport.

2 Moscow Ring Road

Thus, in 2014, began the work on the creation of the ITMS in Moscow. In Moscow there are more than 4,000 streets, and the change of traffic organisation in some of them is reflected in the traffic situation of the whole city. And to change the traffic organisation in the whole

city during 1 year is simply not possible. Thus, the implementation of the ITMS in Moscow is divided into several stages (starting from the city centre to the periphery):

1) The first stage was developed in 2014 and covers the centre and outbound routes of the city;
2) The second stage was developed in 2015-2016 and covers all the area up to the Moscow Ring Road; (figure 1)

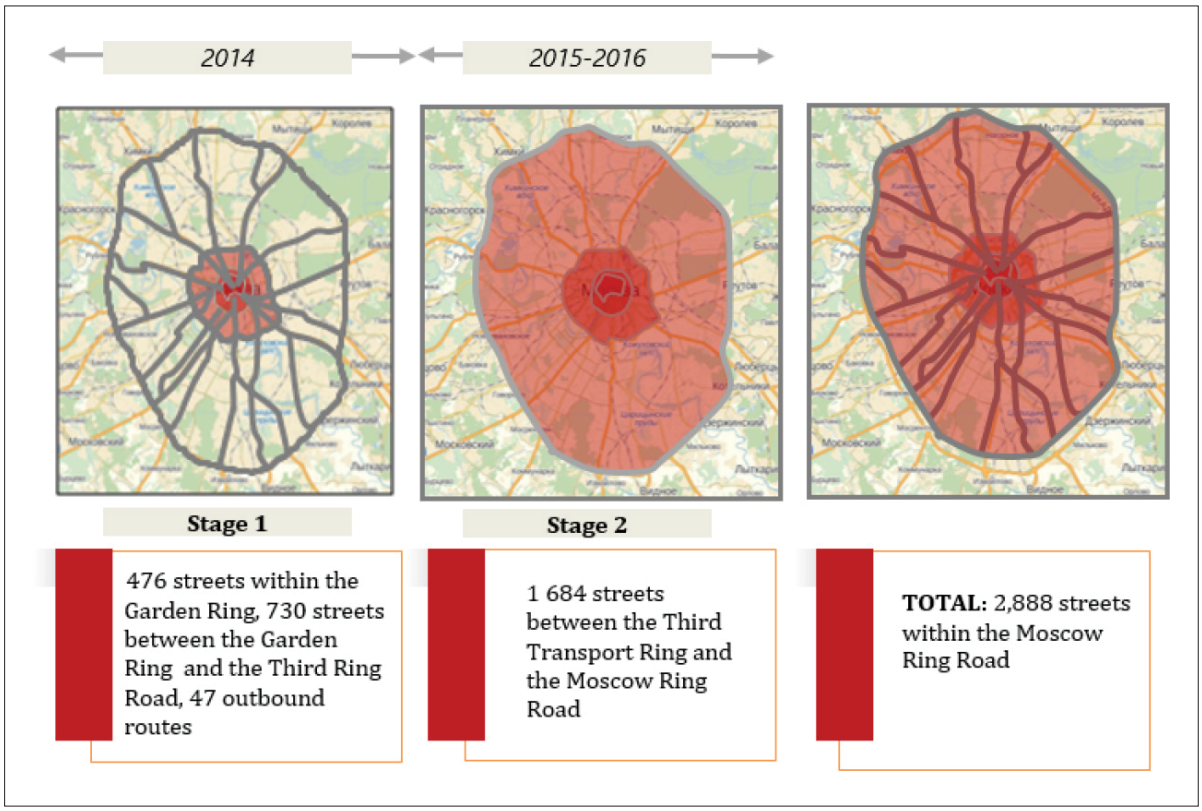

Figure 1 First and second stage of the ITMS in Moscow

At the moment the third stage is being developed on the territory of Moscow Ring Road area, including part of "New Moscow" territory. In the development of traffic organisation projects in ITMS were used specialized programs for the modeling of transport and pedestrian flows. For the assessment of the road and transport situation, two-level modeling was carried out:

- A macro-level, which includes an evaluation of the traffic organisation, which is manifested in the city scale (figure 2);
- Micro-level (local modeling), including the assessment of individual transport hubs and linear road facilities (figure 3).

This approach is aimed at identifying local traffic difficulties for further optimization of the transport situation, by applying ITMS activities. Transport modeling allowed to consider the following solutions:

- proposals for locally-reconstructive measures;
- development of a one-way traffic system;
- system arrangement of parking space;
- installation of traffic light objects and calculation of their control modes;
- change in the number and width of the lanes of the street and road network with road marking;
- Proposals for the location of public transport stops.

Also in the development of traffic organisation projects, a road laboratory was used to record the existing traffic organization on the street and road network using a panoramic video recording system that provides an image with a capture angle of more than 180 degrees and allows to record and assess the condition of the roadway and road construction elements and measure geometric road characteristics (on the basis of the small-scale integrated navigation system), including the position of the road in the plane and in the world the WGS-84 coordinate system, the radiuses of the curves and the angles of rotation in the plan, longitudinal slopes and radii of convex and concave curves, transverse slopes, with subsequent display of this information in the form of an electronic scheme (Figure 4).

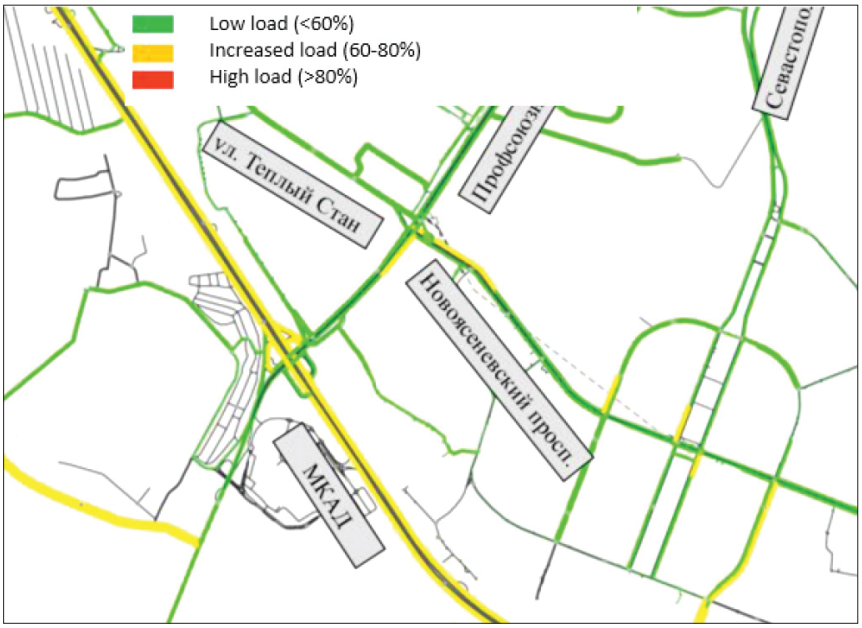

Figure 2 A macro-level, which includes an evaluation of the traffic organisation, which is manifested in the city scale

Figure 3 Micro-level (local modeling), including the assessment of individual transport hubs and linear road facilities

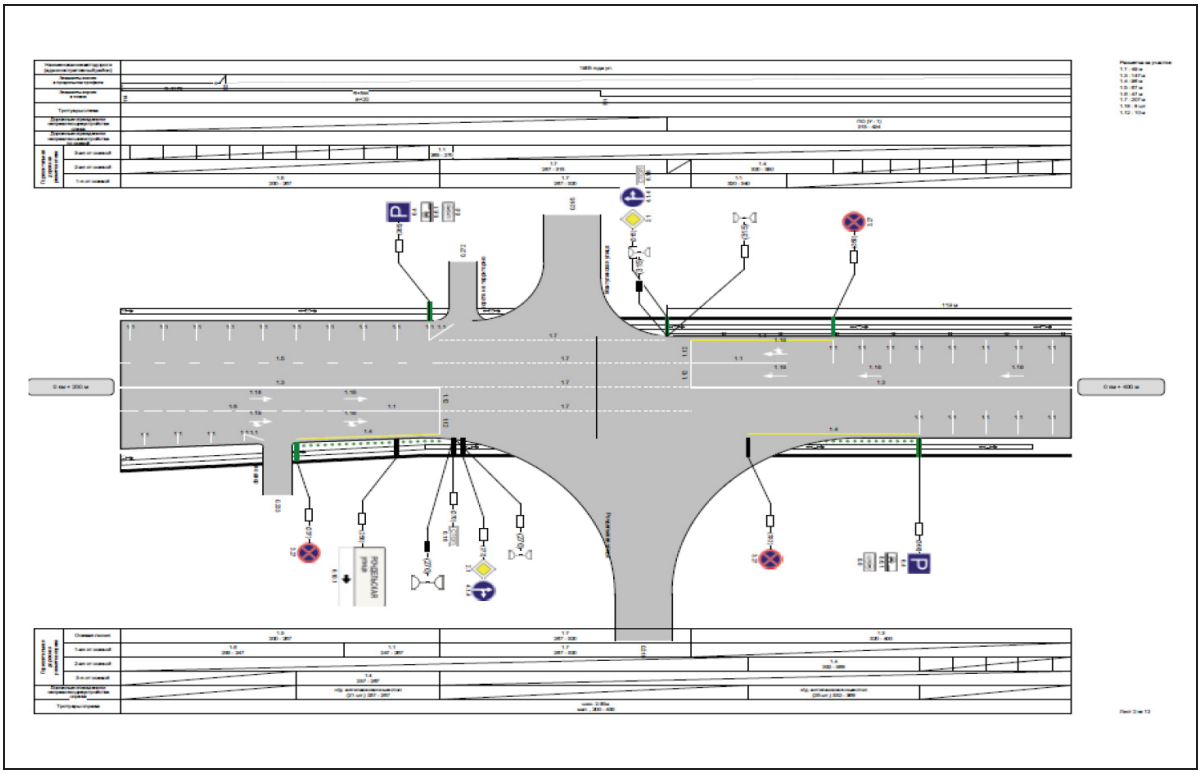

Figure 4

Based on the data obtained after carrying out the transport modeling and the collected initial information, transport organisation projects were developed in which the analysis of the existing traffic organization for each linear object and the deficiencies were revealed. Also there are options for proposals to improve traffic organization with a reasoned choice of them based on the calculations performed, Figure 5.

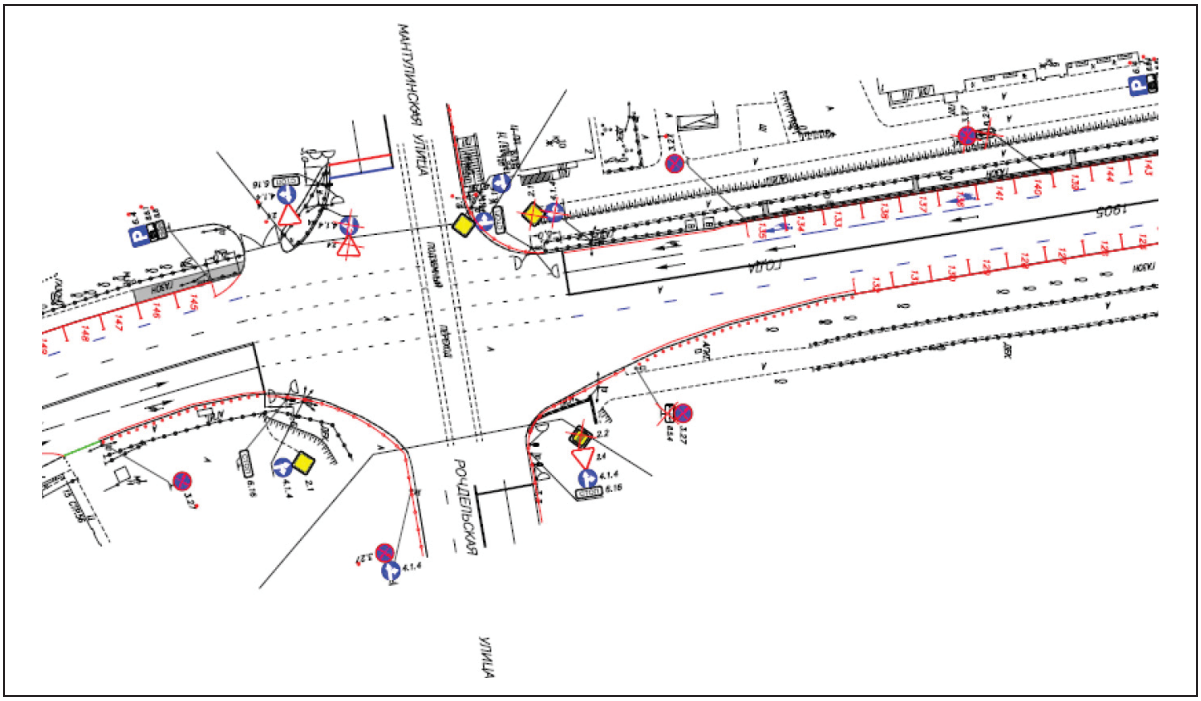

Figure 5

Data on objects related to the road and transport infrastructure, their quantitative and qualitative indicators with information on:
- road marking lines;
- placement of traffic signs;
- traffic lights;
- placement of road barriers;
- pedestrian fences;
- guide devices;
- information on pedestrian crossings in different levels;
- information on routes and location of stops of the SUPT;
- terminus of the SUPT;
- data on the location of railway crossings;
- artificial structures;
- parking of vehicles within the linear objects of street and road network;
- information on projected and existing buildings and structures for road and motor transport purposes;
- data on other elements and linear objects of street and road network.

3 Discussion and Conclusion

At the moment, the ITMS is the fundamental document in the design of the traffic organisation in Moscow, approved by the Moscow Transportation Department of Moscow Government and, thus, all other measures to change the traffic organisation in the city must be linked to the ITMS. Also, the development of the city requires constant adjustments to the traffic organisation, therefore, in addition to the development, there is also an annual update of the ITMS. Following the results of the implementation of 1st and 2nd stages of ITMS by 2017, a positive effect was obtained for the following indicators:
1) Increase of traffic capacity and road safety;
2) Optimization of the parking space and elimination of chaotic parking;
3) Increase in the average speed of the car flow, decrease in travel time;
4) Increase in average speed of movement and availability of SUPT.

Based on the results of the streets under ITMS, a single electronic repository of project documentation was created reflecting the existing traffic organisation in the city. Such a database allows you to quickly get all the necessary information on the existing traffic organization in the city, as well as to identify places of inconsistency of the existing road situation with project solutions. This base is used by all city transport services. An electronic system for the development, adjustment and coordination of projects was also created, which allows to optimize the process of coordination, as well as to regulate and control terms of documentation development. Such a system also allows you to divide objects (streets) into segments and in the case of operational changes in the traffic organisation on a small area of a road to avoid redesigning and recoordinating the entire facility. In the ITMS, such objects were divided into 2 types of segments: intersections and distances between them. At the moment, a pilot project is being developed for segmenting facilities in one Moscow district. In addition to the development of the ITMS, there is also its integration with adjacent urban systems, such as an inventory system for the road network of Moscow. Information is collected in the ITMS, which is obtained from the road laboratory for all objects related to the road infrastructure with its own personal number and its link to the terrain, Figure 6.

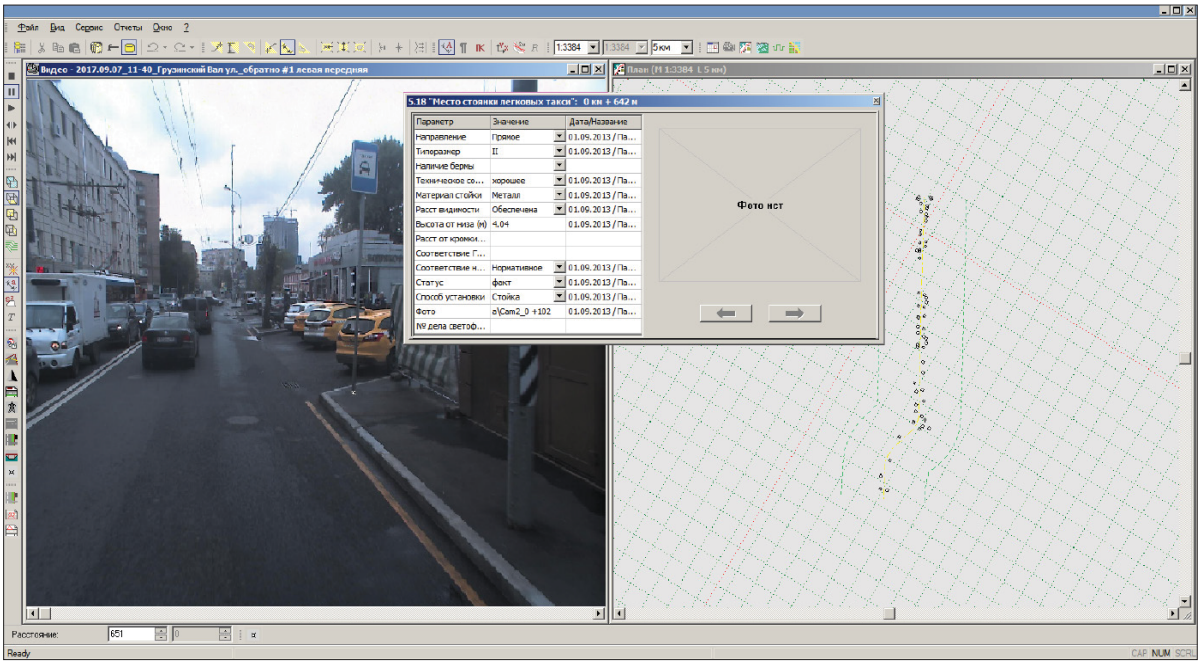

Figure 6

Based on the results of the above, it can be noted that since 2014 the ITMS has changed not only the approach to design, but also being in constant development it allows to solve emerging new problems taking into account the growing motorization of the city, the accession of new territories, and to interact with other electronic systems of the city.