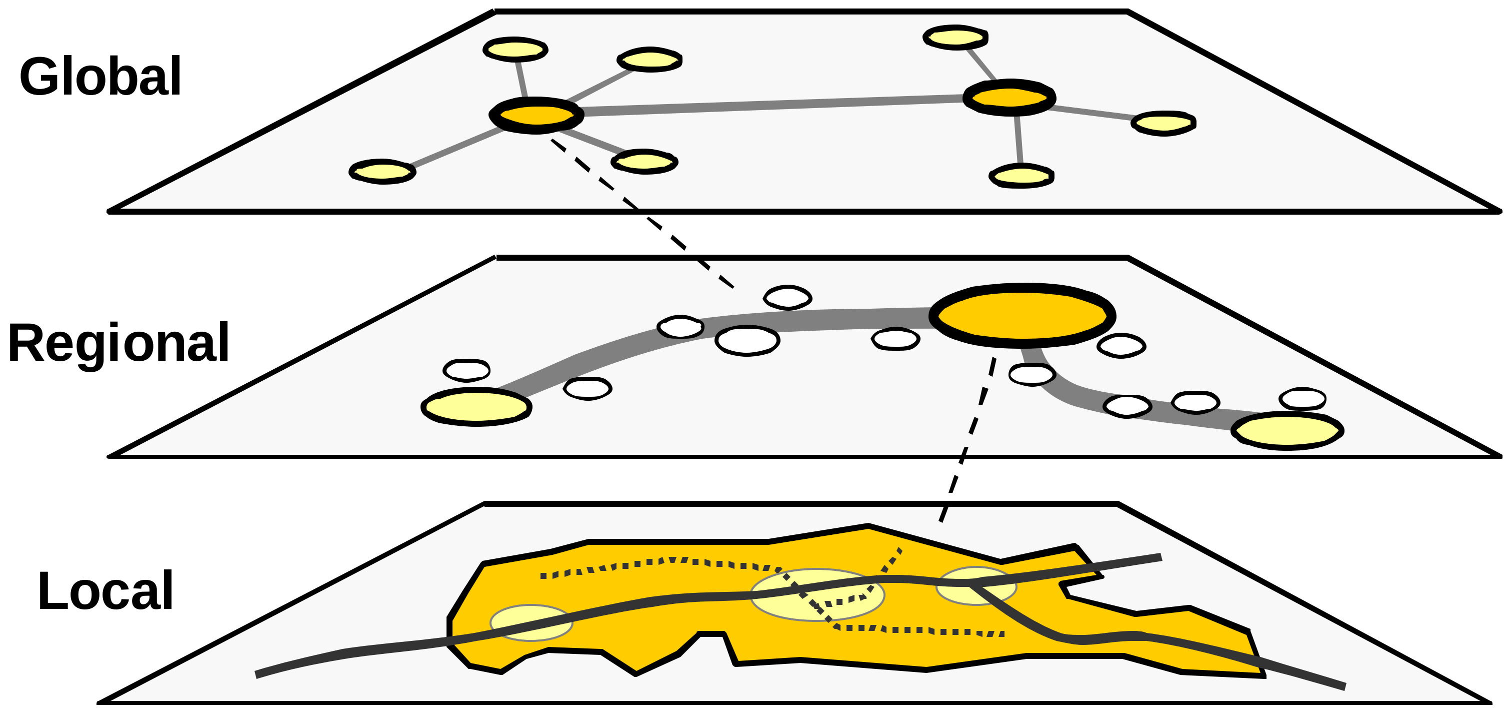
City Logistics Development on the base of Modelling and Simulation

Irina Yatskiv, Professor, Dr.sc.ing.
Igor Kabashkin, Professor, Dr.hab.sc.ing.
Elena Yurshevich, Lector, M.Sc.Comp.

Transport and Telecommunication Institute (Riga, Latvia)

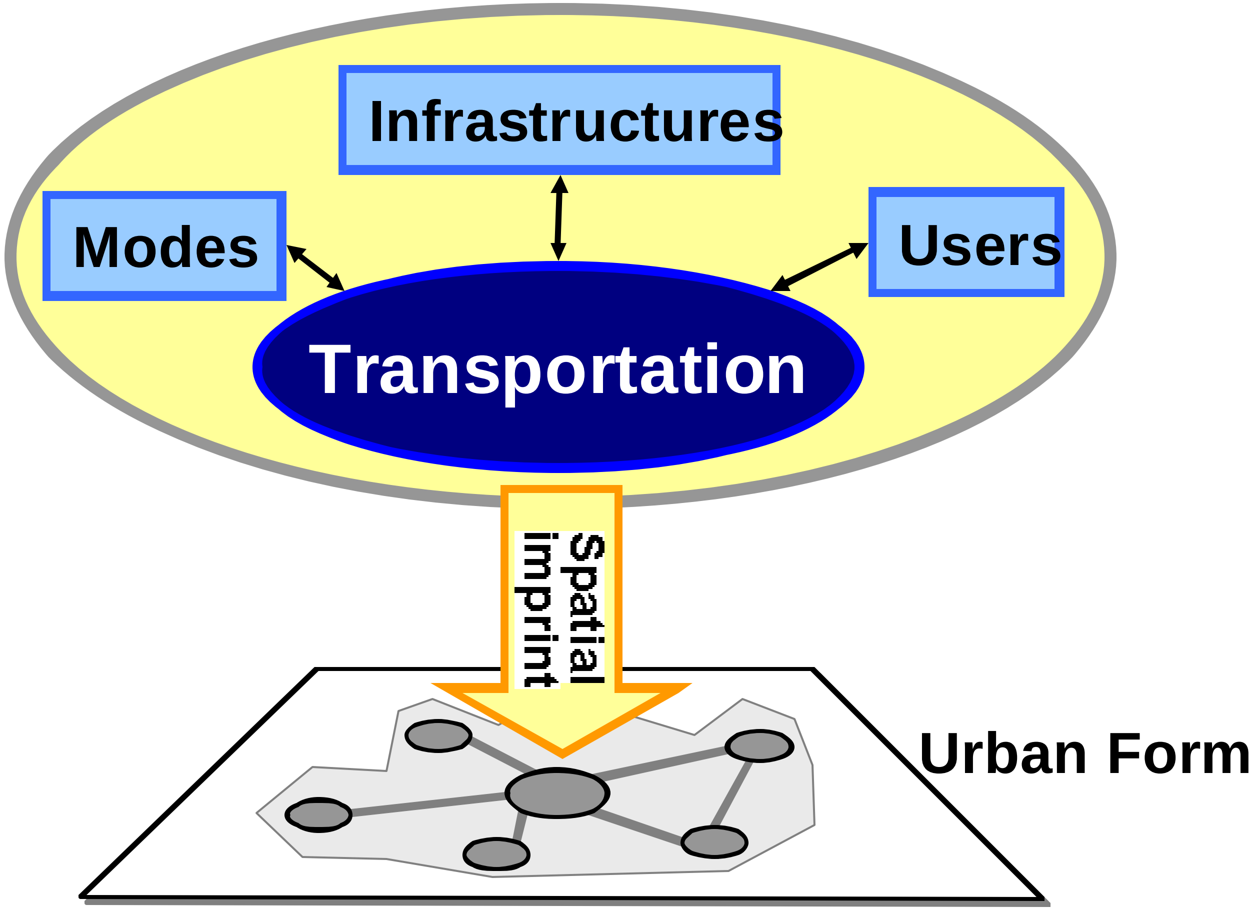
Project part-financed by the European Union

Scales of Spatial Organization for Transportation



Scale	Nodes	Links	Relations
Local	Employment and commercial activities	Roads and transit systems	Commuting and distribution
Region al	Cities	Corridors (rail lines, highways, canals)	Urban system
Global	Gateways (airports and ports)	Air and maritime lanes	Investment, trade and production

Transportation and Urban Form



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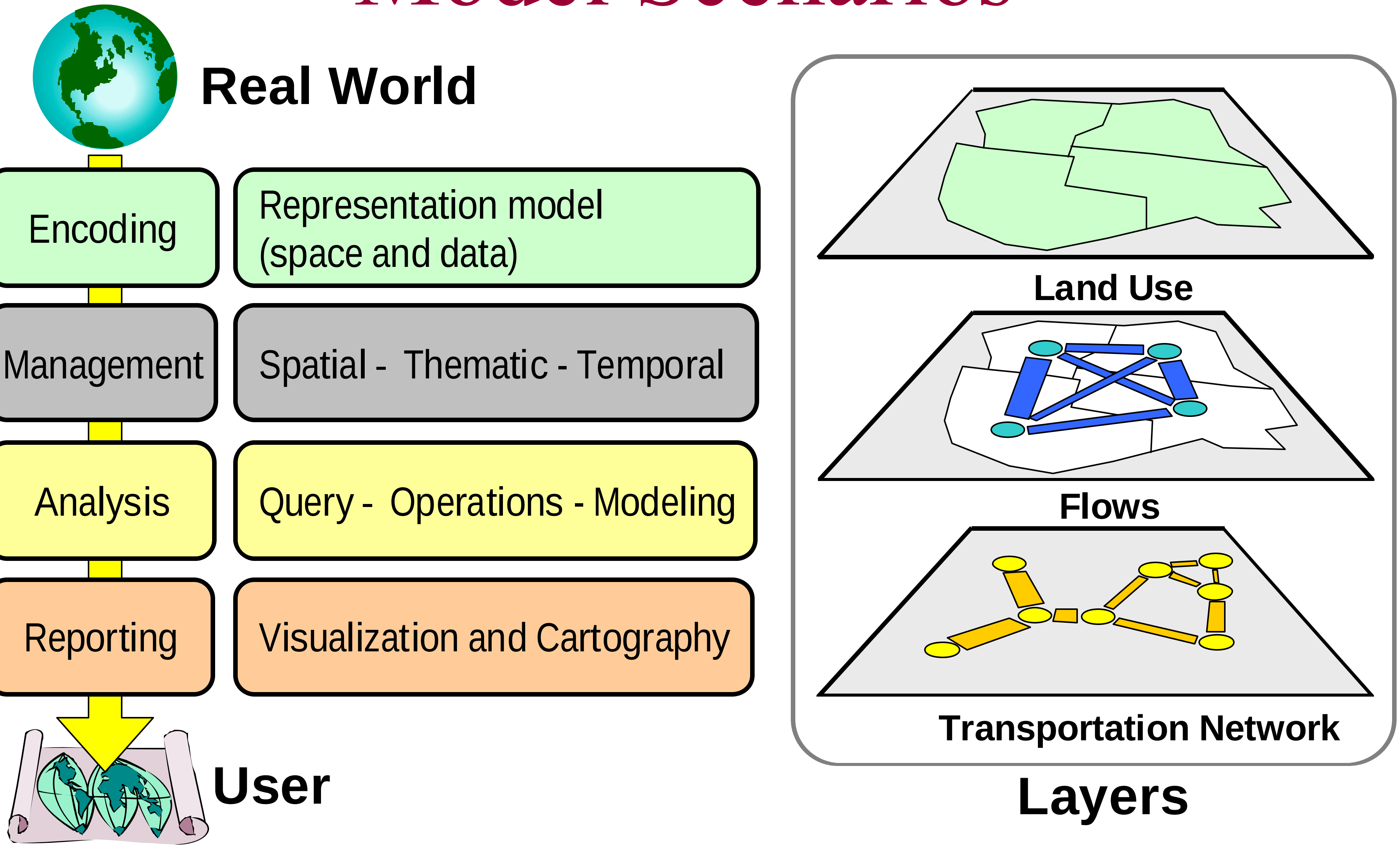
Model Scenarios



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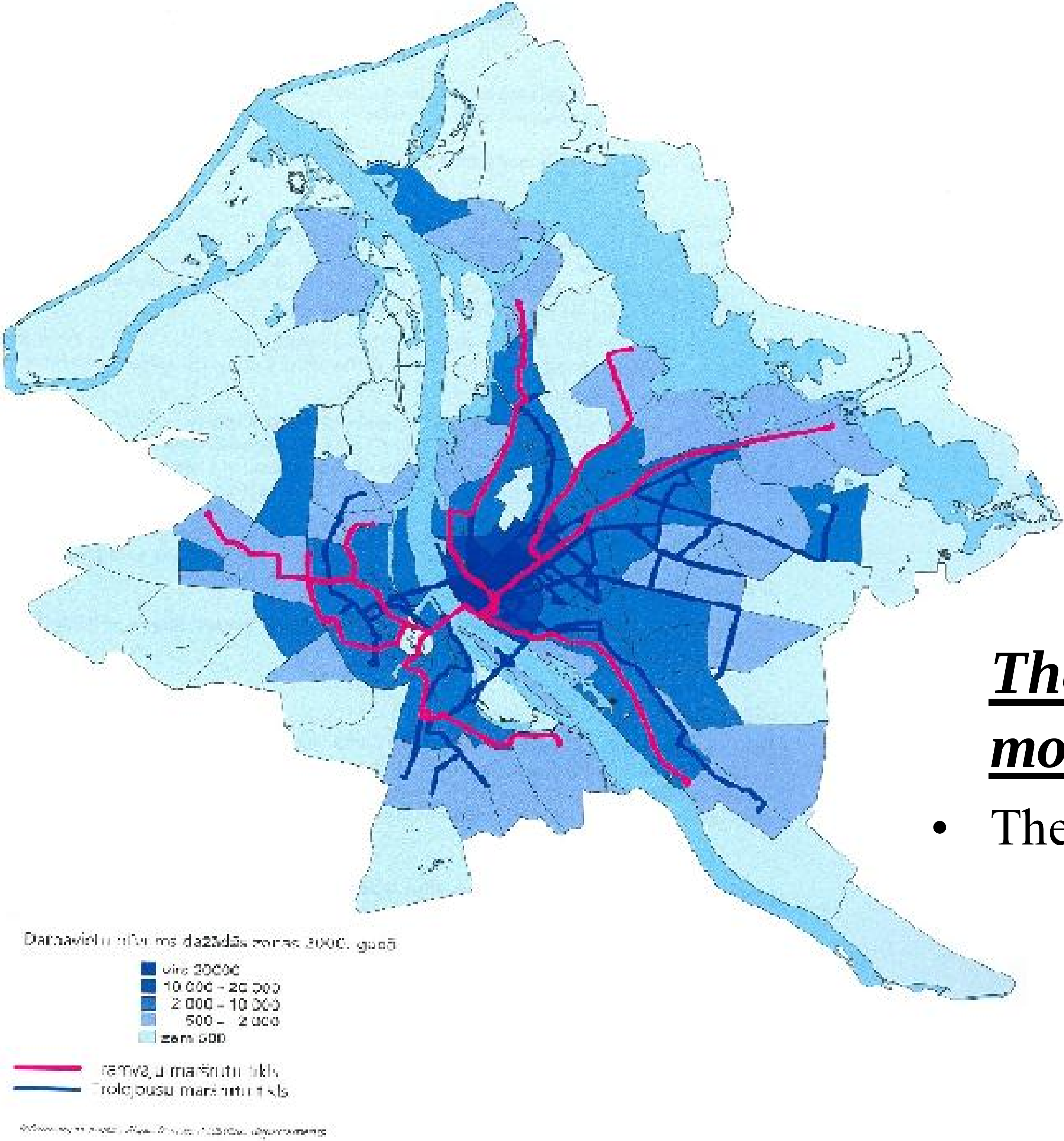
Traffic Intensity on Main Road Network (vehicles/day)

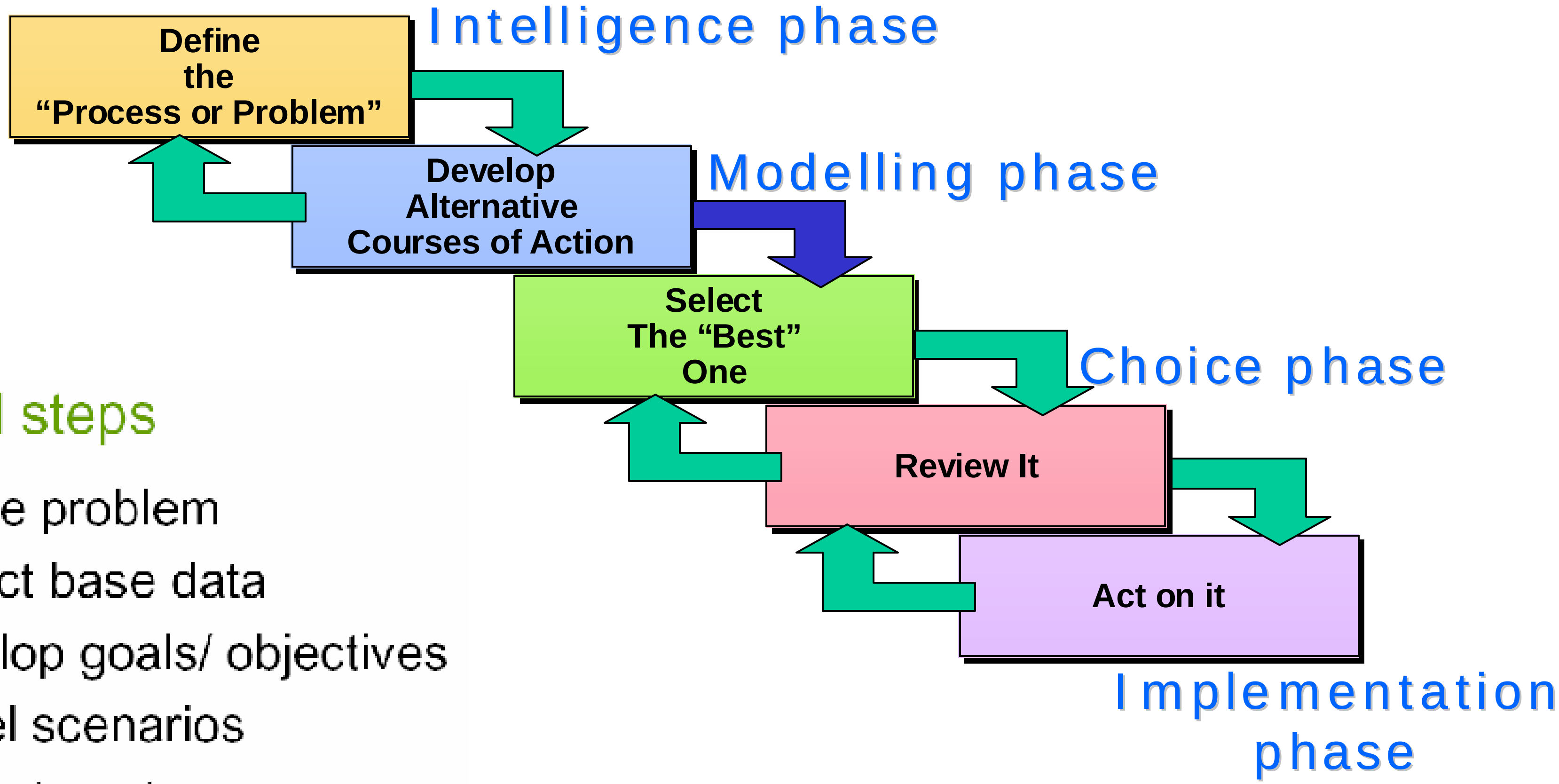


The main working movements in Riga

- There is star topology

Decision Process

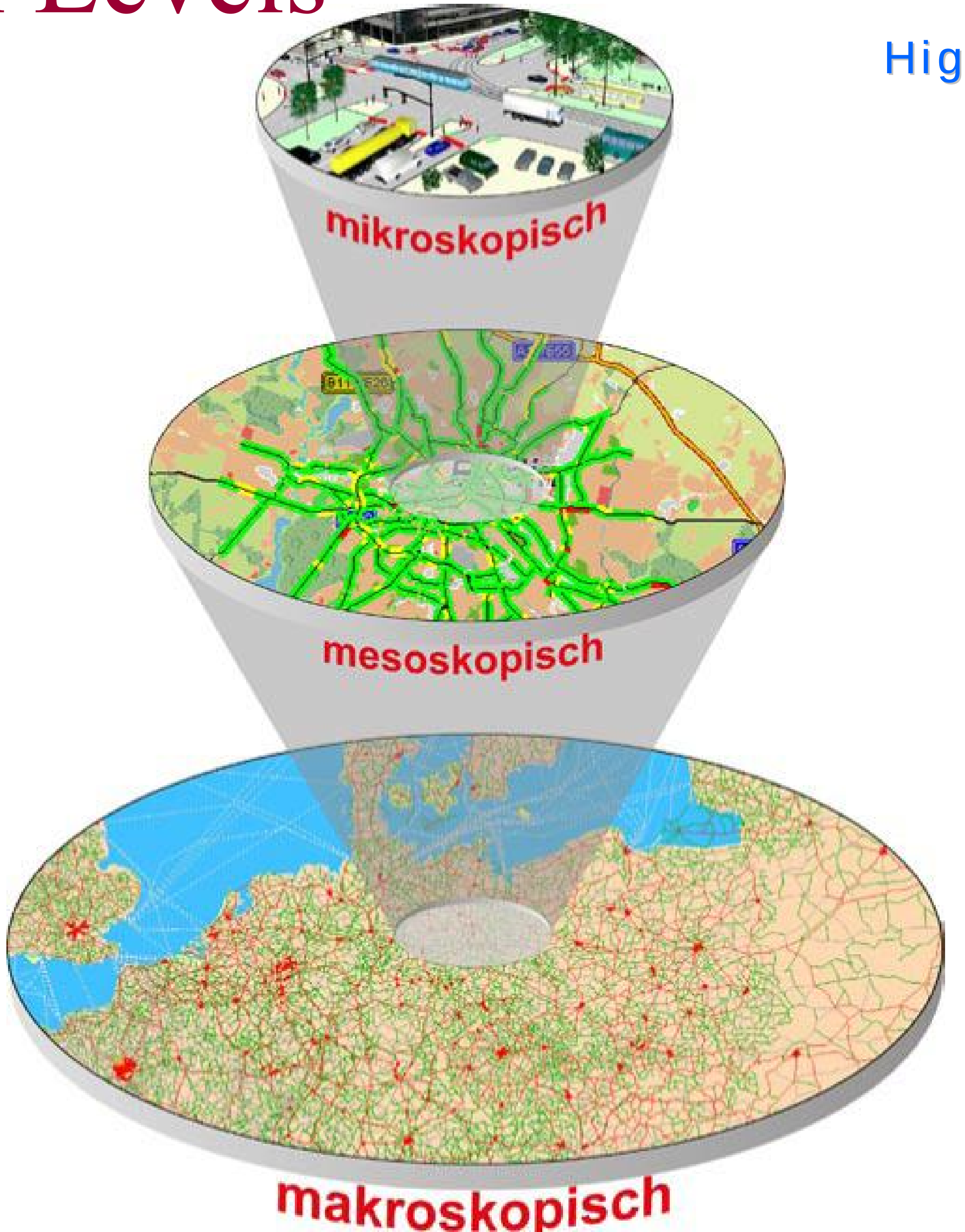
Decision makers goes through a fairly systematic process.



General steps

- Define problem
- Collect base data
- Develop goals/ objectives
- Model scenarios
- Evaluate outcomes

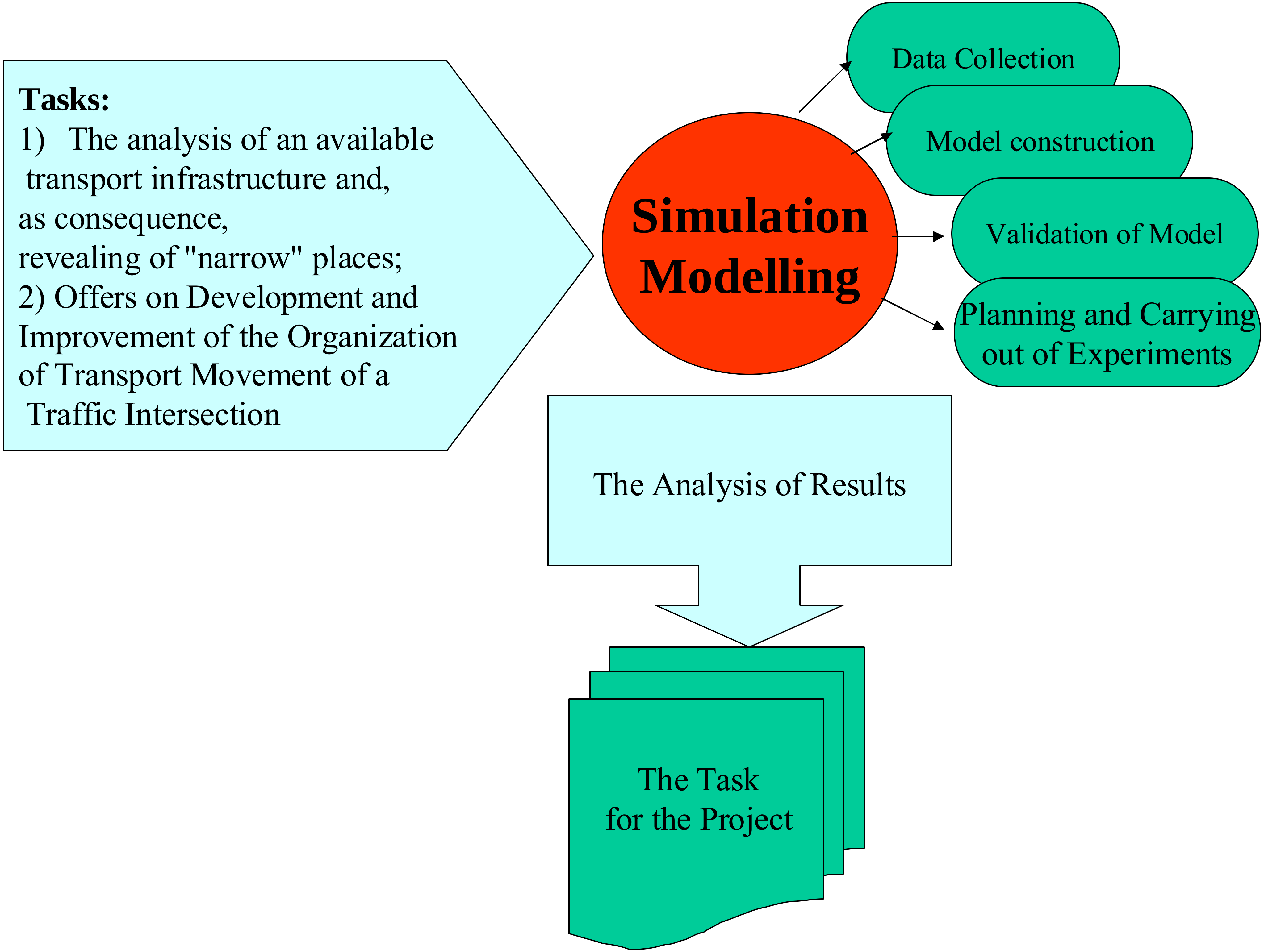
Model Levels



High-detail description

Medium detail

Low detail


Tasks:
1) The analysis of an available transport infrastructure and, as consequence, revealing of "narrow" places;
2) Offers on Development and Improvement of the Organization of Transport Movement of a Traffic Intersection
Simulation Modelling
Data Collection
Model construction
Validation of Model
Planning and Carrying out of Experiments
The Analysis of Results
The Task for the Project

Which aim of data collection for city logistics?

- Knowledge of the flows for traffic management in the town (***short term local decision marking***)
- Decision marking for urban planning (***middle term urban planning policy***)
- Concerns for environment and sustainability (***long term policy and laws: decisions at European, national, regional scale for application at the local level***)

The sources of data in the modelling of transport tasks

- Interview with passengers
- Outer observation (mean number of passengers, frequency, direction and etc.)
- Traffic statistics obtained with the help of objective control systems on the basis of modern transport telematics aids

The investigation within the frame of the international project

"***Riga Light Rail Transit Feasibility Study***"

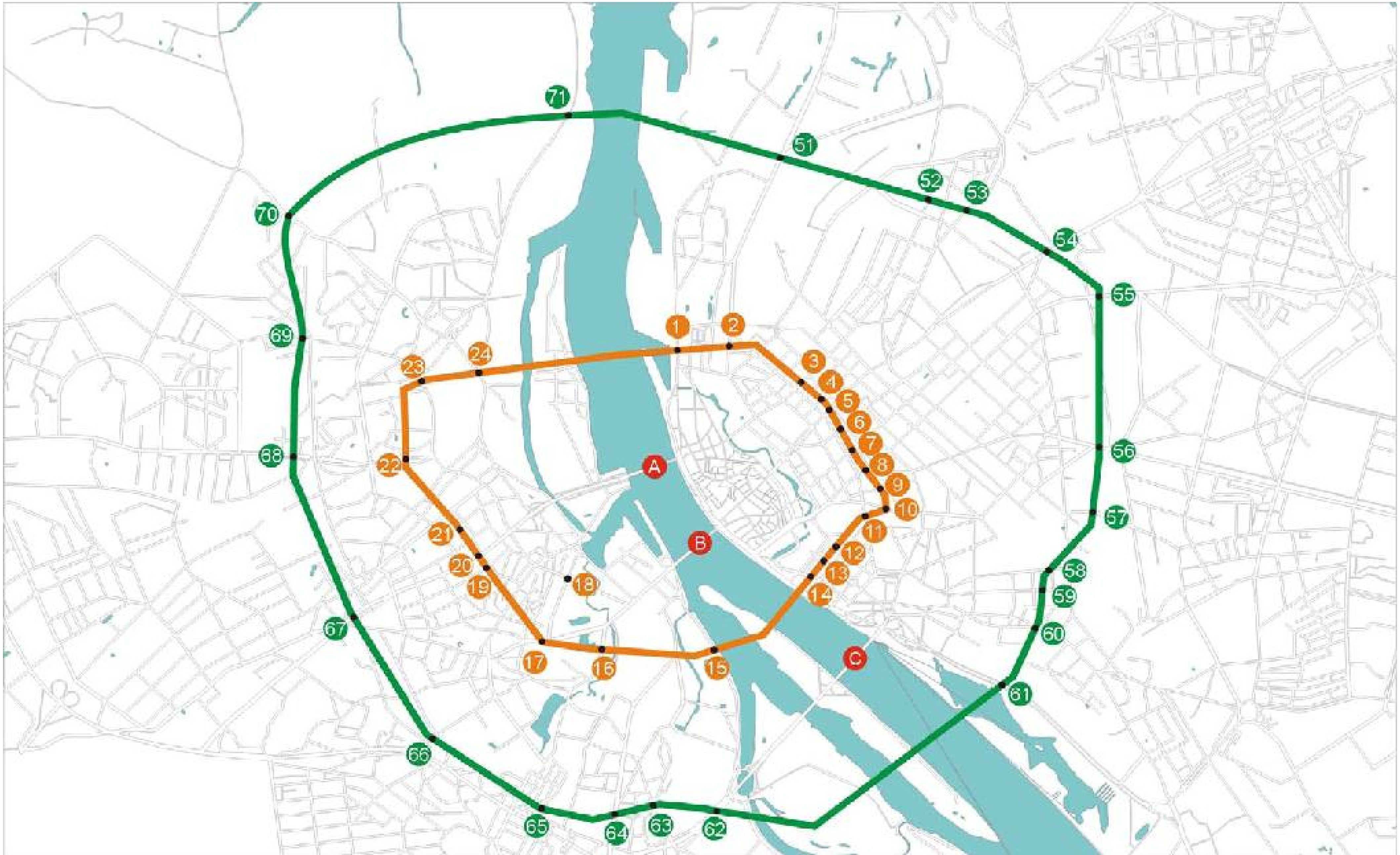
with participation of the representative of group SYSTRA and Transport & Telecommunication Institute

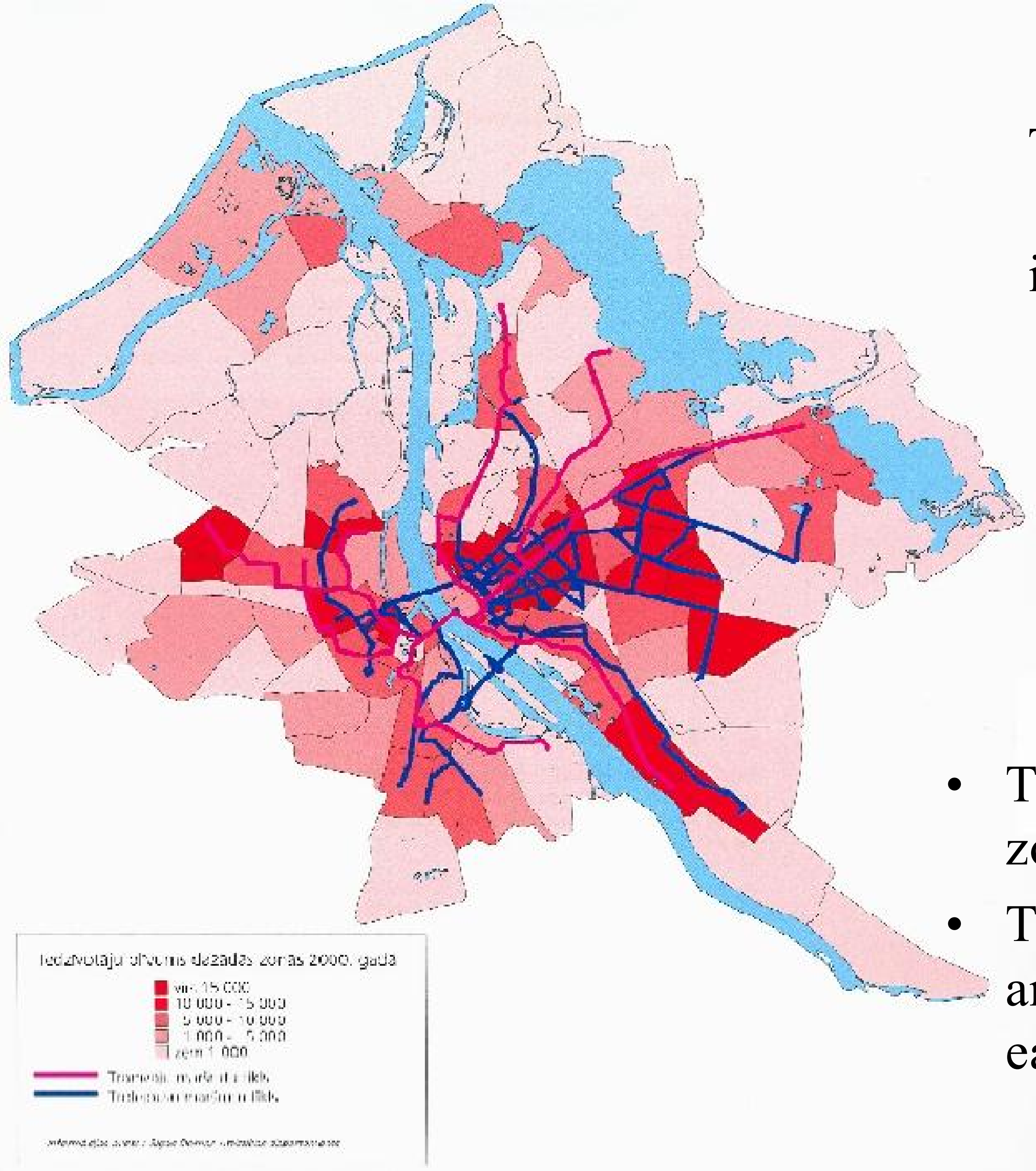
October 2002

Aims

- To elaborate plan of public urban transport development
- To investigate and elaborate priority tram routes
- To elaborate system of public urban transport

It was defined 71 investigation points according to 2 perimeters

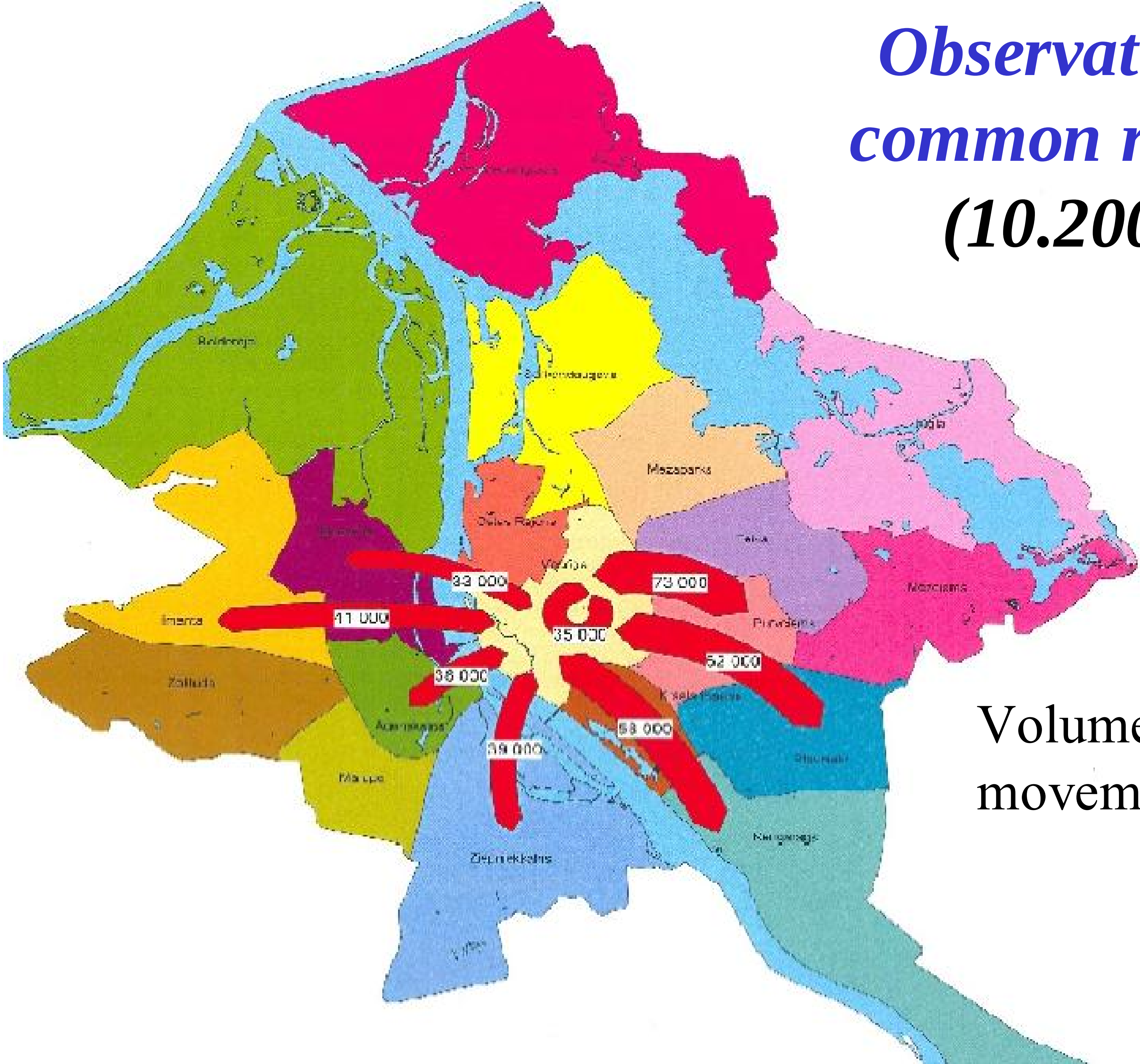




The zoning system on the basis of the analysis of inter-regional movements

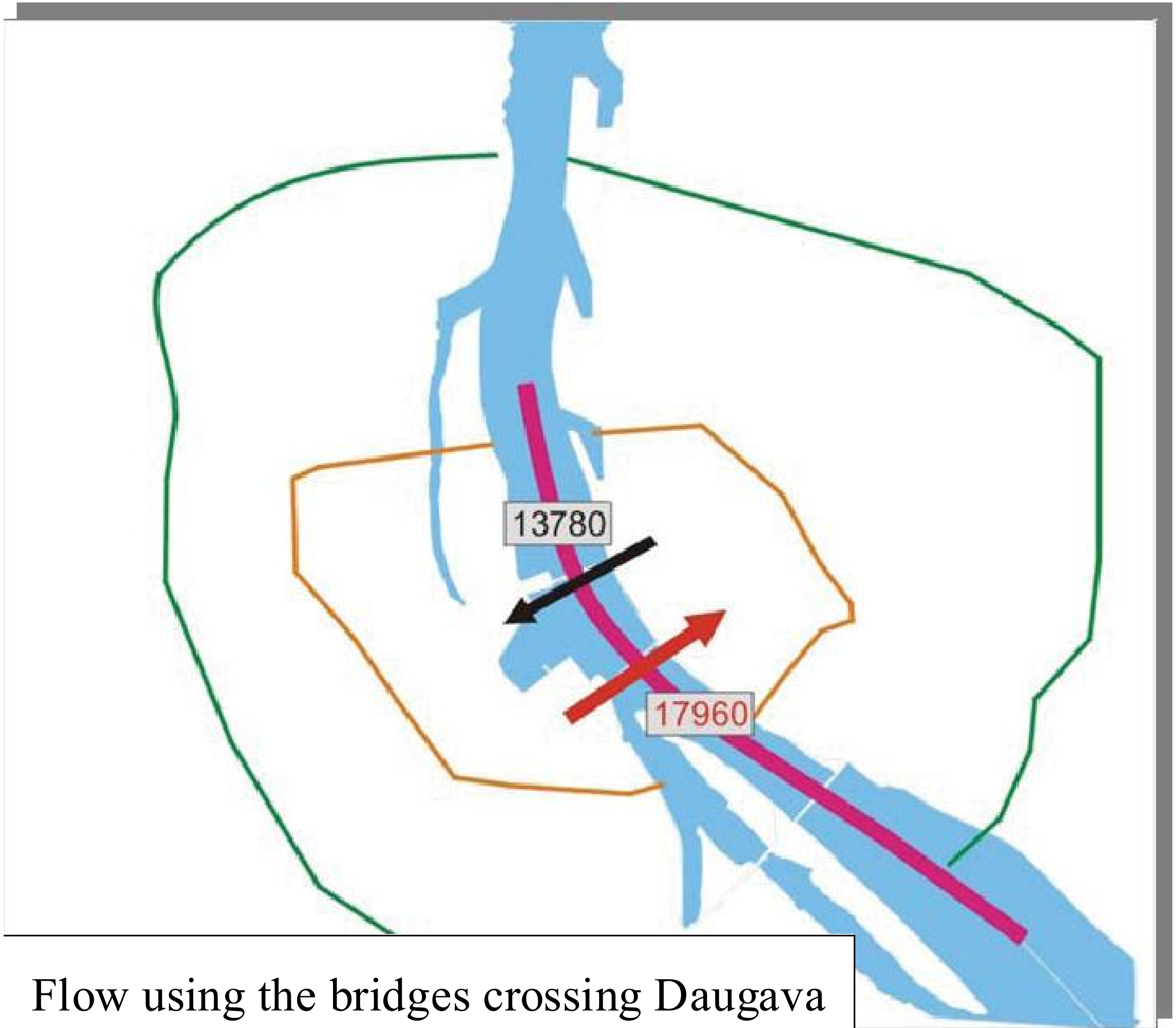
- There were defined 124 zones in Riga
- There are defined origin and destination zones for each movement

Observations: common results (10.2002)



Volume of main movements

Observations: common results (10.2002)



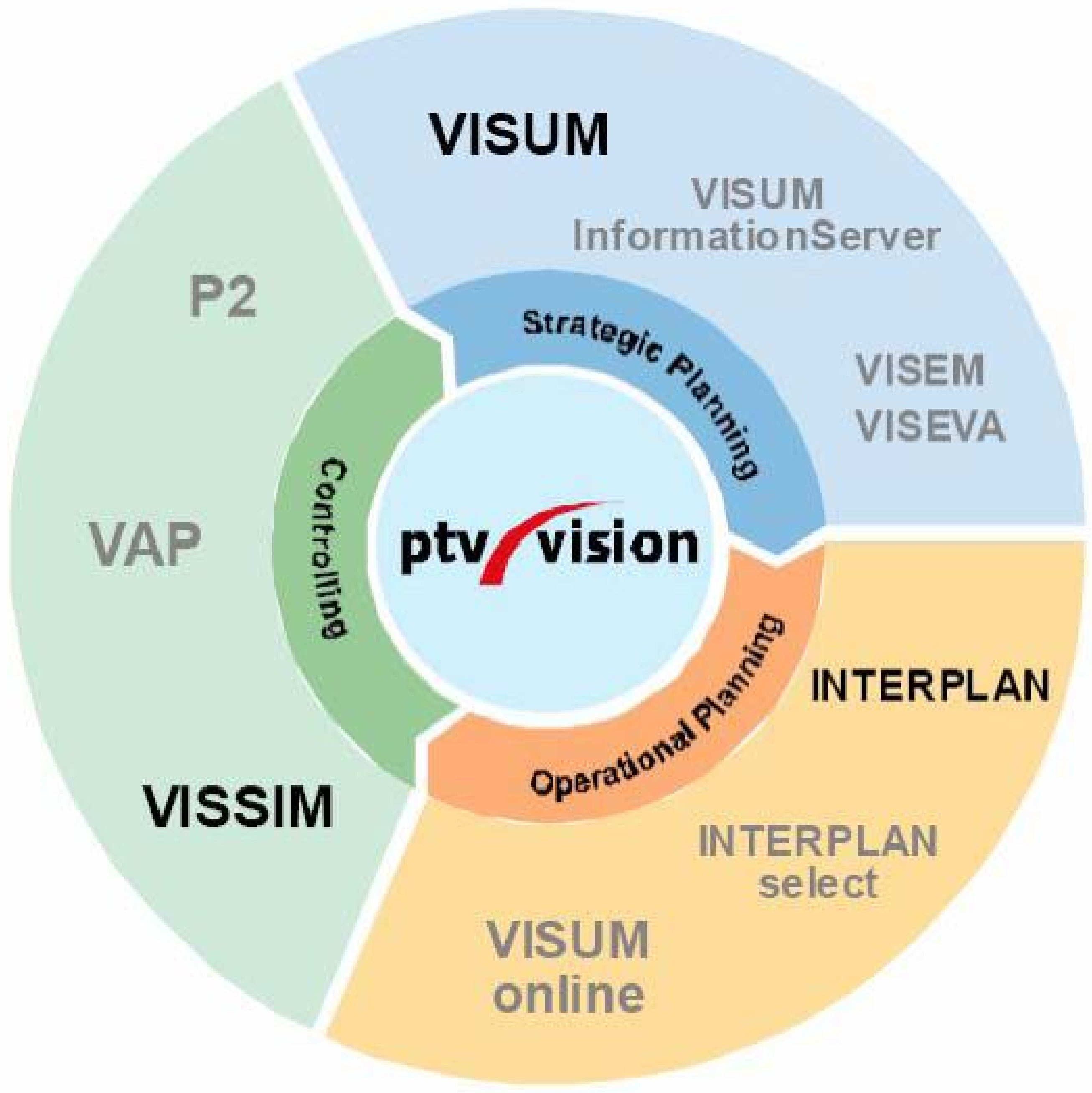
Flow using the bridges crossing Daugava

- The biggest traffic volume moving to the right side
- This volume without private transport

Case study

1. ***Application of Simulation Modelling at the stage of Transport Node Planning (by the example of a Coach Station in Pardaugava)***
2. ***Simulation Model for Complex Transport Node in Pardaugava***

PTV Vision Software Line



<u>Case 1:</u> *Application of Simulation Modelling at the stage of Transport Node Planning (by the example of Coach Station in Pardaugava)*

About the Riga International Coach Station

- RIGA INTERNATIONAL COACH TERMINAL (RICT) was designed from 1960 to 1962 and was built and put to use in 1964.
- Nowadays RICT provides services both to regional (local) long distance and international routes.
- In 2006: 565 domestic runs and 63 international runs were serviced per day.
- RICT cooperates with 53 carriers and 8 travel agencies.
- RICT annually provides services to 5-6 million passengers.

The Future Plans of Riga Coach Station Evaluation

- The Ministry of Transport of the Republic of Latvia has forecasted that in the next years the transport flow thought the RICT will increase by at least 5% a year.

This requires:

- A comprehensive reconstruction of the RICT in order to improve the operational reliability and to increase the capacity of the Coach Terminal in servicing buses and passengers.
- Construction of an alternative terminal

The Project

The object of simulation:

- The new coach station on the Vienibas Gatve 6
- The territorial location of the land plot is close to the railway station „Torņakalns”, next to a newly developing administrative and cultural centre of the city.

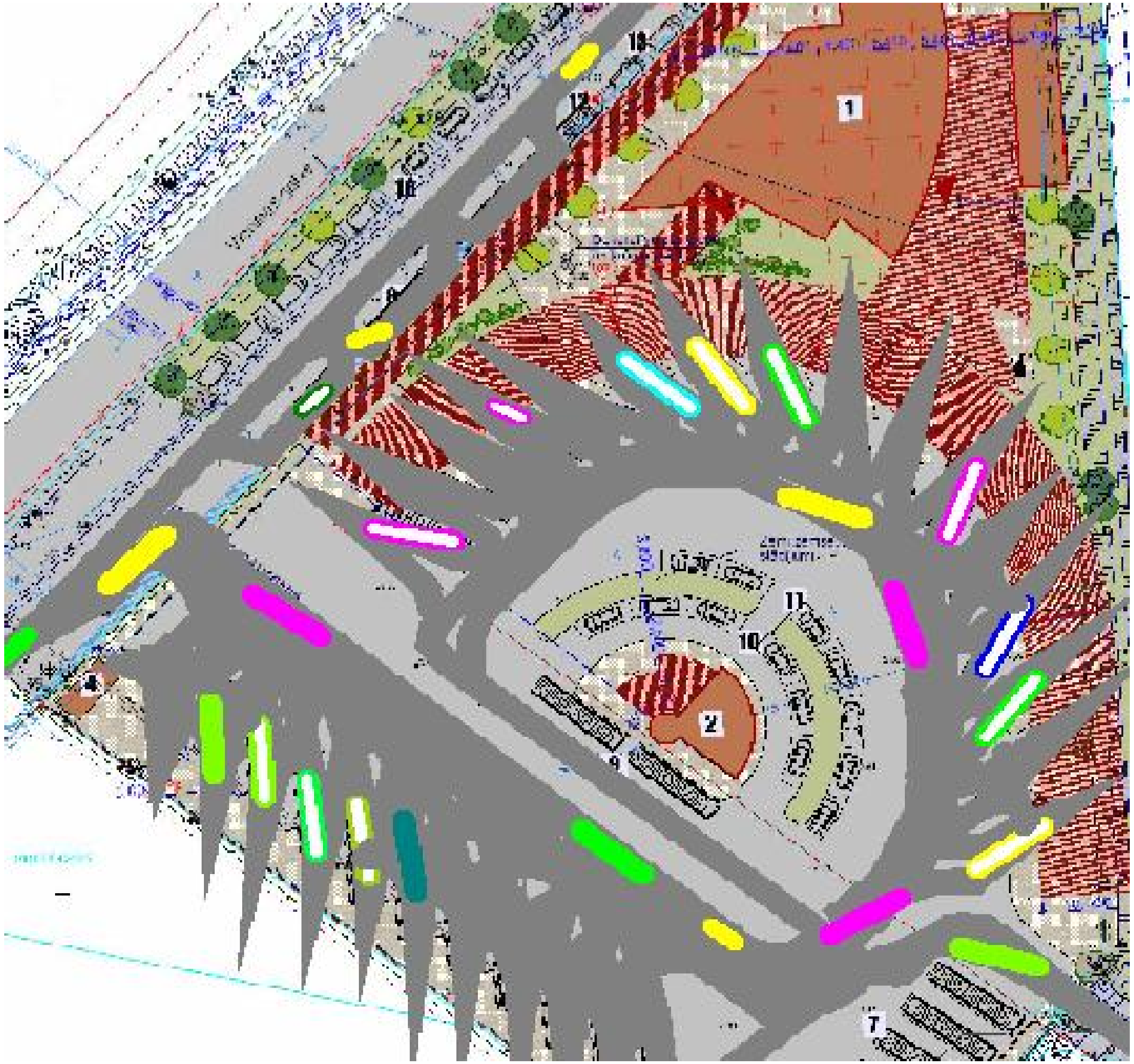
The main goal of using modelling at the stage of the transport node planning is the analysis of future decisions and their influence on common situation around.

The Project Participants

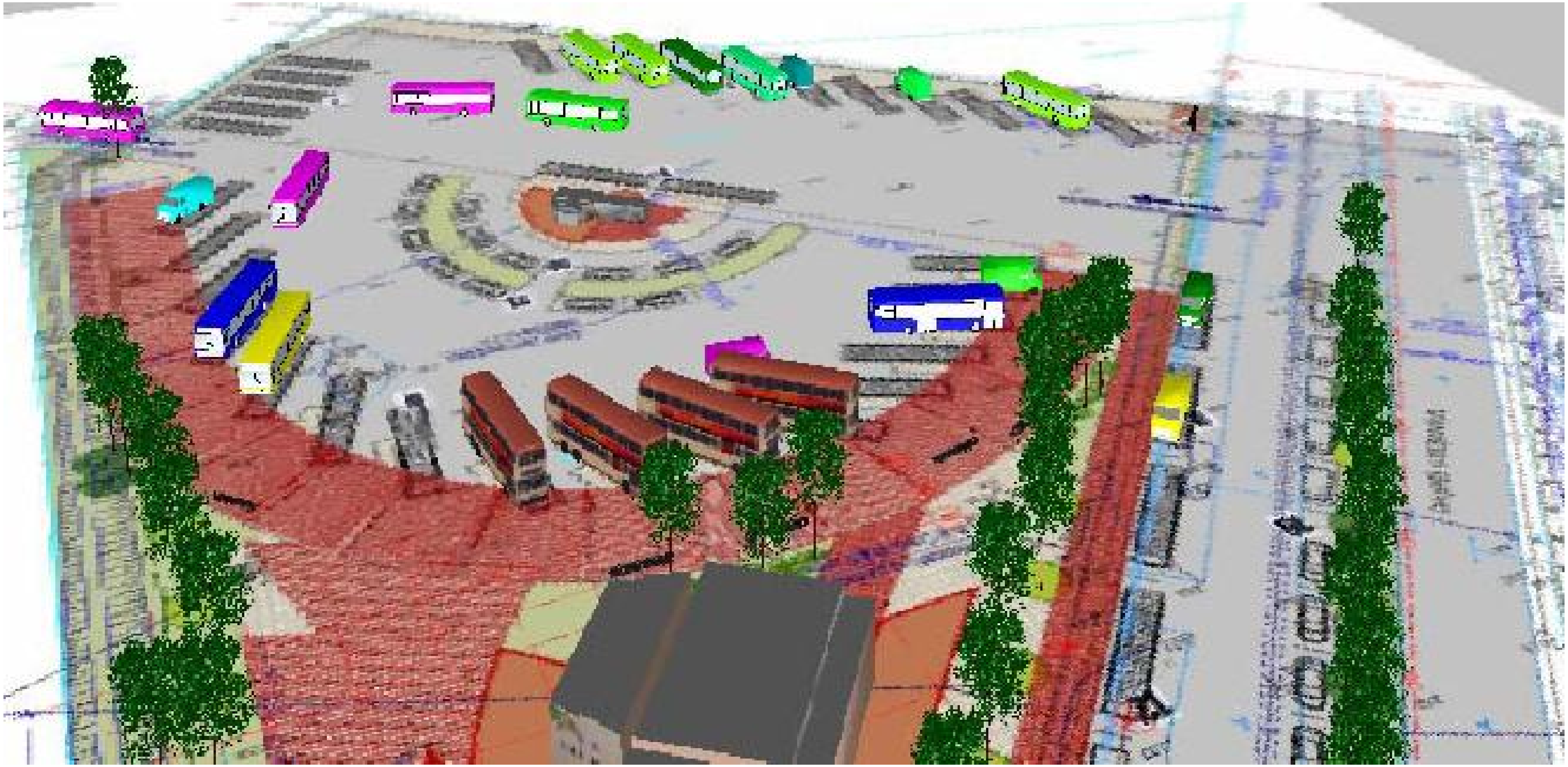
•JSC “Rīgas Starptautiskā Autoosta”

•JSC “Transporta un Sakaru Institūts”

The view of realized model (2D)

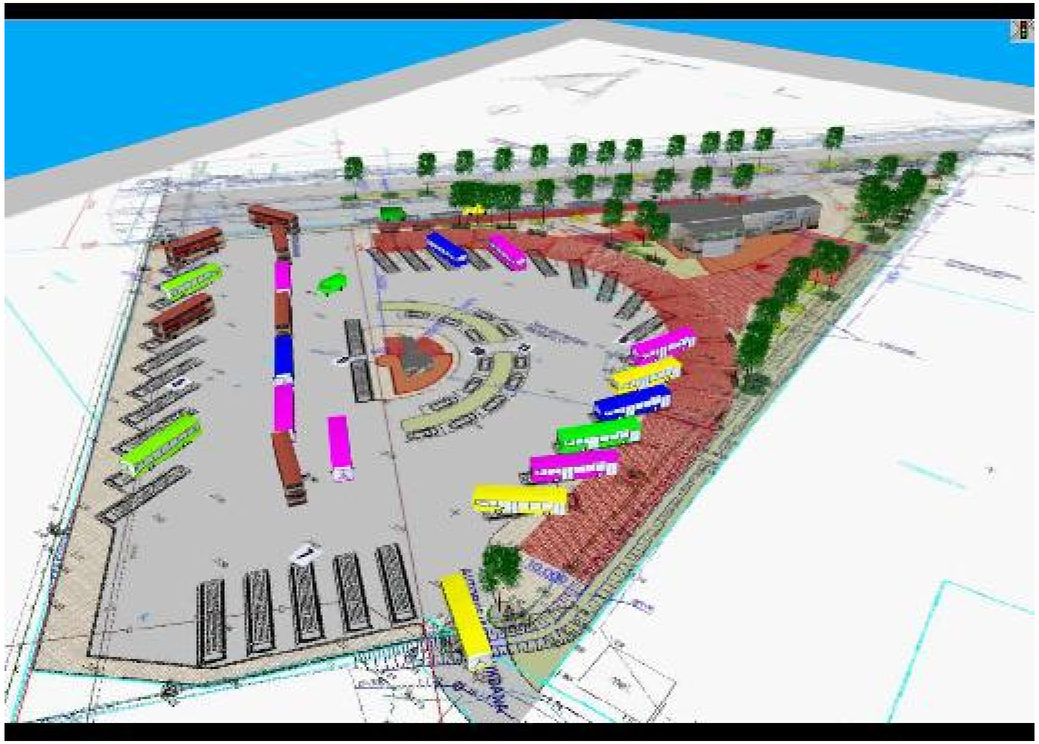


The view of realized model (3D)



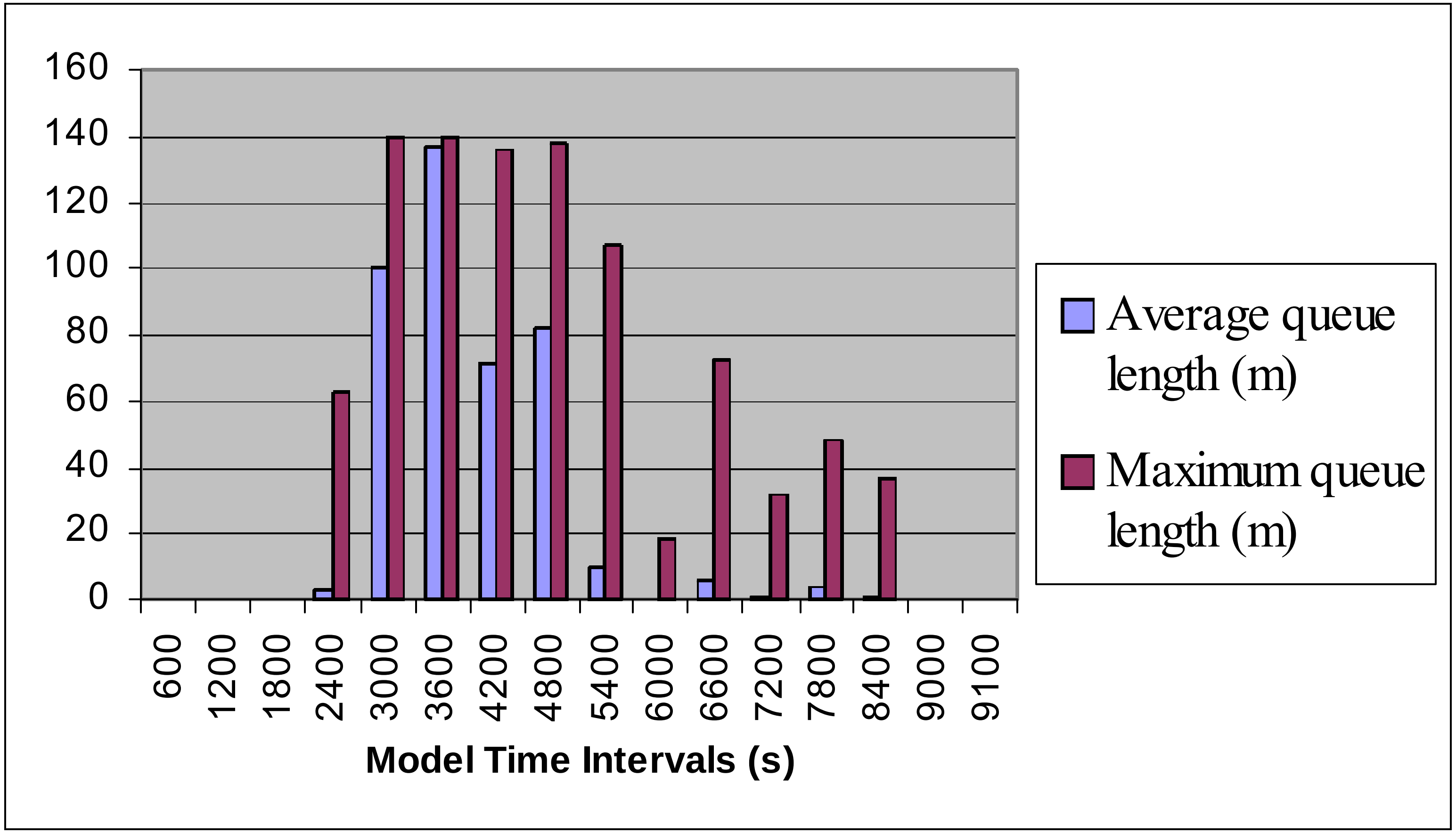
The modelling results

- The buses queue fixation (evening loading):
  - The maximum queue length – 11 buses
  - The maximum time of staying in queue – 5 min



The modelling results

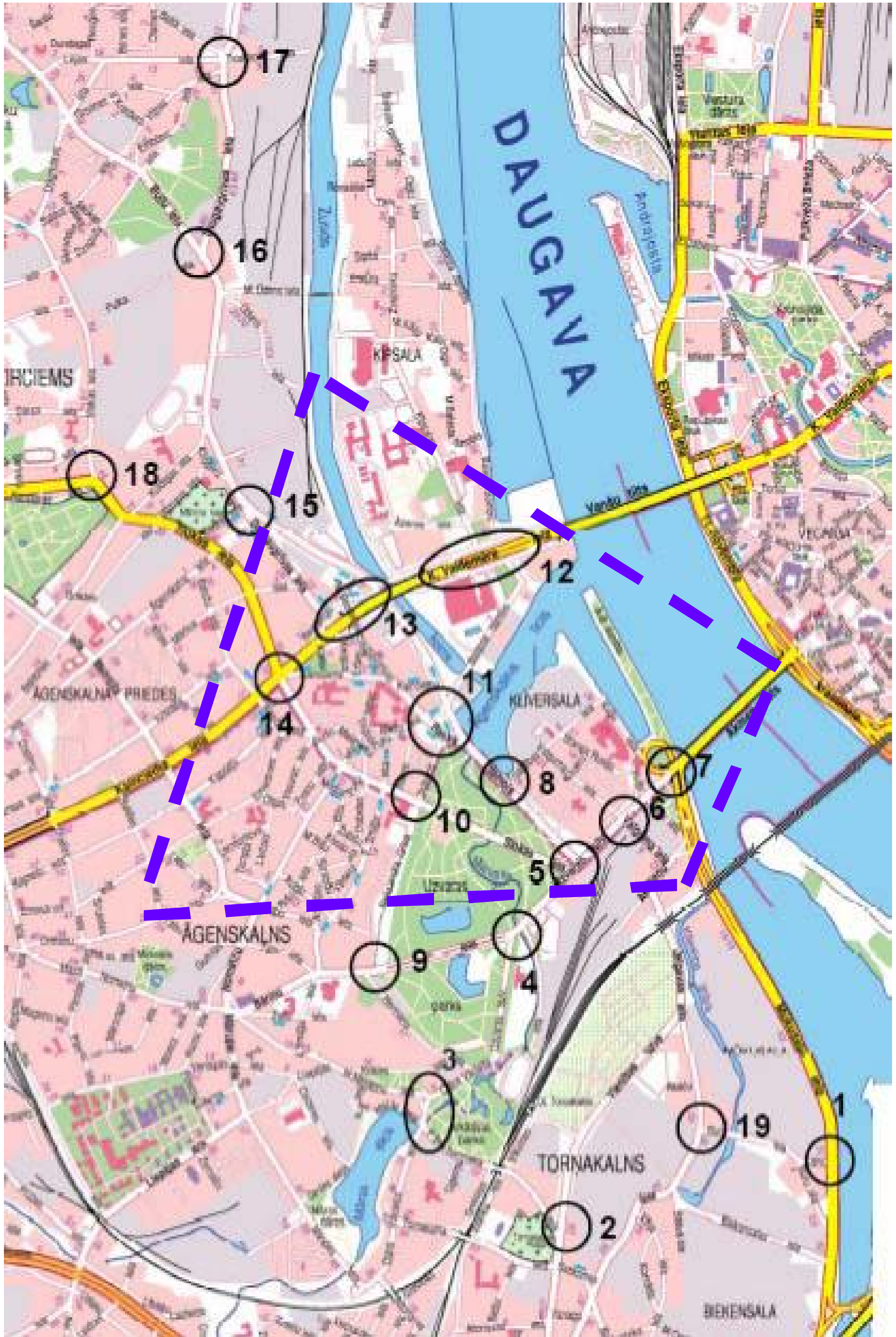
- The distribution diagram of average and maximum queue length by time



The conclusions (case study 1)

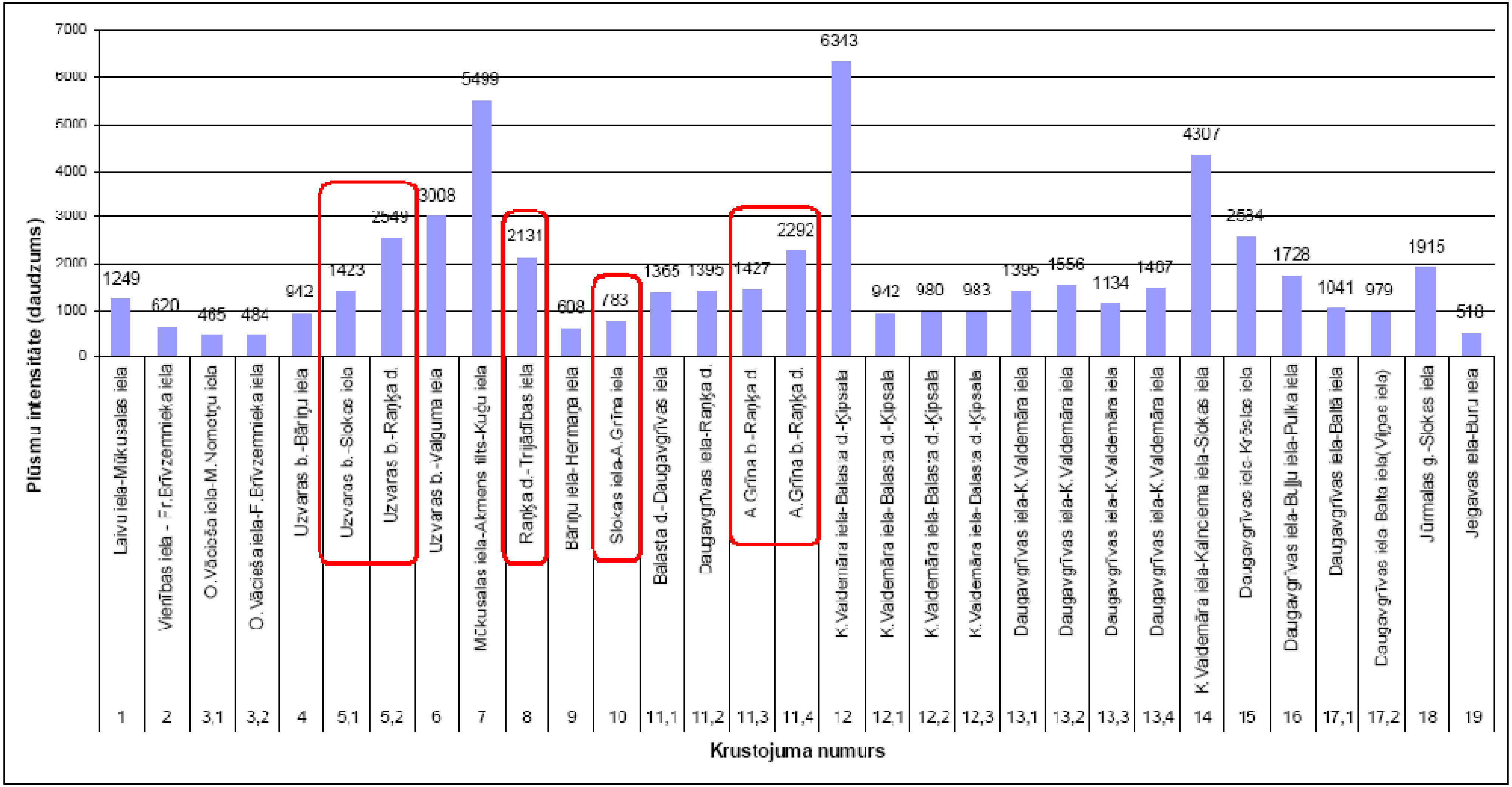
- The constructed simulation model validated the design of new coach station in the scope of maximizing the potential throughput of the station
  - The intermediate results of simulation have been taking into account for new station plan realization
- The simulation has shown:
  - The new station is able to operate the existing bus station loading in general
  - But, it operates at the braking point of its potential
  - It has been established that the scheme of buses exits from the bus station territory suggested for today leads to a queue formation
- The future work:
  - The realization of different scenarios of bus station plan optimization and analyzing of new schedules scenarios influencing

Case 2: *Simulation Model for Complex Transport Node in Pardaugava*

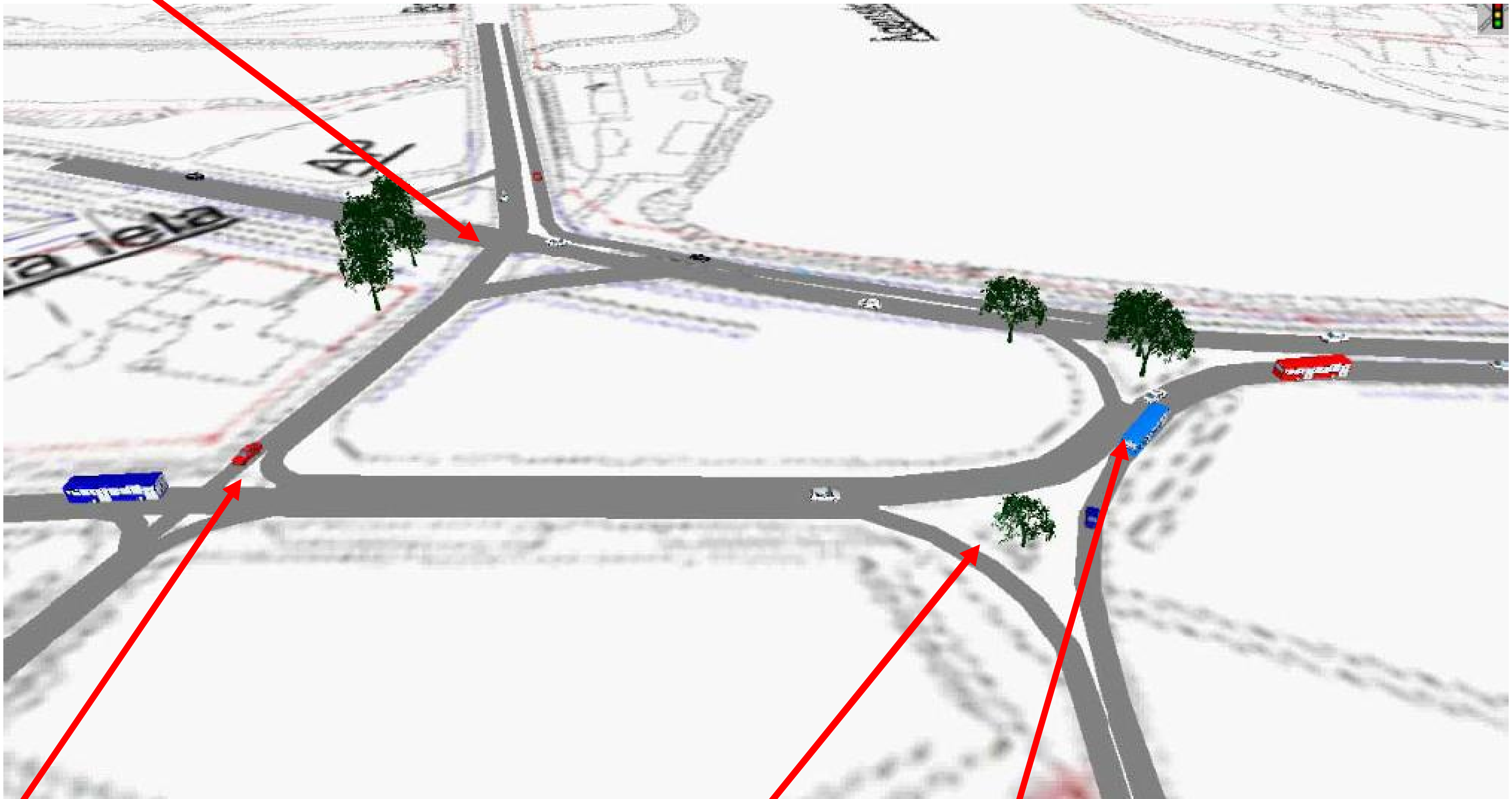


DAUGAVA
KIPSALA
ĀGENSKALNA PRIEDES
ĀGENSKALNS
TORNAKALNS
ĶĪVERSALA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Traffic flow intensity (8:15 – 9:15)



Krustojums Nr.11.1 (Balasta dambis-Daugavgrīvas iela-A.Grīna bulv.-Raņķa dambis)



Krustojums Nr.11.2 (Balasta dambis-Daugavgrīvas iela-A.Grīna bulv.-Raņķa dambis)

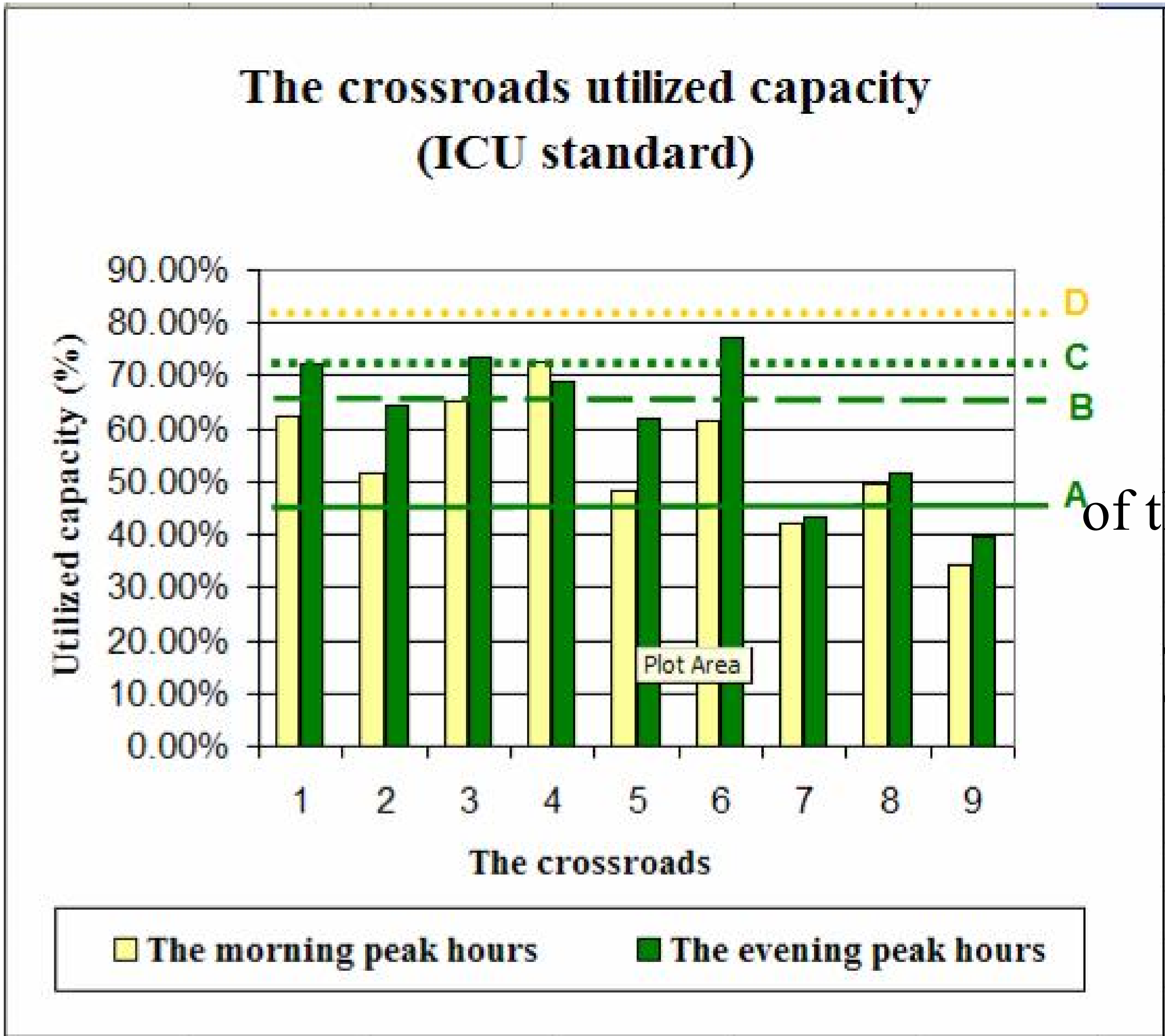
Krustojums Nr.11.3 (Balasta dambis-Daugavgrīvas iela-A.Grīna bulv.-Raņķa dambis)

Krustojums Nr.11.4 (Balasta dambis-Daugavgrīvas iela-A.Grīna bulv.-Raņķa dambis)

Krustojums Nr.5.2 (Uzvaras bulv.-Slokas iela-Raņķa dambis)

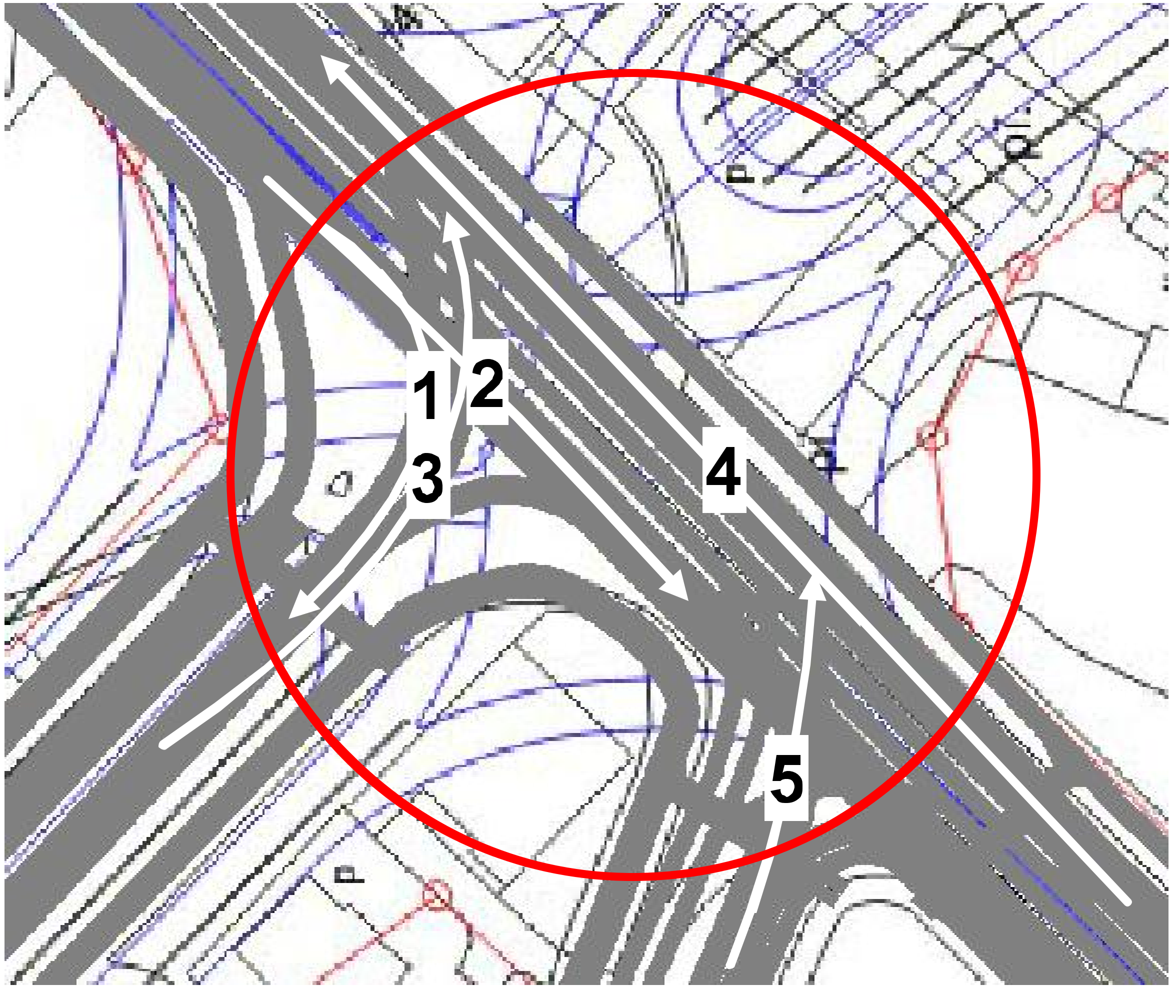
animation

The Distribution of a Congestion Level of Crossroads according to the ICU Standard



Standard ICU establishes A as the lowest level of congestion (55%) H - the highest (109%). A level of congestion of the majority of crossroads is in norm (A, B, C) and crossroads 3 and 6 concern to group, which is the last satisfactory (D).

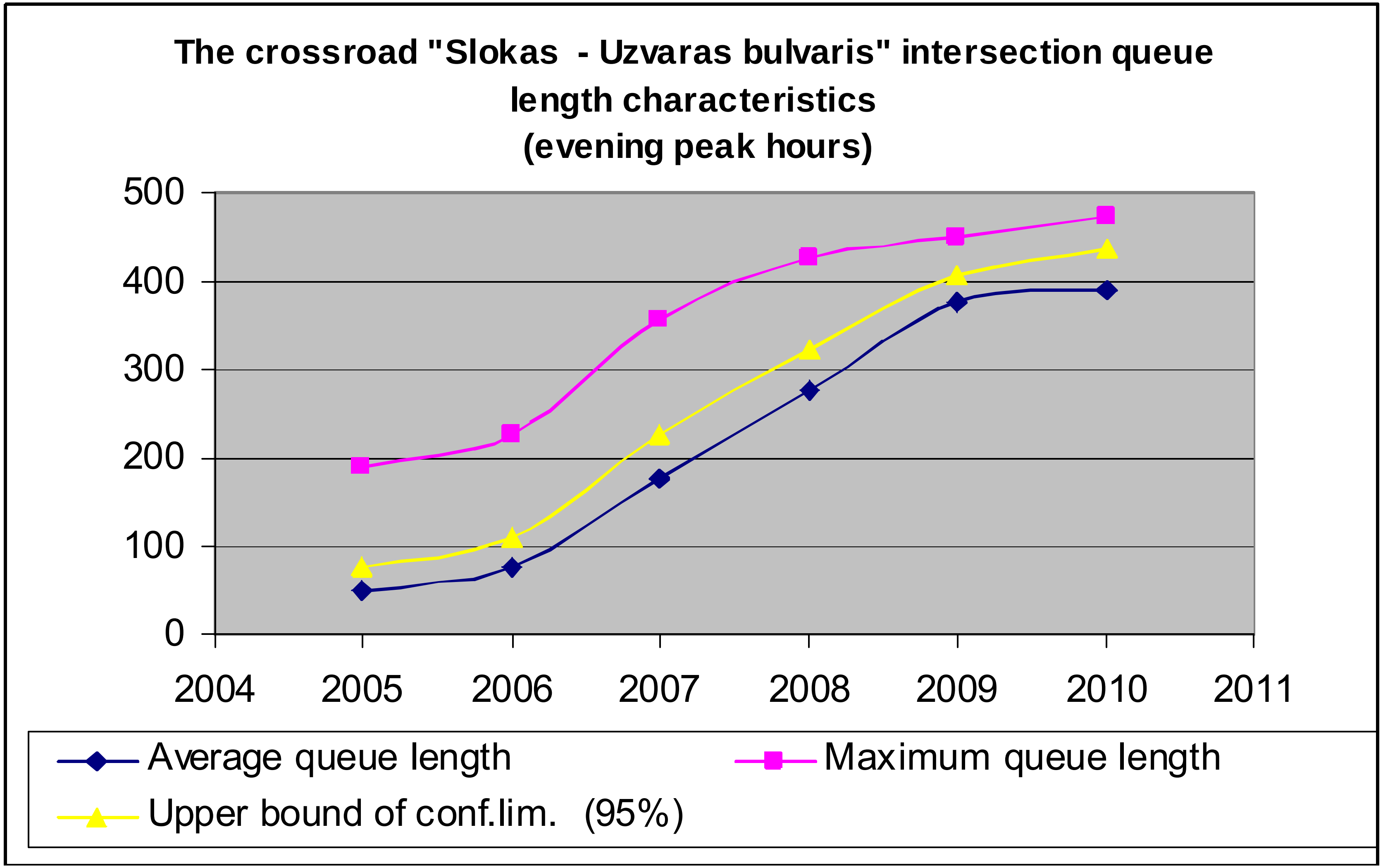
The most problematic node



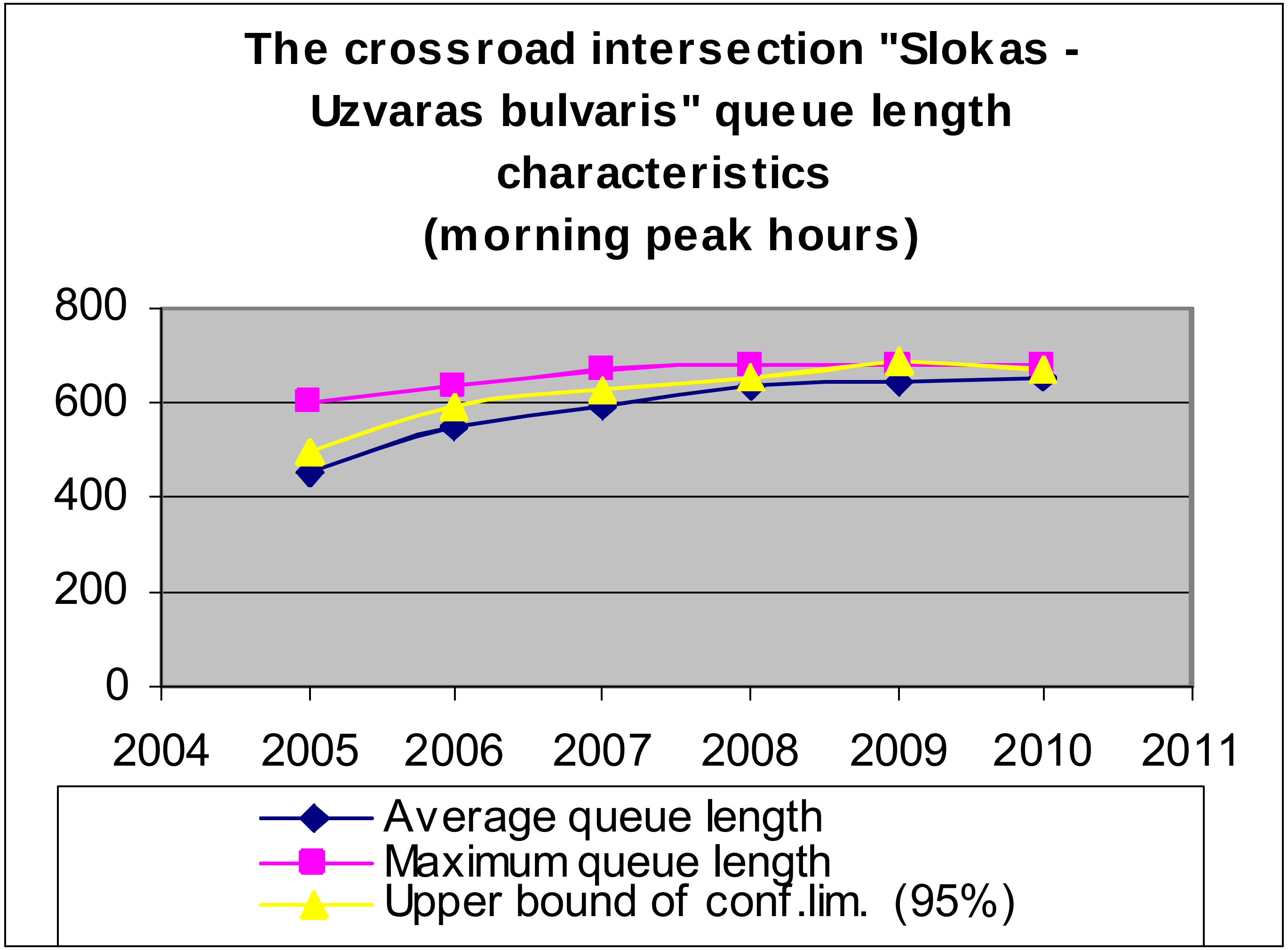
The Information about Transport Network Loading

The information about transport network loading	Evening peak hours		Morning peak hours	
	2005	2010	2005	2010
Number of vehicles in the network, all vehicle types	266	621	297	591
Number of vehicles that have left the network, all vehicle types	4435	4585	4265	4534
Average speed [km/h], all vehicle types	17.186	8.609	15.987	9.761
Average delay time per vehicle [sec], all vehicle types	83.786	213.347	91.688	174.263
Average stopped delay per vehicle [sec], all vehicle types	48.116	137.017	48.658	109.544
Average number of stops per vehicles, all vehicle types	1.976	4.004	2.398	3.615

The Forecast of Crossroad ”Slokas - Uzvaras Bulvaris” Queue Length (5)



The Forecast of Crossroad ”Slokas - Uzvaras Bulvaris” Queue Length (5)



Results

- The investigated crossroads are now at the normal level of congestion according to ICU standard, but the situation will change opposite if the rate of motorization level is held on the same level (as last 5 years).
- This investigation did not take into account the possible increasing of the traffic volume on the reason of new administrative centre construction.

Conclusions

- Cities have developed over many years and both their transport and their social systems are complex.
- Problems of city cannot be solved by simply increasing transport supply; demand management is both desirable and necessary
- Complexities of city structure, an integrated systems approach to travel demand management on the base of modelling and simulation provides the best opportunity for the development of equitable, efficient and sustainable urban transport systems.

Transport and Telecommunication Institute

Lomonosova 1

www.tsi.lv

E-mail: *ivl@tsi.lv*

Tel. 371-7100594

Fax. 371-7100660