Methodology for household travel survey and traffic counts for SUMBA project

3rd PART. Update of RTSM and scenarios evaluation

Customer: Riga City Council Department of City Development

Executor: Transport and Telecommunication Institute
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Introduction

One of the key goals of the SUMBA project is to update the existing macroscopic transport model of the Riga City Municipality, considering two sub-models: demand model and supply model. Current demand and supply sub-models used in the EMME model are outdated and require new input data. In the same time functionality of the existing model is limited to private and cargo flows for morning peak hours. In frame of SUMBA project, it is planned to update and extend both sub-models: demand model and supply model.

Current report represents the results of the project with relation to update of the demand and supply sub-models. Regarding supply model, the existing networks coded in EMME was reviewed and synchronised with real network state with inclusion into the model the network parts which relates to Riga suburban area. Additionally, the supply model has been updated with public transport infrastructure, which is represented with stops, lines, and routes for main public transport systems of Riga (busses, trams, trolleybuses, urban & suburban trains).

The demand models have been updated based on data collected during household mobility survey, traffic counts, analysis of existing data regarding tickets purchase for public transport. Demand model has been significantly updated as one of the most change has been done with relation to the number of transport zones coded in the model. The primary purpose of extending number of transport zones was related with public transport inclusion into the model. Finally updated model has been used to evaluate two development scenarios.

Supply & demand sub-models update and extension

Existing Riga Traffic Simulation Model (RTSM) is classical macroscopic model realized based on EMME software from INTRO. As any classical macroscopic model, it has two sub-models as demonstrated in Figure 1.

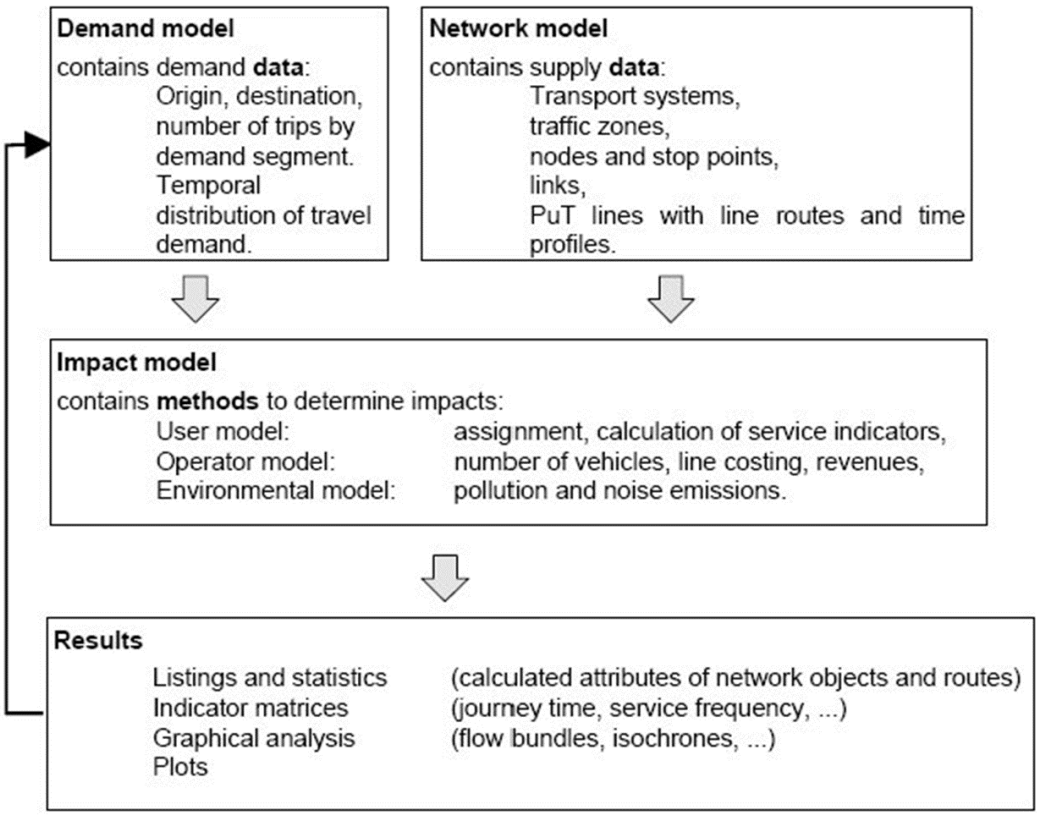

Figure 1. Macroscopic model generic representation (PTV VISION VISUM Official Manual, PTV AG)

As could be seen from the Figure 1 macroscopic model is based on two sub-models which are demand model and supply (network) model. Each sub-model consists of set of data which is a core information to perform the simulation. In supply (model) model the core data are related to the following elements:

- Network data (links, nodes, capacity, volume-delay functions etc).
- Transport modes, transport systems.
- Public transport data (stops, lines, routes, time profiles).
- Transport zones.

The demand model primary consists of the demand data, which describes the mobility patterns and temporal distribution of travel demand.

The next sections describe data about renew, update and extension of supply and demand data in the RTSM in frame of the SUMBA project.

Supply sub-model update in RTSM

Supply sub-model is an important part of the macroscopic model as it provides the infrastructure and services to complete the journey by the travelers. Considering current state of the RTSM and strategic model development plans it was made decision to put special attention into update and extension of the transport zoning system, network, & public transport. Next subchapters describe the results of the update and extension of the mentioned above elements of the model.

Update & extensions of transport zones

Considering strategic goals to include public transport into the RTSM model and include into the model suburban areas of the Riga city. The zoning system has been updated and extended. The previous RTSM model was based on zoning system which included 180 transport zones. Riga city by itself had 124 zones, suburban area -14 zones, other zones (beside Riga and suburban area) - 42. After update, the zoning system has been extended to 516 zones, the main changes covered more detailed split of Riga city into zones and addition of suburban areas.

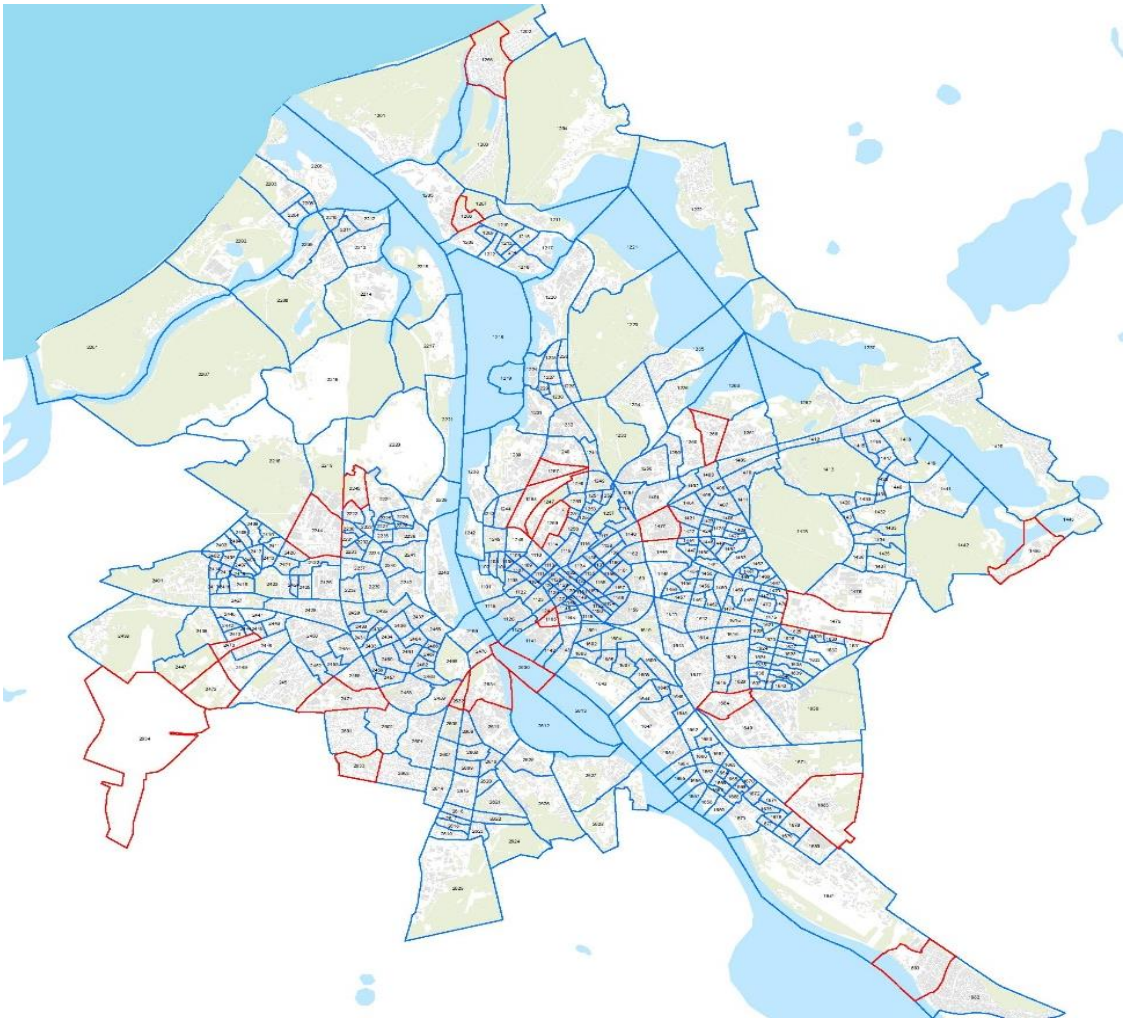

Figure 2. Transport zones in updated RTSM (without external zones)

The most changes covered the territory of Riga city, the proposed zoning system includes 452 zones, while in suburban area the number of zones has been raised to 49, the rest territory impacting Riga is presented by 15 zones. The complete list of new transport zones could be found in Annex 1.

The size and number of zones was subject of balance between availability of data per zone and exactness of simulation results. The homogeneity of population density was another factor which has been considered. The Figure 2 represents the zoning system after completing update and extension of the model. During coding of the zones, the coding system used in Riga City Development department has been used to ensure continuity of the RTSM development. The zone centroids (for transport zones) are presented in Figure 3 below.

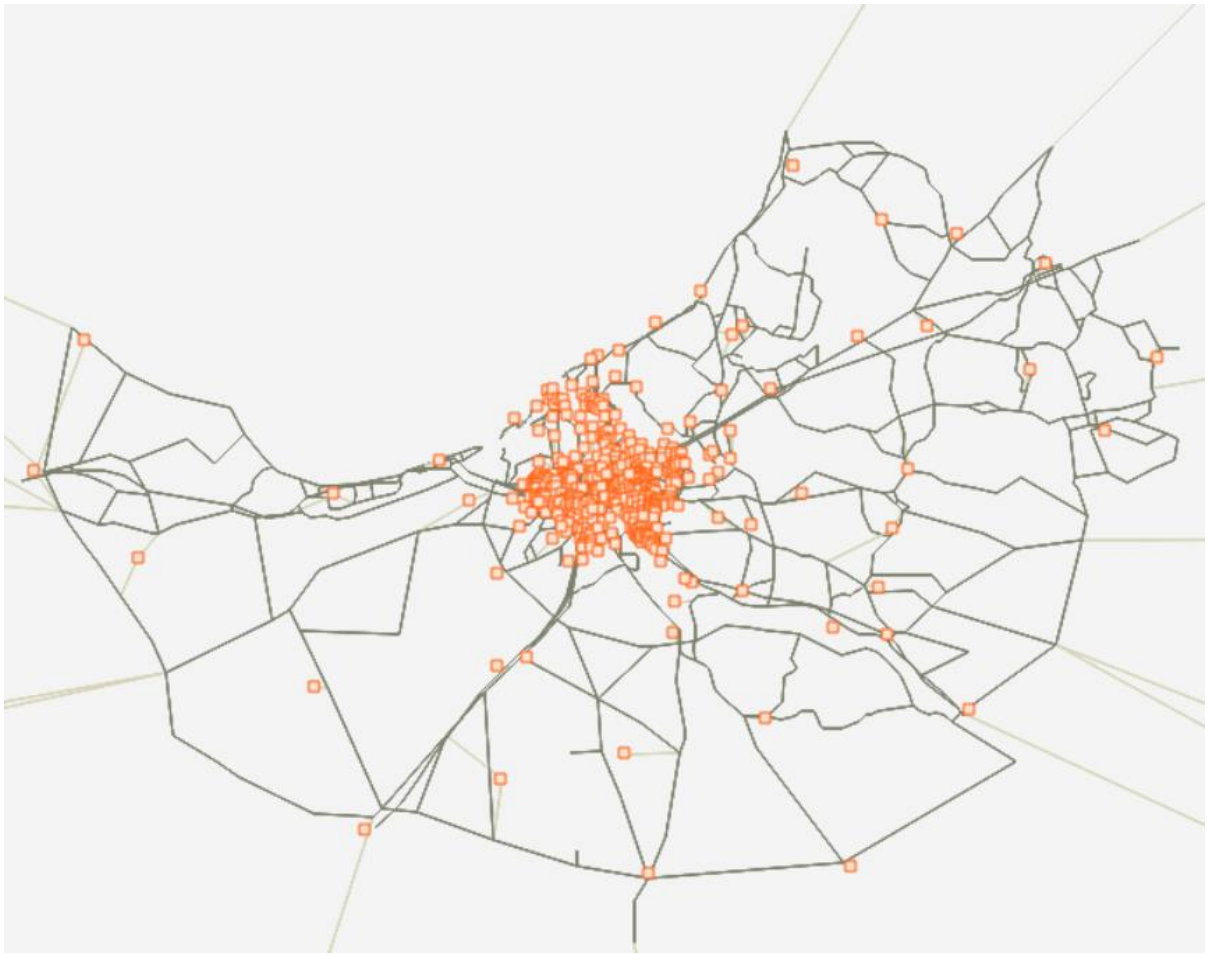

Figure 3. Centroids of transport zones in new model

Network update

Extension of number of zones leads to more detailed simulation of the mobility patterns, therefore the network of the model has been updated by new links, nodes and turns. In total number of links has been raised from 3324 (previous RTSM model) to 5177 (new RTSM model); number of nodes has been raised from 1056 to 1443; number of turns has been raised from 4413 to 6754.

Figure 4. Coded transport network

Each new link has been attributed by the number of lanes, speed, and capacity and volume delay function. Following speed levels has been used in the model 50km/h, 70km/h, 90km/h, 100km/h. No changes in the volume delay functions has been provided into the model compare to the previous model. Figure 4 represents the coded network in new model.

Public transport

The public transport element has been included into the model based on available data about stops, lines, routes, and schedule. Following transport system has been included: trams, busses, trolleybuses, and urban-suburban trains. For trams, busses, and trolleybuses the data available from http://transitfeeds.com/feeds has been used in General Transit Feed Specification format (GTFS). Figure 5 represents GTFS availability for Latvia.

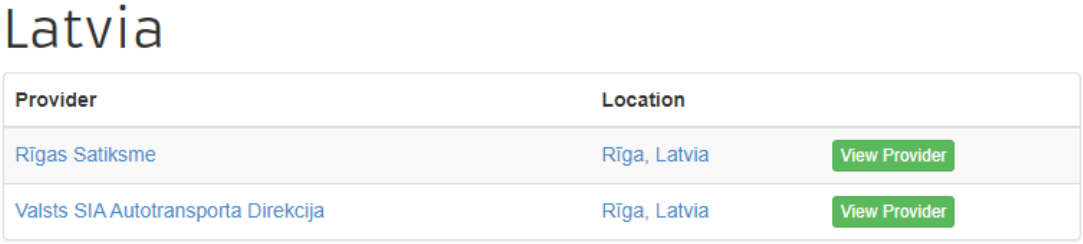

Figure 5. Transport zones in updated RTSM (http://transitfeeds.com)

"Rīgas Satiksme" is the provider, which operator of public transport in Riga city. The GTFS data from "Rīgas Satiksme" has been used to update the model by importing them using internal functionality of the EMME software with manual adjustments. Figure 6 represents imported data.

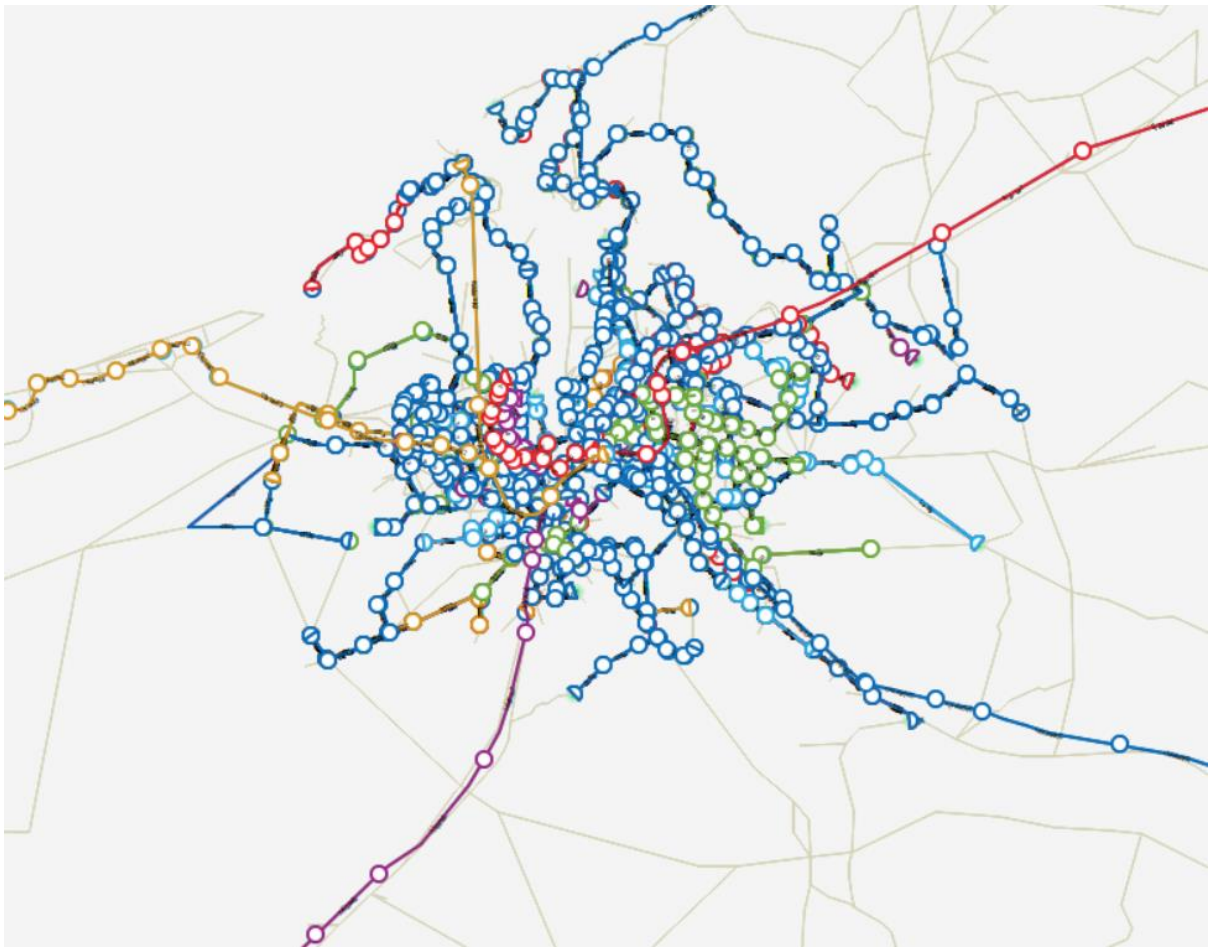

Figure 6. Public transport system (stops & lines)

By the red color, the bus transport system has been visualized, by blue color trams and by the green color the trolleybus public transport system. In total the models have been updated by 1673 stops, 63 lines, 293 routes and 1527 schedules.

Additionally, the data about urban and suburban train has been added to the model. As GTFS data is absent for this transport system. So, the stops, lines and routes has been coded manually. Figure 7 represents coded transport system.

Figure 7. Urban and suburban train transport system (stops & lines)

The schedule for urban and suburban trains has been adopted from official webpage of service provider "Pasažieru Vilciens" - https://www.pv.lv/lv/marsrutu-saraksts. An example of the schedule is presented in Annex 2.

Transport systems and modes

The list of transport systems used in model has been updated according requirements. The complete list, after update, of transport systems and modes is presented in the Table 1 below.

Table 1. New list of transport systems and modes

#	Mode	Description	Type
1	u	trollybus	2
2	t	tram	2
3	s	localtrain	2
4	r	regionbus	2
5	p	pedestrian	3
6	m	microbus	2
7	k	trucks	4
8	h	bike	4
9	g	motorbike	4
10	f	cargo+	4
11	e	mid cargo	4

#	Mode	Description	Type
12	d	ligh cargo	4
13	c	car	1
14	b	citybus	2
15	a	tr_access	3

Considering appearance of new transport modes, the allowed transport mode attribute of the links of the models have been updated accordingly.

Summary

The Table 2 below summarize the key differences between previous version of RTSM model and updated one in frame of the project.

Table 2. Comparison of current and updated RTSM

RTSM version	Transport modes	Transport zones	Nodes	Links	Turns	Stops	Lines
Current	11	180	1056	3324	4413	0	0
Updated	15	516	1443	5177	6754	1759	68

Demand sub-model update in RTSM

The demand part of the macroscopic transport model is treated as one of the most important components of the model, as it described the mobility patterns of the citizens.

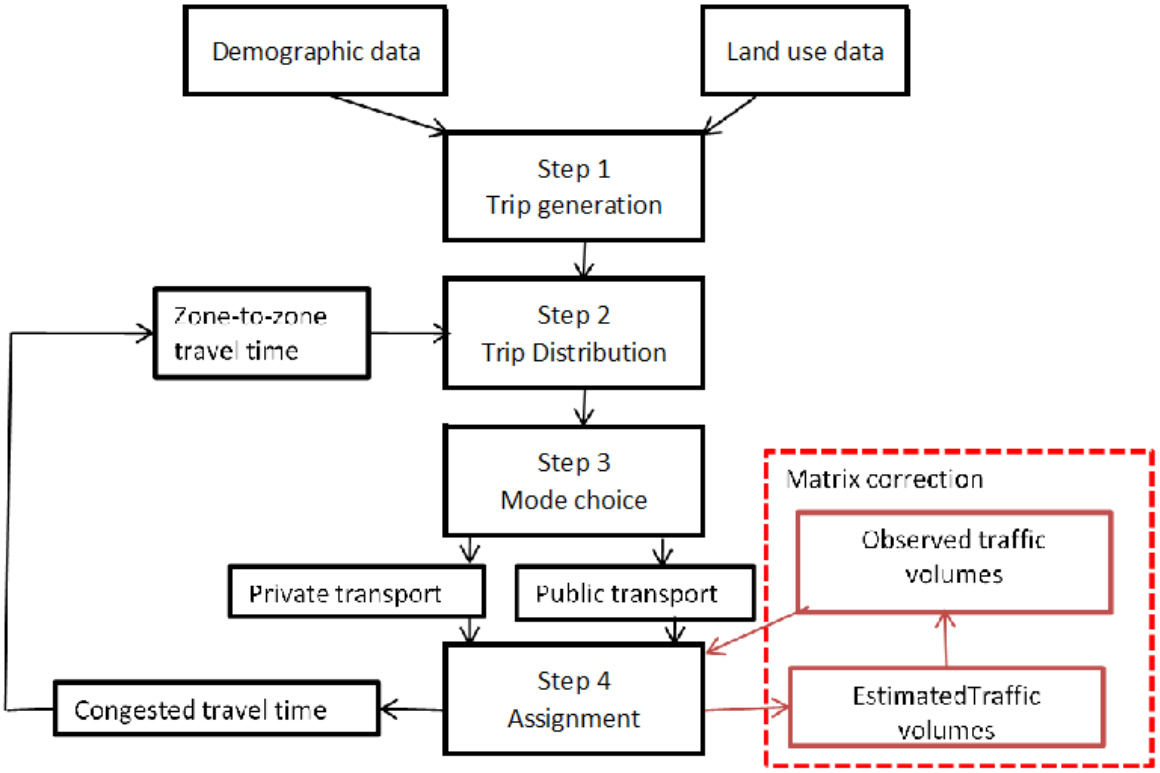

Figure 8. 4-step model scheme

Demand sub-models is represented in form of origin-destination matrices. In this project the classical 4-step models have been utilised to produce the matrices and to complete the assignment. The model evaluation is done in four steps and is therefore called four step models. The role each step has in the model is expressed in Figure 8.

- **Trip generation (step one)** determines the frequency of origins or destinations of trips in each zone, as a function of land uses and demographics, and other socio-economic factors.
- **Trip distribution (step two)** calculates how big proportion of the total traffic travels between each pair of the zones based on how good connection there is between the zones. The connection quality is often measured in travel time.
- **Mode choice (step three)** computes the proportion of trips between each zone that use a particular transportation mode.
- **Trip assignment (step four)** calculates how the traffic will distribute on the road network. Calculation methods often take delays caused by congestions into consideration. New travel time between zones is calculated with these traffic delays

and step two is then repeated with the new travel time. This process is repeated until certain criteria are reached.

- **Matrix correction.** Matrix correction methods are used to adjust a given OD matrix in such a way that the result of the assignment closely matches the latest traffic count figures (see red boxes in Figure 8). Resulting trip distribution matrix from such adjustment is no longer based entirely on productions, attractions, and connection quality between zones instead combination of these factors and traffic counts. (Marzano, Papola and Simonelli, 2009).

Trip generation

On trip generation step the data from household mobility survey has bee used as initial starting point. Based on the data following trip purposed has been in this project:

- Home-Primary&Secondary School (**HS**),
- Home-Further education (**HU**),
- Home-Work (**HW**),
- Home-Shopping (**HP**)
- Home-Other (**HO**).

The selecting of the purposed has been based on analysis of the purposes indicated by survey respondents (see Figure 9).

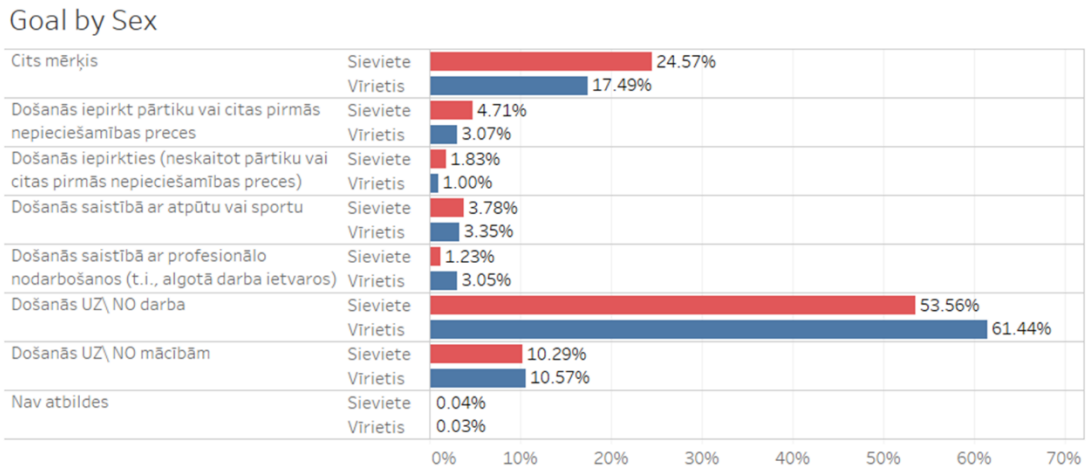

Figure 9. Goal of trips

Also based on analysis of the survey data following mobility groups has been selected for further modelling of the demand:

- Employees (**E**) are the workforce of the study area.
- Not employed (**NE**) are for example unemployed, pensioners.
- School pupils (**Pup**) are all inhabitants in age groups from 7 years to 18 years old.
- Students (**Stu**) are university students.

The selection of specific mobility groups has been based on data from household mobility survey (see Figure 10).

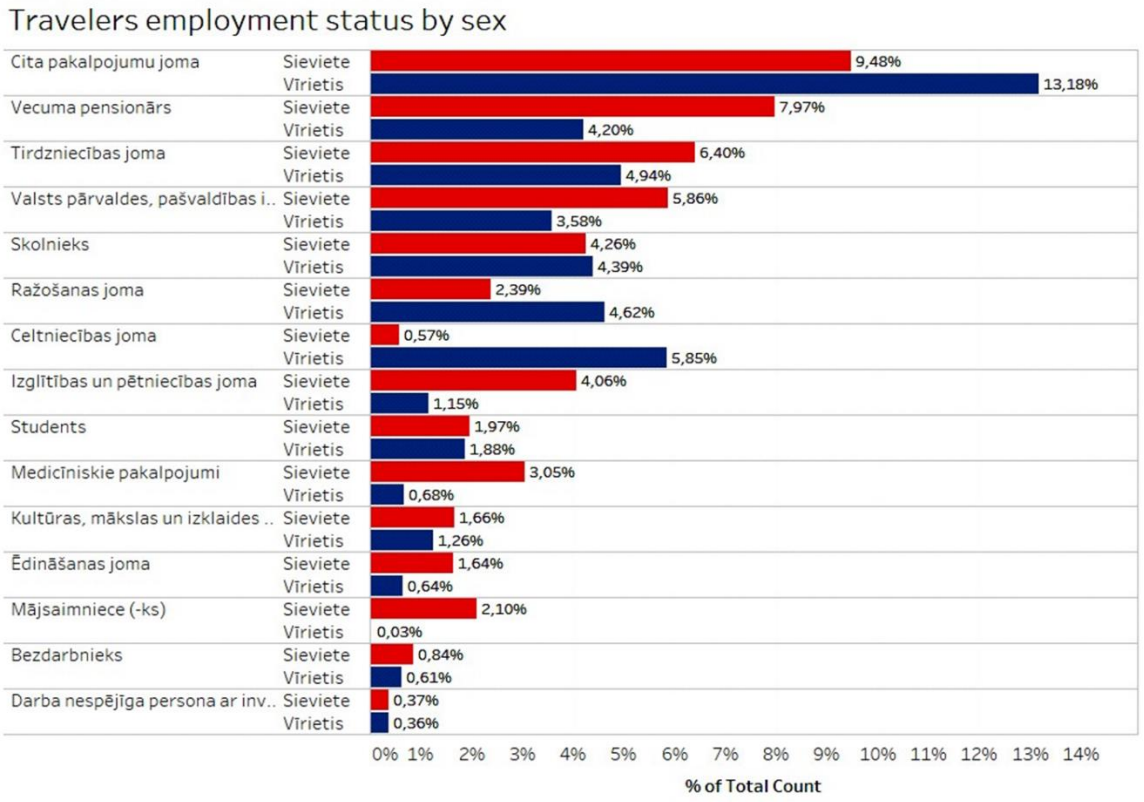

Figure 10. Mobility groups

By defining mobility groups and purposes of the trip the following demand stratums has been considered:

- Home-Work (**HW**) - Employees (**E**): **HW-E.**
- Home-Primary&Secondary School (**HS**) - School pupils (**Pup**): **HS-Pup**.
- Home-Further education (**HU**) - Students (**Stu**): **HU-Stu**.
- Home-Other (**HO**) - Employees (**E**): **HO-E.**
- Home-Other (**HO**) - Not employed (**NE**): **HO-NE**.
- Home-Other (**HO**) - School pupils (**Pup**): **HO-Pup**.
- Home-Other (**HO**) - Students (**Stu**): **HO-Stud.**

The table below demonstrates the average trip rate and production for different mobility groups.

Table 3. Average trip rate mobility groups

	E	NE	Pup	Stu
Average trip rate	**4,5**	**2,98**	**3,45**	**4,3**

Based on data the following proportions has been calculated to each mobility groups as demonstrated in Table 4.

Table 4. Calculation of the production for each demand stratum

	HW	HS	HU	HO	Total
E	**72%**			**28%**	**100%**
Pup		**76%**		**24%**	**100%**
Stu	**11%**		**74%**	**15%**	**100%**
NE			**5%**	**95%**	**100%**

So, general workflow to model the demand for the updated RTSM looks in the following way as presented below in Figure 11.

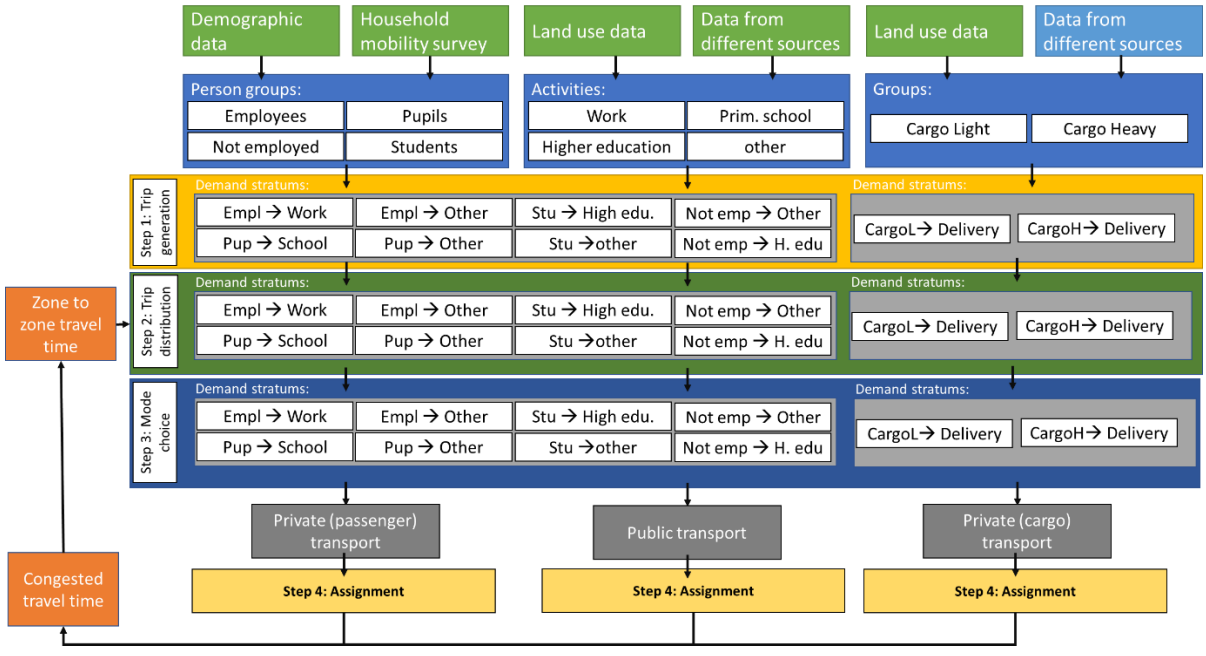

Figure 11. Schematic workflow adopted in the project

Trip distribution

The core purpose of this stage is to match the trip productions to the trip attractions evaluated on previous stage for each pair of transport zones. The gravity model has been applied to make a trip distribution. Gravity model assumes that the trip made are proportional to following issues:

- the relevant origin and destination demand in all zones;
- the functional values of utility between transport zones.

Following equation has been considered (Ortuzar, J. and Willumsen, L.G., 2001):

$$T_{ij} = a_i b_j O_i D_j f(c_{ij})$$

where

T_{ij} – number of trips between zone i and zone j,

a_i and b_j – balancing factors,

O_i – the production of zone i,

D_j – the attraction of zone j,

$f(c_{ij})$ – the utility function between zone i and zone j

Mode choice

In this stage the specific transport mode for travelers (zone to zone) has been evaluated. The generalized logit model has been applied to determine the split between modes and estimate the probability for travelers of choosing the specific mode (NCHRP Report 365, 1998). The generalized logit model is described with the following equation:

$$p_i = \frac{e^{u^i}}{\sum_{i=1}^{k} e^{u^i}}$$

where

p_i – probability of choosing mode i,

u_i – a linear function of the attributes of mode I, this function describes the attractiveness (utility or impedance) of mode i,

$\sum_{i=1}^{k} e^{u^i}$ – the sum of the linear functions of the attributes for all alternatives k, for which choice is available.

The linear function of the attributes u_i is presented in following form:

$$u_i = a_i + b_i * IVTT_i + c_i * OVTT_i + d_i * COST_i$$

where

$IVTT_i$ – the in-vehicle travel times using mode i,

$OVTT_i$ – the out of the vehicle travel time using mode i,

$COST_i$ – the cost of mode i

a_i – mode specific coefficient to include mode bias not measured with level of service variables,

b_i – coefficient for the IVTT variable of mode i (described the importance of IVTT for travelers),

c_i – coefficient for the OVTT variable of mode i (described the importance of OVTT for travelers),

d_i – coefficient for the COST variable of mode i (described the importance of COST for travelers).

Mentioned above coefficient are subject to model calibration and understanding the preferences of the travelers and factors which influence the choice of the mode. IVTT and OVTT are calculated from the model. While COST is determined by existing prices for each mode. For public transport modes the cost has a constant value according to the price list of the public transport operator (Rīgas satiksme). The deviation of price for pupils and employee and students has been differentiated. While for private vehicle, the prices per km, has been determined from data of csb.gov.lv and csdd.lv. Based on calculations the 0,35 EUR/km is a price used to describe the cost variable for private transport.

Trip assignment

No significant changes have been provided to the existing RTSM model regarding trip assignment stage. The only changes, which impacts the trip assignment were done in frame of updating the network (links, noted, turns).

Matrix correction

As a core of Matrix correction step the TFlowFuzzy algorithm is utilized. The main reason of using this specific algorithm is explained by its characteristics. The main goal of the TFlowFuzyy is to adjust a given OD matrix in such a way that the result of the assignment closely matches the observed link volumes or origin/destination travel demand (PTV AG., 2020):

- For private and public transport.
- For link volumes.
- For OD travel demand by zone.
- For turn volumes at nodes.
- For any combination of these three (mentioned above).
- Counts and tolerances.
- Use of user defined attributes.

The generic idea of TFlowFuzzy is represented in Figure 12. As could be seen the TFlowFuzzy utilize three types of input data: initial OD matrix, network, and traffic counts with tolerance level.

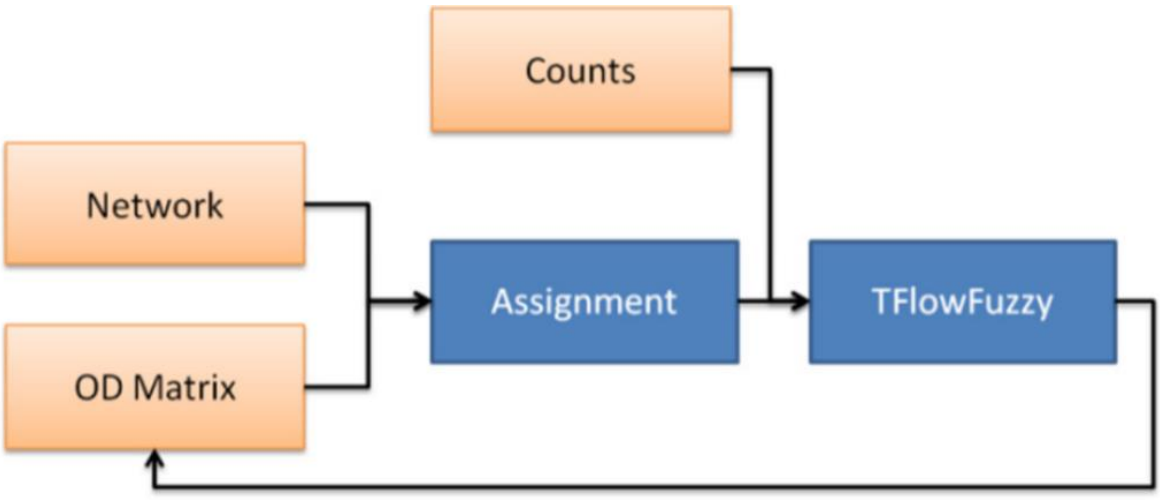

Figure 12. TFlowFuzzy procedure scheme (Savrasovs and Pticina, 2017)

The actual network exists in the model, the initial OD matrices has been received during previous three stages, traffic counts has been collected during traffic counts survey. The tolerance level has been set to 10%.

For private and cargo vehicles of different types the data from traffic counts survey has been used. In total data about volume of traffic has been collected in 50 traffic counting locations. The Figure 13 represents location of the traffic counting points.

ID	Title	ID	Title
1	Vanšu tilts	26	Krišjāņa Valdemāra iela
2	Akmeņu tilts	27	11. novembra krastmala
3	Salu tilts	28	Maskavas iela
4	Dienvidu tilts	29	Krasta iela
5	Brasas viadukts	30	Krustpils iela
6	Zemitānu viadukts	31	Augusta Deglava iela 2
7	Slāvu tilts	32	Lubānas iela
8	Gaisa tilts	33	Piedrujas iela
9	Augusta Deglava tilts	34	Dzelzavas iela
10	Gustava Zemgale Gatve 1	35	Biķernieku iela 2
11	Kalnciema ielas viadukts	36	Lielvārdes iela
12	Maskavas iela (Rumbula)	37	Gustava Zemgale Gatve 2
13	Brīvības iela (Jugla)	38	Juglas iela
14	Kārļa Uļmaņa gatve	39	Ganību dambis
15	Vienības gatve	40	Skanstes iels
16	Ziempniekalna iela uz Valdlaučiem	41	Duntes iela
17	Daugavas iela P132	42	Lielirbes iela
18	Jūrmalas gatve	43	Jūrmalas gatve
19	Kleistu iela	44	Daugavgrīvas iela
20	Daugavgrīvas šoseja	45	Mūkusalas iela
21	Jaunciema gatve	46	Slokas iela
22	Biķernieku iela	47	Kārļa Uļmaņa gatve 2
23	Augusta Deglava iela	48	Jaunciema gatve 2
24	Brīvības iela	49	Senču iela
25	Čaka iela	50	Lāčplēša iela

Figure 13. Location of traffic counting points

The data collected during traffic count survey are split by time and by the types of the vehicles. This one is considered to update the OD matrix for specific type of transport mode and specific part of the day. The Figure 14 represents the example of collected data used in OD matrix calibration process for private vehicles and cargo vehicles.

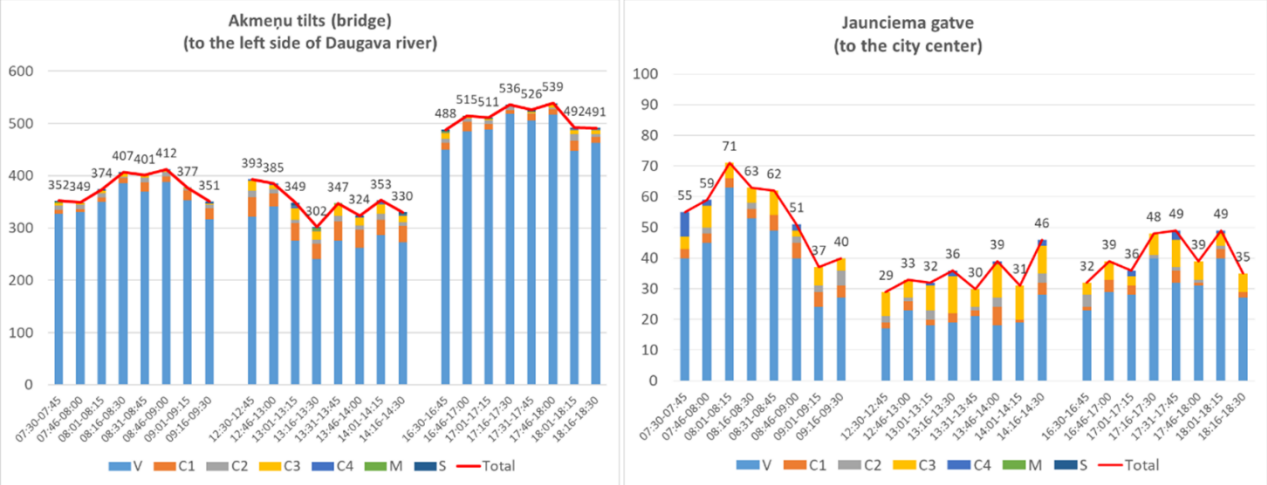

Figure 14. An example of traffic counts data

Figure 14 demonstrates the example of data collected during traffic counts survey. Three periods of the day have been utilized during traffic counting: morning peak hour (7:30-9:30), daytime (12:30-14:30), evening peak hour (16:30-18:30). As RTSM refer to simulation of 1h, the average volume of traffic has been used. Annex 3 described the coding and coloring scheme used in Figure 14.

As for public transport the e-talons database has been used to evaluate the amount passengers, who travels by public transport. E-talons data has been obtained from “Rīgas Satiksme” in form of CSV files. The big lack of this database is absence of destination point of the passenger, as passengers are forced to do only validation by entering the public transport. Therefore, the specific algorithms have been developed using Python programming language to complete the analysis of the e-talons data and get information about travel patterns of the passengers, who uses public transport. The scheme, of data analysis used in this task is presented in Figure 15.

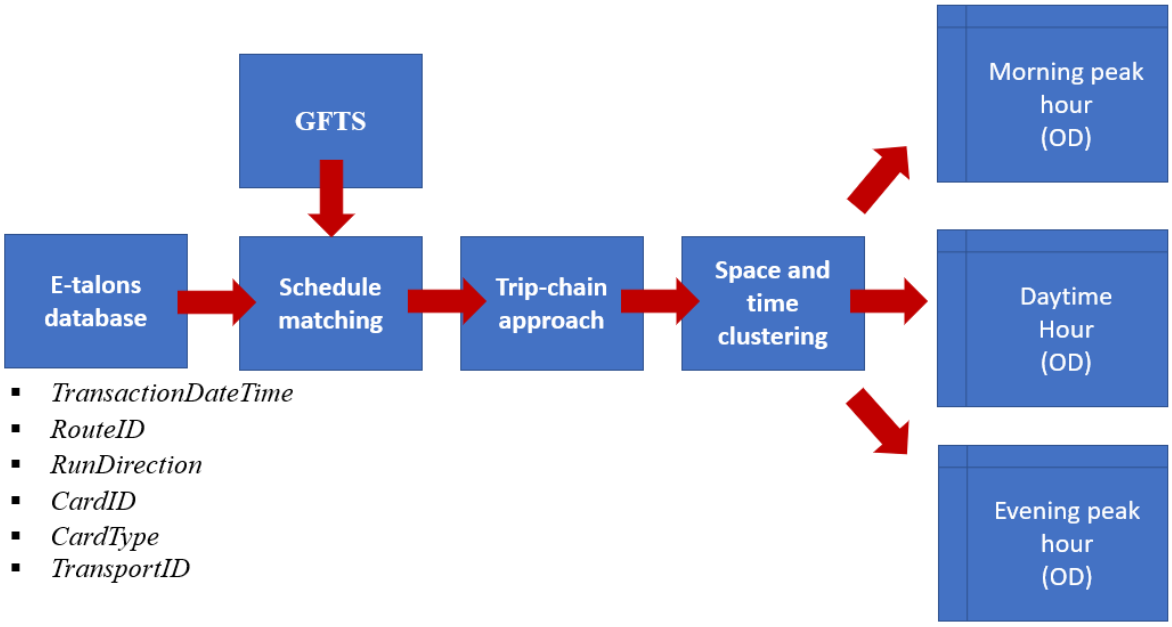

Figure 15. E-talons data analysis scheme

The key input for the described above scheme is a structure of available data and its completeness. In this project, data from two non-integrated data sources were utilized:

- Smart card validation data set that is provided by PT operator;
- Scheduling information that was collected in general transit feed specification (GFTS) format from OpenMobilityData (MobilityData, 2019).

A sample of validation records, obtained from the smart card system contains the following information:

- **RouteID** codes information about the transport mode and the route number (for example, tram_11).
- **RunDirection** is a binary indicator of movement direction (forward or backward).
- **CardID** is a unique card identifier that is utilised for trip chain identification.
- **CardType** includes information about applied fares (one-hour tickets, discount tickets, etc.).
- **TransportID** is a unique PT vehicle number.

Table 5. Example of data from e-talons database

Route ID	Run direction	Card ID	Card type	Transport ID
Bus 3	forward	2030603xxx	10 one-hour tickets	544189912
…	…	…	…	…
Tram_1	forward	6400065xxx	daily	386483920
Tram_1	forward	2565066xxx	monthly	983736630

The smart card database is not integrated with the automated vehicle location system, so there is no natural information about the spatial dimension of data. Thus, PT schedules were utilised, and data fusion was implemented for enhancing the smart card data set with spatial information. Scheduling information for every date is collected via historical feeds in GFTS format and includes information on:

- ***RouteID* and *TripDirection*** that are matched to corresponding fields from the smart card database;
- ***StopSpatialLocation*** includes geographical coordinates of every PT stop in the system;
- ***ScheduledTripID*** is a unique identifier of a scheduled PT trip;
- ***StopTimes*** are scheduled arrival and departure times for every trip and PT stop.

The core of the realized algorithms is use of the trip-chain approach which is based on the fact, that most of the trips done by passengers starts by the morning in origin zone and the origin zone by the evening time will be the destination zone during morning travel (Primerano, Taylor, Pitaksringkarn and Tisato, 2007).

The data processing workflow used in algorithm of obtaining mobility patterns is presented in Figure 16.

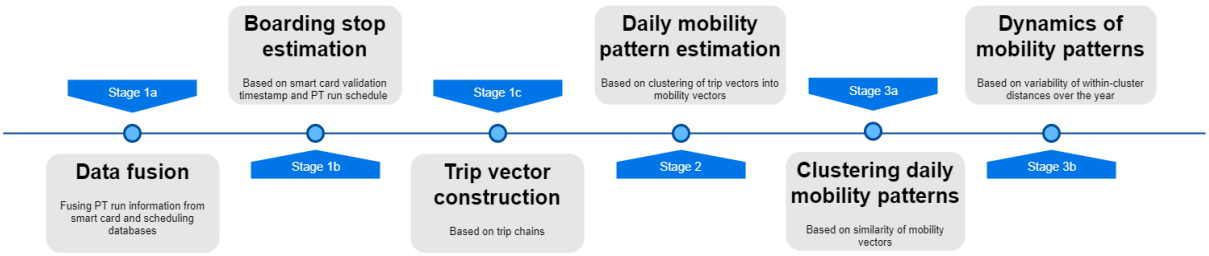

Figure 16. Data processing workflow

The results of the algorithm application for the obtained dataset is demonstrated in the Figure 17.

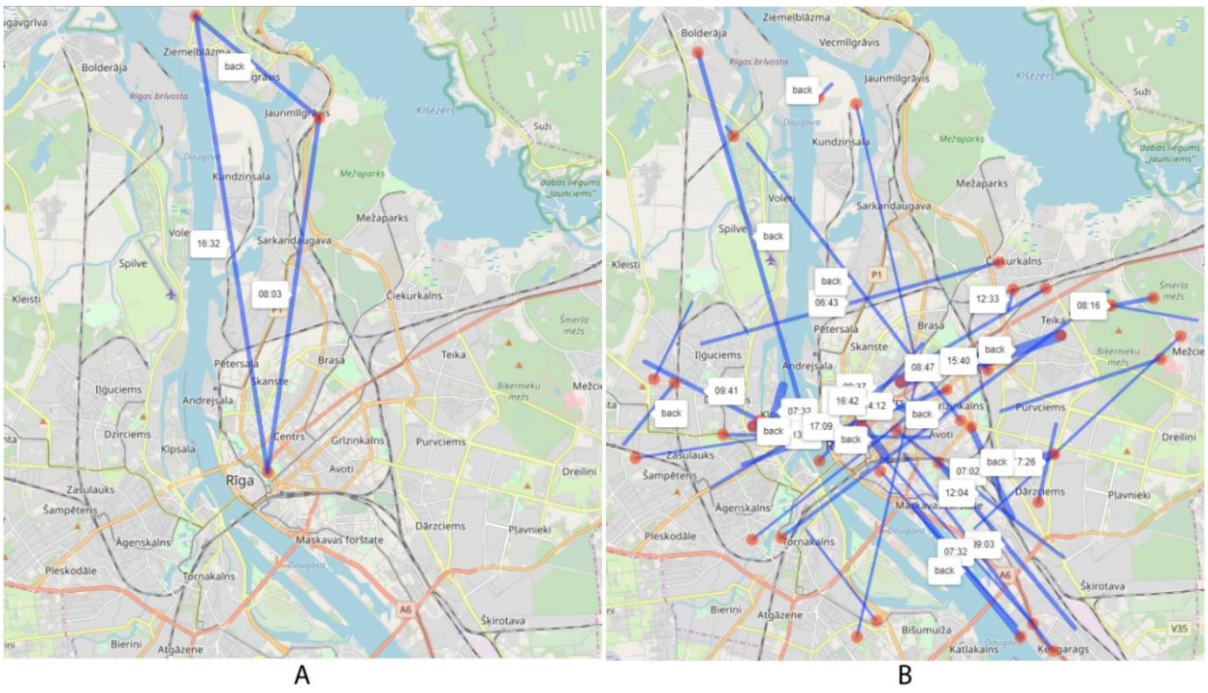

Figure 17. Typical individual trip vectors (A) and a daily mobility pattern (B). Destinations are marked with red circles; flow volumes presented by vector widths.

Summary

The following issues should be highlighted and recommended to consider for further RTSM models development and actualization:

- It is recommended to update zonal socioeconomical data on annual bases (1 time per year) and do re-evaluation of the demand model. It is recommended to include more complex data into the demand model, like different categories of households, different categories of working spaces etc.
- It is recommended to calibrate existing origin-destination matrices on a regular basis, based on collected traffic counts and passengers counts on stops. For this purpose, include the calibration procedure to the existing model workflow.
- It is recommended to establish a strong collaboration with existing data providers to receive the data on a regular basis in a specified format, which fits to model data format. This will simplify update of the demand model.

- It is recommended to establish a modelling department/entity, which will be responsible for management of model, its update and use. This department/modelling should consider updating the model on regular basis, collect any data in single database regarding traffic flows, ensure strong collaboration with data providers and finally be a single point for evaluation different development scenarios.

Scenarios evaluation

This section of the report highlights the application of the developed model for two scenario evaluation.

Scenarios description

Figure 18 represents general view on scenarios and their reference year.

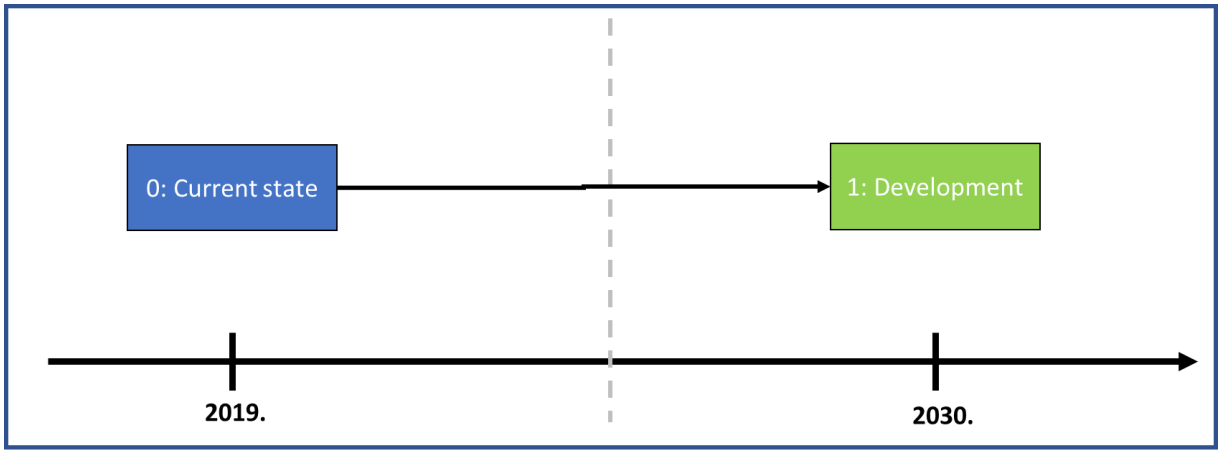

Figure 18. Scenarios to be evaluated

As could be seen from the figure above it is planned to evaluate two scenarios: the firs scenario is a current state with reference year appointed to 2019, while second scenario is a scenario appointed to 2030 year. The table below summarize scenario conditions which should be considered.

Table 6. Scenarios conditions

Scenario title	Conditions
0: Current state	• Current state of the network and the demand
1: Development	• *Changes in the network:* ○ Skultes overpass (Skultes pārvads)

Scenario title	Conditions
	○ East highway (Austrumu maģistrale) ○ Dzelzavas street (Dzelzavas iela) ○ South bridge all stages (Dienvidu tilts) ○ Anniņmuižas overpass (Anniņmuižas pārvads) ○ Liepajas street reconstruction (Liepājas iela) ○ Heavy cargo vehicle rerouting from city center • *Changes in the demand:* ○ Population forecast for 2030y

As could be seen from Table 6 the first scenario is a current state of the network without any additional changes in network and the demand data. While second scenario refer to the significant changes in network and the demand. The changes in the network consider following infrastructure projects, which are planned to implement until 2030y:

- Skultes overpass (Skultes pārvads) – for details of this project see Annex 4.
- East highway (Austrumu maģistrale) – for details of this project see Annex 5.
- Dzelzavas street (Dzelzavas iela)
- South bridge all stages (Dienvidu tilts) – for details of this project see Annex 6.
- Anniņmuižas overpass (Anniņmuižas pārvads)
- Liepajas street reconstruction (Liepājas iela)
- Heavy cargo vehicle rerouting from city center

The Figure 19 represents the geographical location of the mentioned above infrastructure projects. As could be seen they are in different parts of the city and probably will influence traffic flows highly.

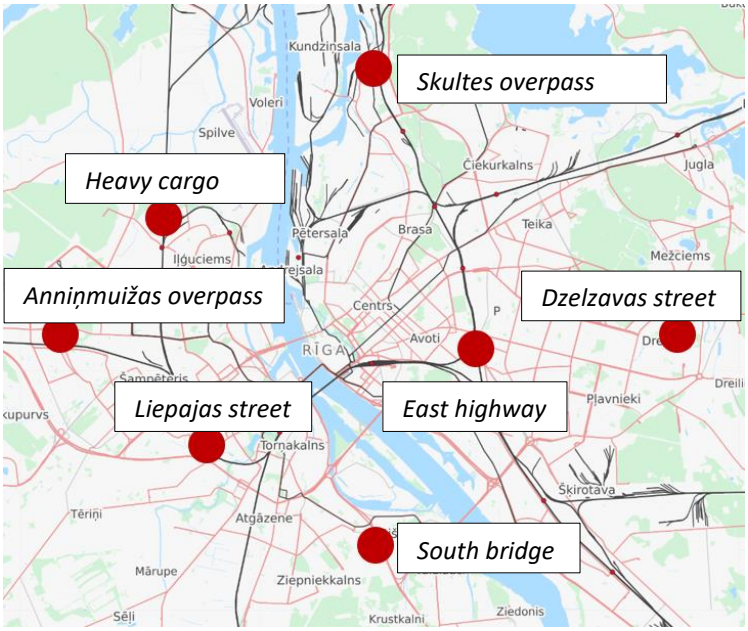

Figure 19. Location of the infrastructure project

To evaluate the demand data for 2030y the forecast of the population has been adopted from Riga City Council Development department. The forecast shows current and forecasted population for 2030 year by the zone. The analysis of the forecasted data shows decreases of urban population in average by 5.5%. The Table 8 gives an example of the demographic situation highlighting top 10 zones with increasing population and decreasing population.

Table 7. Top zones by increase and decrease of the population

#	Zone	2020y	2030y	Diff	Zone	2020	2030	Diff
1	Skanste	2125	5627	3502	Purvicems	58603	52471	-6132
2	Āgenskalns	24400	25032	632	Ķengarags	48394	44047	-4347
3	Pētersala-Andrejsala	5561	6140	589	Vecmilgrāvis	21964	18093	-3871
4	Vecāķi	1875	2200	325	Iļģuciems	23655	20235	-3420
5	Mežaparks	4344	4633	289	Imanta	46052	43027	-3025
6	Šampēteris	9716	9910	194	Pļavnieki	44210	41307	-2903
7	Berģi	3205	3387	182	Centrs	37717	34986	-2731
8	Dzirciems	11158	11301	143	Sarkandaugava	17298	14710	-2588
9	Teika	30836	30950	114	Jugla	25995	25534	-2461
10	Mežciems	14731	14803	72	Maskavas forštate	27038	24659	-2379

The detailed data about forecast of population could be found in Annex 9. Here should be mentioned that the distribution by age is considered the same as it is now (2019).

Scenarios evaluation

Based on described scenarios two experiments has been completed using updated RTSM model. To see the impact of the scenarios following well-known measures of effectiveness (MoE) has been considered and measured:

- **Average speed in network, km/h** – describes the performance of the network.
- **Average travel time, min** – describes the effectiveness of the mobility.
- **Level of Service (LoS)** – describes impact on local elements of the infrastructure.

Based on described above MoE following results has been obtained from the simulation and analysed. The Figure 20 demonstrates the change of the average speed in the network for 3 ranges across the day (R – morning peak hour; D – daypart; V – evening peak hour).

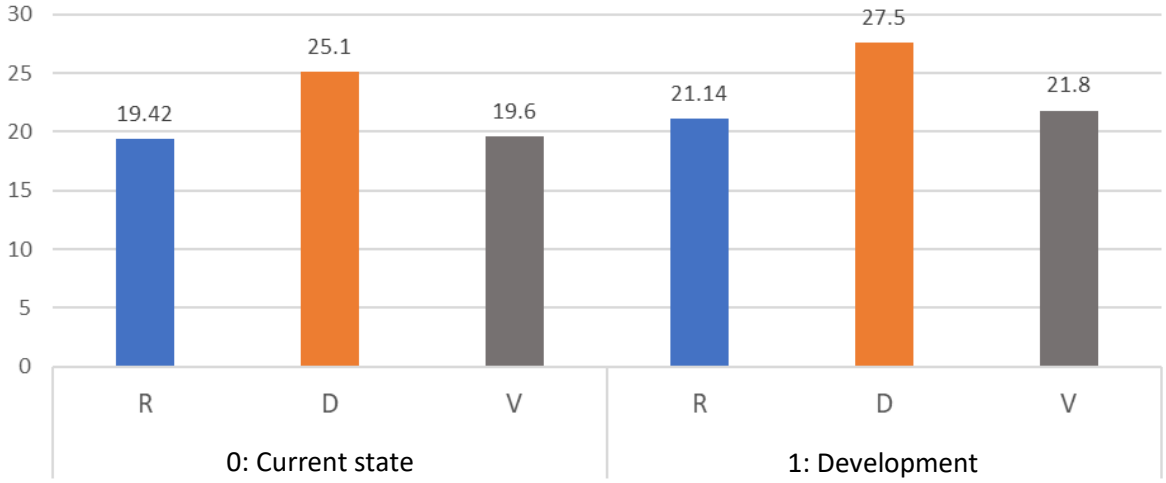

Figure 20. Average speed in the network, km/h

As could be seen from Figure above for all three ranges of the day the increase of the average speed of the network has been observed. To note the average speed has been considered only for zones located in urban area. In average the growth of the average speed is around 10%.

The Figure 21 represents the more detailed data about average speed split by transport systems; private, public, cargo.

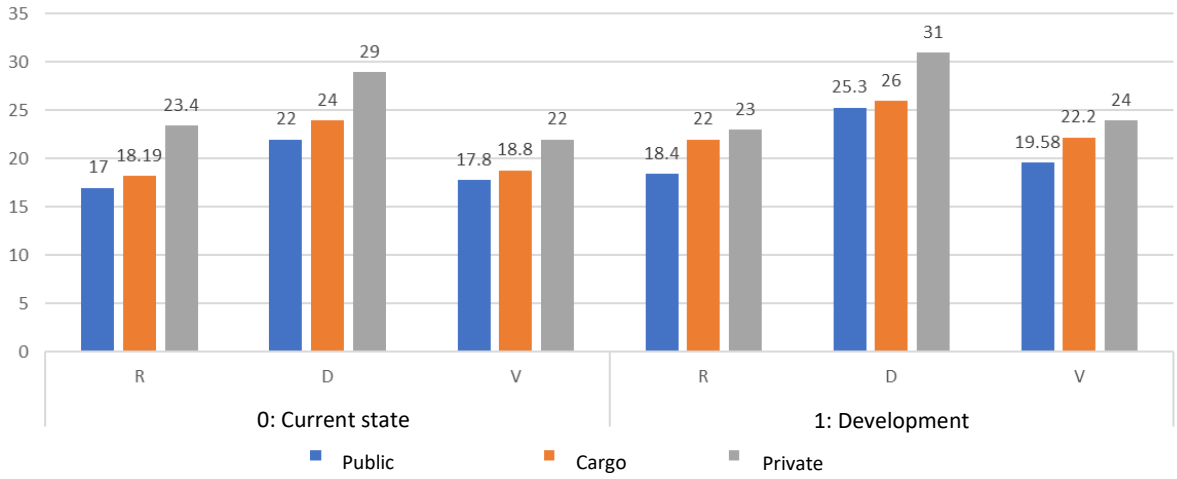

Figure 21. Average speed in the network, km/h (split by public, cargo, private)

As could be seen from Figure 21 in all time ranges the increase of the average speed is observed. In all time ranges the increase is observed, but highest is during daypart, which indicates that still congestions during morning and evening peak hours impact the system.

Figure 22 represents data regarding average travel time in the network (the urban area zones are only considered).

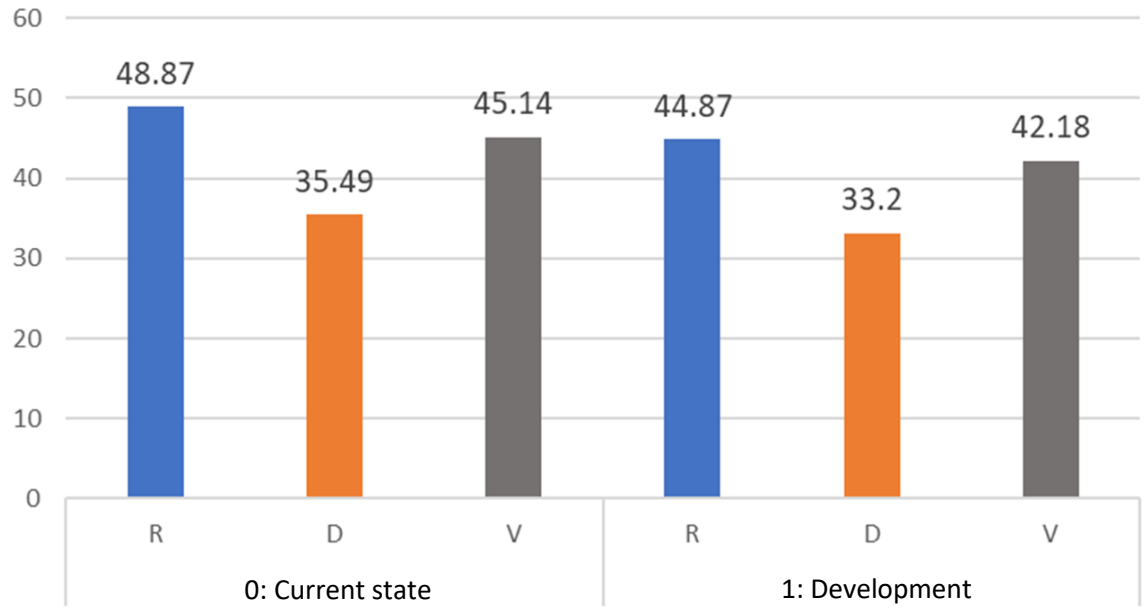

Figure 22. Average travel time, min

Figure 22 shows the average travel during three ranges of time during the day. As could bee seen from the data the realization of the described above projects will impact the mobility

measure. For all three time ranges the decrease of the travel time in average by 7 % is observed.

The table below summarize the data regarding level of service in different parts of the network, selected in the area of project's realization.

Table 8. Level of service

Part	0: Current state			1: Development		
	R	D	V	R	D	V
Skultes overpass	-	-	-	B/C	B	B/C
East highway	C/D	B/C	C/D	B/C	B	B/C
Dzelzavas street	-	-	-	B/C	B	B/C
South bridge	-	-	-	C	B	C
Anniņmuižas overpass	D	C	D	C	B	C
Lipejas street	B/C	B	B/C	B	B	B

As could be seen from Table 8 in all cases the level of service is increased, this should be considered as a positive impact of the implemented infrastructure projects. To note the missing values, refer to the part of the network which currently is missing.

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ANNEX

Annex 1

Table of new transport zoning system

#	Territory	Zone ID	Description
1	Riga	110100	
2	Riga	110200	
3	Riga	110300	
4	Riga	110400	
5	Riga	110500	
6	Riga	110600	
7	Riga	110700	
8	Riga	110800	
9	Riga	110900	
10	Riga	111000	
11	Riga	111100	
12	Riga	111200	
13	Riga	111300	
14	Riga	111400	
15	Riga	111500	
16	Riga	111600	
17	Riga	111700	
18	Riga	111800	
19	Riga	111900	
20	Riga	112000	
21	Riga	112100	
22	Riga	112200	
23	Riga	112300	
24	Riga	112400	
25	Riga	112500	
26	Riga	112600	
27	Riga	112700	
28	Riga	112800	
29	Riga	112900	
30	Riga	113000	
31	Riga	113100	
32	Riga	113200	
33	Riga	113300	
34	Riga	113400	
35	Riga	113500	
36	Riga	113600	
37	Riga	113700	
38	Riga	113800	
39	Riga	113930	
40	Riga	114000	
41	Riga	114100	
42	Riga	114200	
43	Riga	114300	

44	Riga	114400	
45	Riga	114500	
46	Riga	114600	
47	Riga	114700	
48	Riga	114800	
49	Riga	114900	
50	Riga	115000	
51	Riga	115100	
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61	Riga	116100	
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83	Riga	121800	
84	Riga	121900	
85	Riga	122000	
86	Riga	122100	
87	Riga	122200	
88	Riga	122300	
89	Riga	122400	

90	Riga	122500	
91	Riga	122600	
92	Riga	122700	
93	Riga	122800	
94	Riga	122900	
95	Riga	123000	
96	Riga	123100	
97	Riga	123200	
98	Riga	123300	
99	Riga	123400	
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101	Riga	123600	
102	Riga	123700	
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122	Riga	125700	
123	Riga	125800	
124	Riga	125900	
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441	Riga	262600	
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444	Riga	262900	
445	Riga	263000	
446	Riga	263200	
447	Riga	263300	
448	Riga	263400	
449	Riga	263500	
450	Riga	280400	
451	Riga	280700	Ķekava
452	Riga	290900	Bauska
453	RR	300100	Jūrmala, Majori
454	RR	300200	Jūrmala, Kauguri
455	RR	300300	Tukums
456	RR	300400	Slampe
457	RR	300500	Ķesterciems

458	RR	300600	Piņķi
459	RR	300800	Olaine
460	RR	300900	Celmraugciems
461	RR	301000	Jelgāva
462	RR	301100	Cena
463	RR	301200	Lapas
464	RR	301300	Iecava
465	RR	301400	Baldone
466	RR	301600	Ķegums
467	RR	301700	Vecumnieki
468	RR	320130	Saulkrasti
469	RR	320230	Sēja
470	RR	320330	Ragana
471	RR	320430	Sigulda
472	RR	320530	Gauja
473	RR	320630	Garciems
474	RR	320730	Kadaga
475	RR	320830	Vangaži
476	RR	320930	Kalngale
477	RR	321030	Adaži
478	RR	321130	Garkalne
479	RR	321230	Baltezers
480	RR	321330	Bukulti
481	RR	340130	Inčukalns
482	RR	340230	Allaži
483	RR	340330	More
484	RR	340430	Mālpils
485	RR	340530	Langstini
486	RR	340630	Berģi
487	RR	340730	Upesciems
488	RR	340830	Gaidas
489	RR	340930	Ropaži
490	RR	360130	Dreiliņi
491	RR	360230	Vālodzes
492	RR	360330	Saulrieši
493	RR	360430	Kākciems
494	RR	360530	Salaspils
495	RR	360630	Ikšķele
496	RR	360730	Tīnuži
497	RR	360830	Ogre
498	RR	460130	Jaunmārupe
499	RR	460230	Tīraine
500	RR	460730	Doles sala
501	RR	460930	Jaunolaine
502	Latvija	500100	Ventspils
503	Latvija/ES	500200	Panevežes

504	Latvija/ES	500300	Šauļi
505	Latvija	500400	Saldus
506	Latvija	500500	Liepāja
507	Latvija	500600	Kuldīga
508	Latvija	500700	Talsi
509	Latvija	500800	Aizkraukle
510	Latvija	500900	Jēkabpils
511	Latvija	501000	Koknese
512	Latvija	501100	Ergļi
513	Latvija	501200	Gulbene
514	Latvija	501300	Smiltene
515	Latvija	501400	Valmiera
516	Latvija	501500	Limbāži

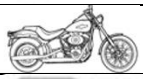
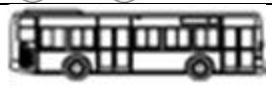
Annex 2

Example of train schedule

Rīga	Jelgava	Vilciena Nr.	Maršruts	Ceļā	Biļetes cena ar atlaidi
05:24	06:08	6701	Rīga - Jelgava	44 min	1.89 €
06:05	06:51	6703	Rīga - Jelgava	46 min	1.89 €
07:02	07:47	6709	Rīga - Jelgava	45 min	1.89 €
07:49	08:34	6711	Rīga - Jelgava	45 min	1.89 €
08:30	09:14	6713	Rīga - Jelgava	44 min	1.89 €
09:40	10:25	6715	Rīga - Jelgava	45 min	1.89 €
11:01	11:45	6717	Rīga - Jelgava	44 min	1.89 €

Annex 3

Types of vehicles

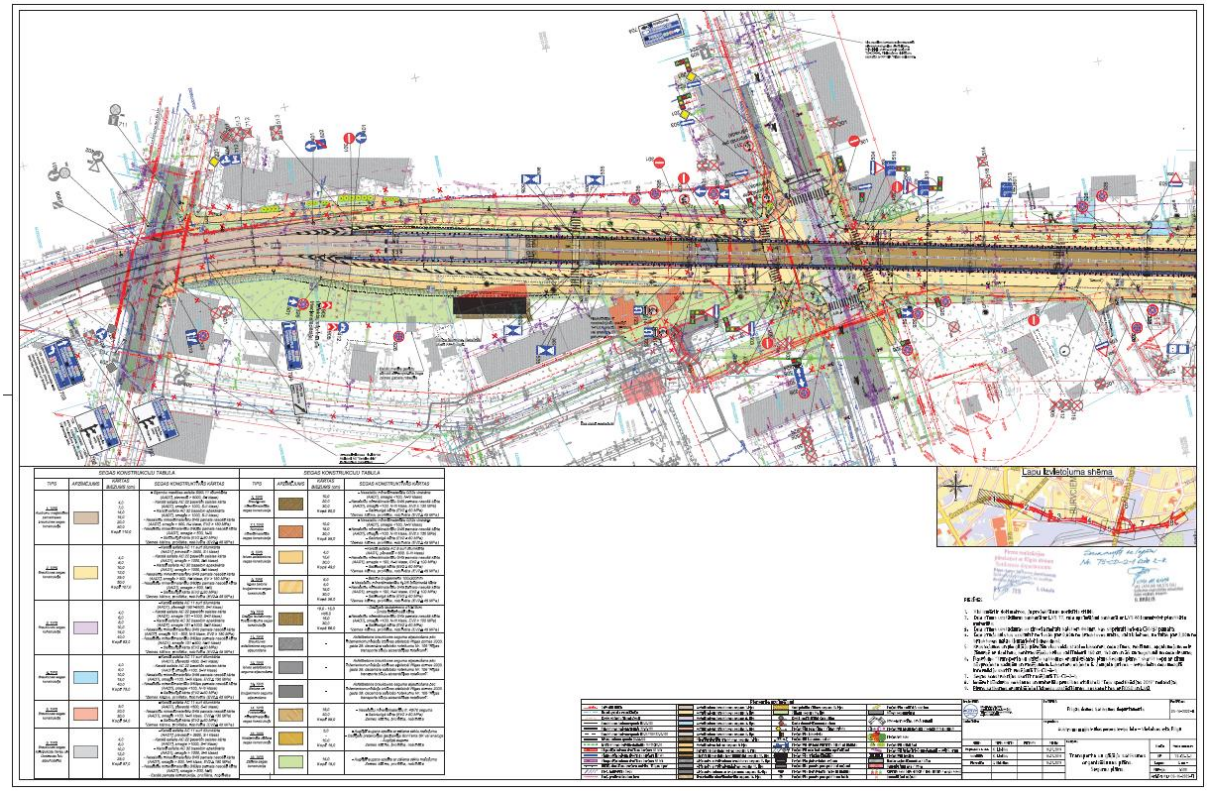
Graphical representation	Code	Description
	V	Passenger vehicles
	C1	Light cargo vehicles
	C2	Mid cargo vehicles
	C3	Cargo vehicles
	C4	Cargo vehicles with trailer
	M	Motorbikes
	S	Buses

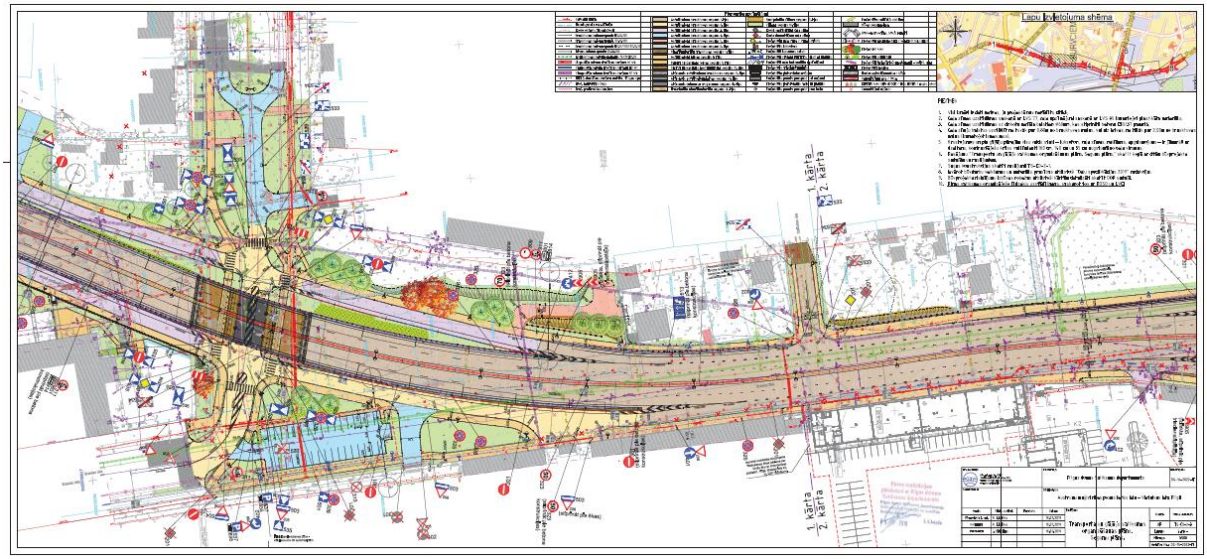
Annex 4

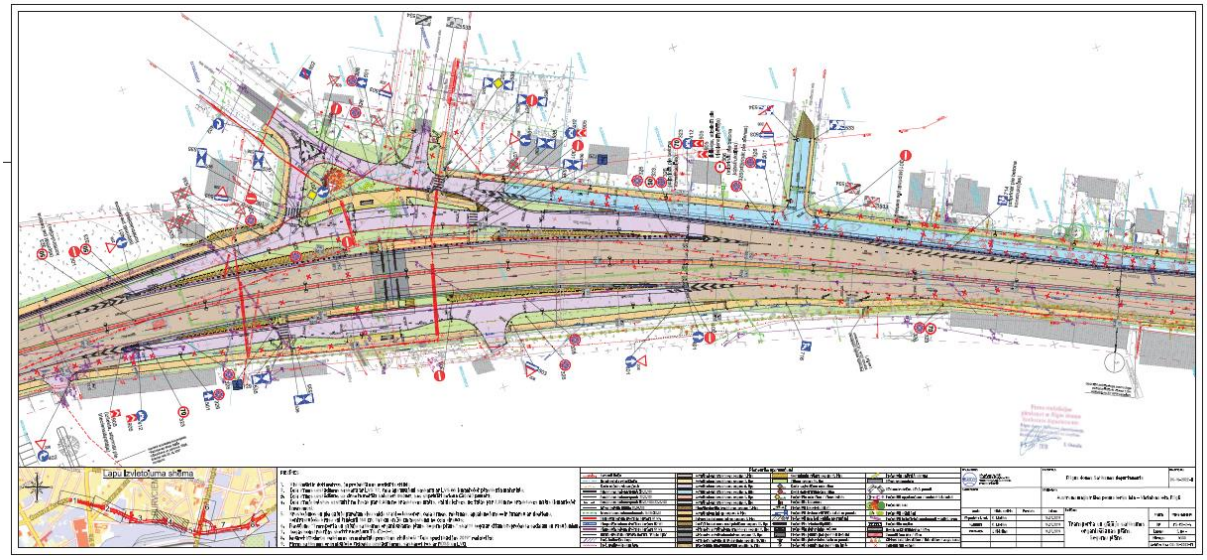
Skultess overpass (Skultes pārvads) data

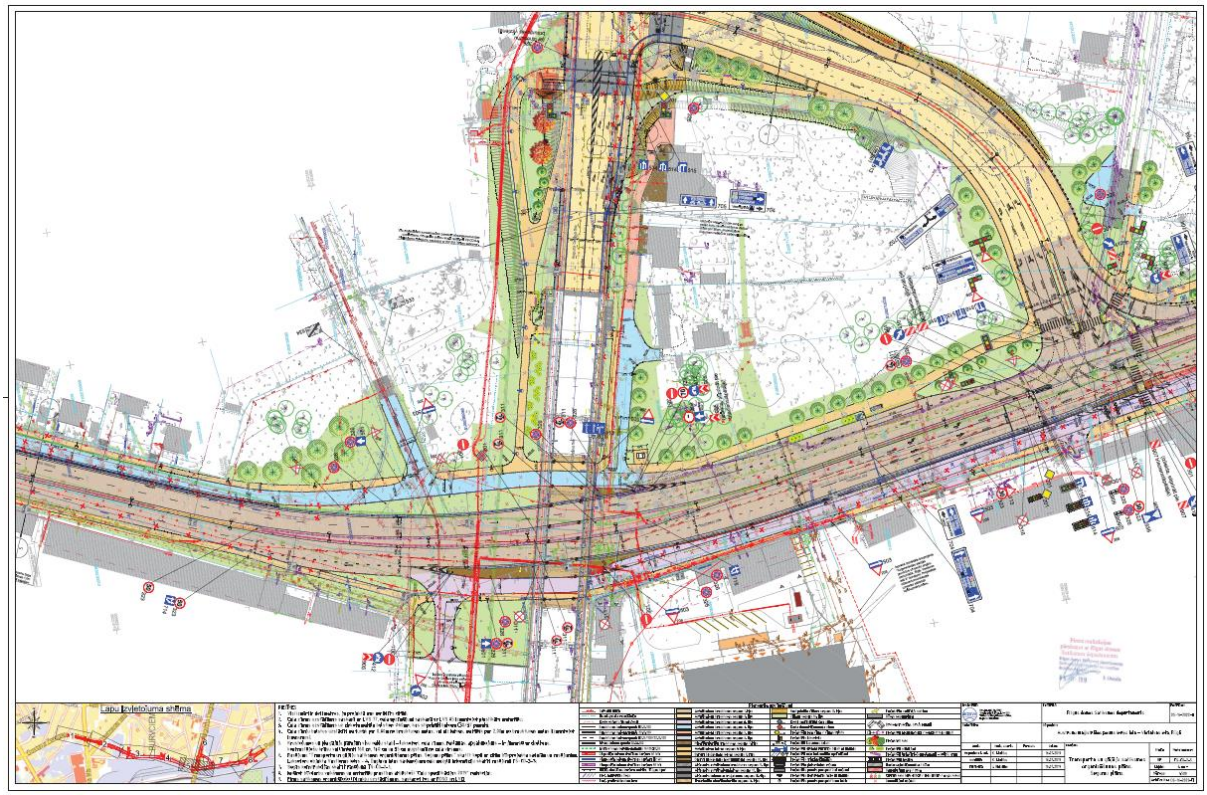
Annex 5

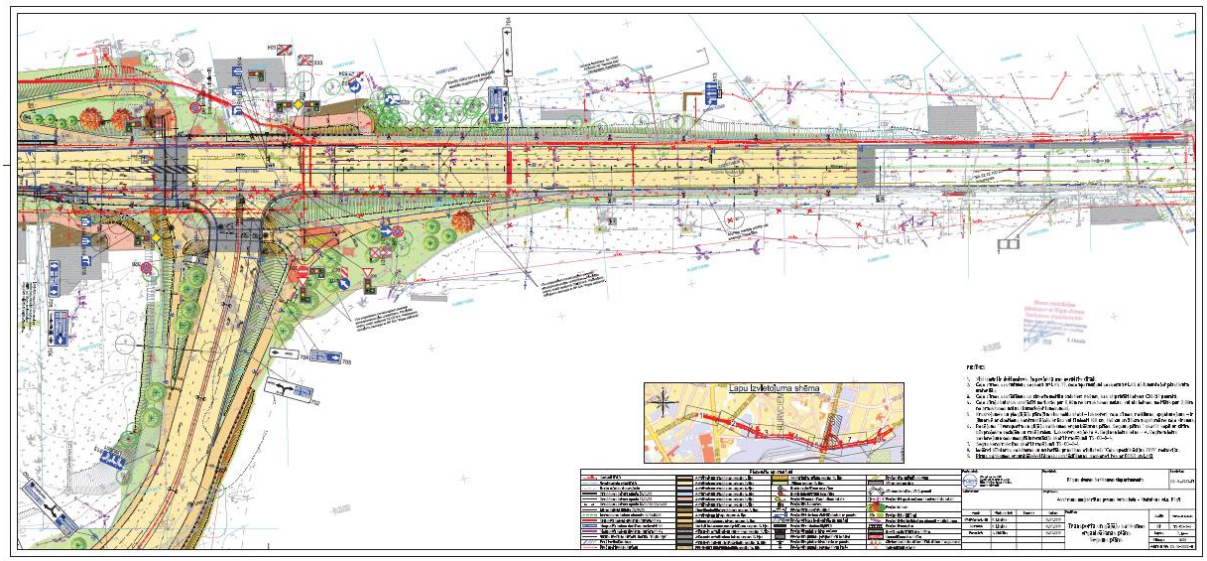
East highway (Austrumu maģistrale) data

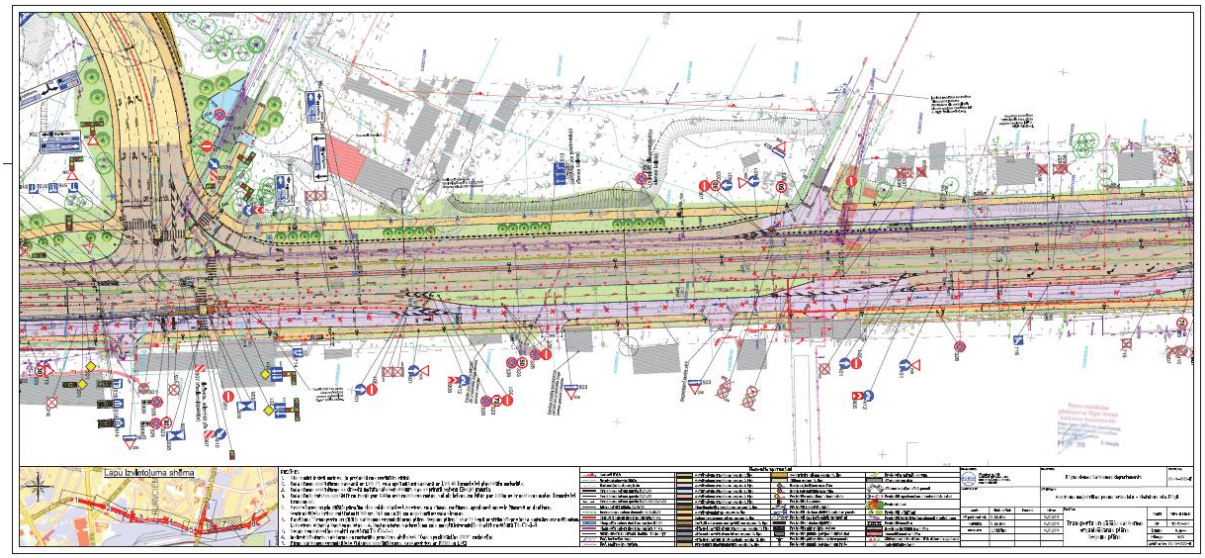


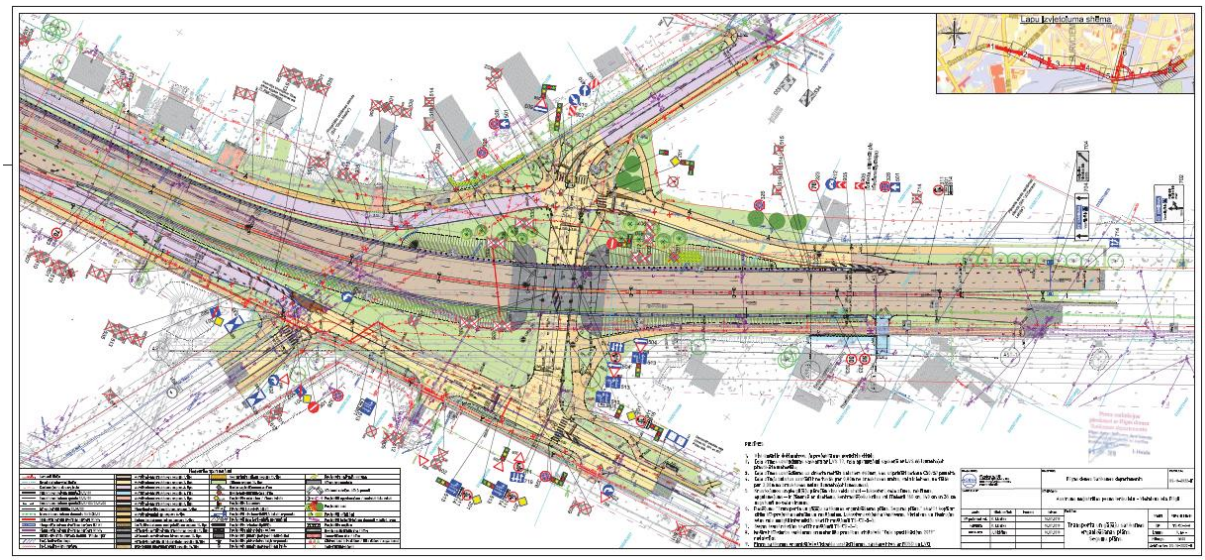

Lapu izvietojuma shēma
1. karta
2. karta


Lapu izvietojuma shēma



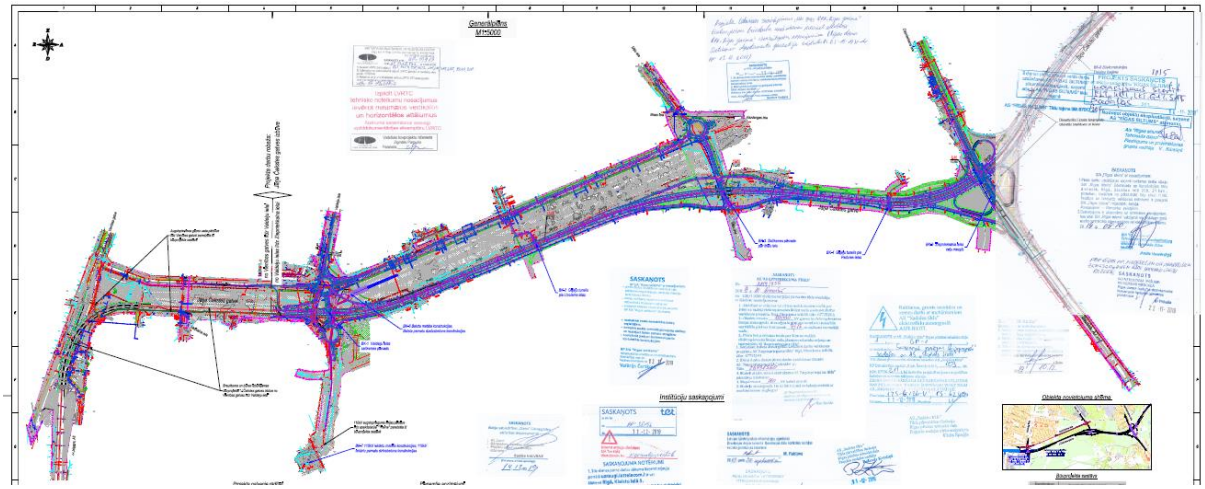


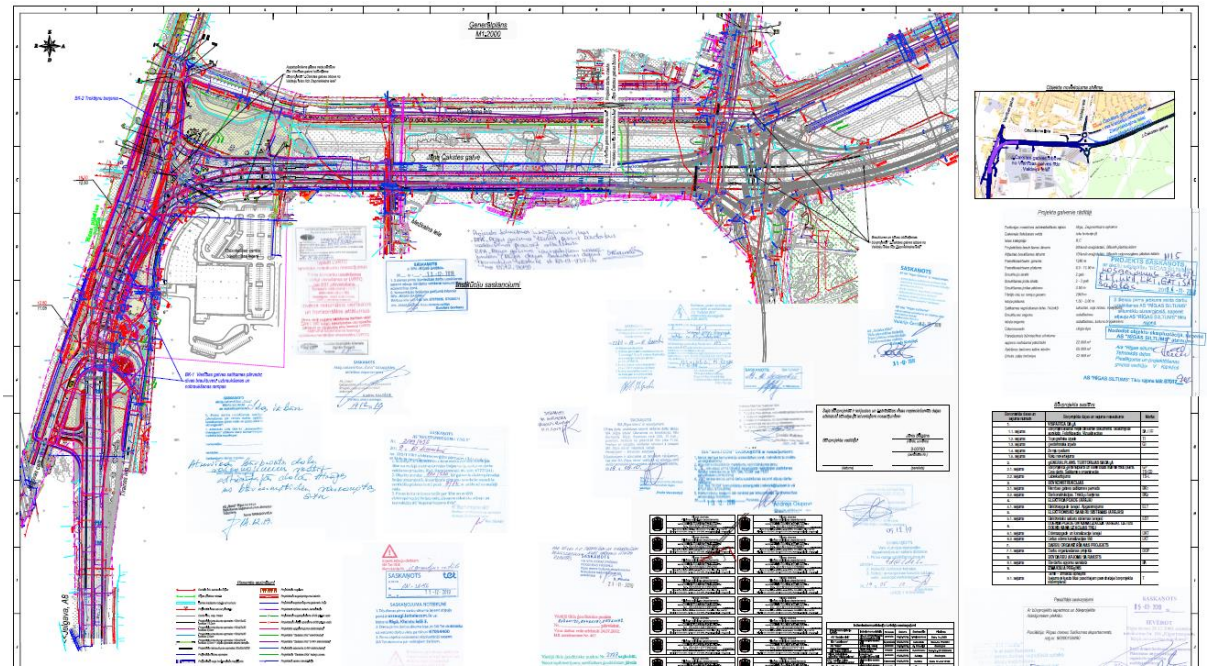




Annex 6

South bridge all stages (Dienvidu tilts)





Annex 7

Number of pupils in schools in Riga (Ministry of Education and Science, 2019)

School title	Number of pupils
Rīgas Klasiskā ģimnāzija	2010
Rīgas Juglas vidusskola	1597
Rīgas Zolitūdes ģimnāzija	1451
Rīgas 64. vidusskola	1404
Rīgas Purvciema vidusskola	1374
Rīgas 88. vidusskola	1323
Rīgas 72. vidusskola	1276
Rīgas 84. vidusskola	1202
Rīgas 34. vidusskola	1201
Rīgas Teikas vidusskola	1132
Rīgas Franču licejs	1116
Rīgas Centra humanitārā vidusskola	1110
Rīgas Angļu ģimnāzija	1068
Rīgas 6. vidusskola	1057
Rīgas 95. vidusskola	1054
Rīgas Valsts 1. ģimnāzija	1032
Rīgas Hanzas vidusskola	1023
Rīgas Ziepniekkalna vidusskola	1019
Rīgas 40. vidusskola	1007
Rīgas Ostvalda vidusskola	1002
Ziemeļvalstu ģimnāzija	978
Rīgas 71. vidusskola	896
Rīgas Imantas vidusskola	894
Rīgas 96. vidusskola	881
Rīgas Natālijas Draudziņas vidusskola	878
Rīgas 49. vidusskola	874
Rīgas 10. vidusskola	846
Rīgas Anniņmuižas vidusskola	844
Rīgas Valsts 2. ģimnāzija	816
Rīgas 92. vidusskola	810
Āgenskalna Valsts ģimnāzija	807
Rīgas Kultūru vidusskola	801
Rīgas 25. vidusskola	790
Rīgas Rīnūžu vidusskola	786
Rīgas 41. vidusskola	783
Rīgas Reinholda Šmēlinga vidusskola	776
Rīgas 33. vidusskola	770
Rīgas Valsts 3. ģimnāzija	765
Rīgas Pļavnieku pamatskola	749
Rīgas 45. vidusskola	745
Rīgas 80. vidusskola	734
Mežciema pamatskola	718
Rīgas 89. vidusskola	714
Rīgas 86. vidusskola	710
Rīgas 13. vidusskola	707
Rīgas Ķengaraga vidusskola	669

J.G.Herdera Rīgas Grīziņkalna vidusskola	666
Puškina licejs	659
Rīgas 74. vidusskola	657
Andreja Pumpura Rīgas 11. pamatskola	655
Rīgas Valsts vācu ģimnāzija	653
Rīgas 51. vidusskola	651
Rīgas 63. vidusskola	650
Rīgas 1. vidusskola	632
Rīgas 22. vidusskola	624
Iļģuciema vidusskola	571
Tālmācības vidusskola "Rīgas Komercskola"	551
O.Kalpaka Rīgas Tautas daiļamatu pamatskola	545
Rīgas 75. vidusskola	538
Rīgas 93. vidusskola	534
Rīgas 21. vidusskola	527
Āgenskalna sākumskola	526
Pamatskola "Rīdze"	520
Rīgas 18. vidusskola	518
Rīgas Valda Zālīša sākumskola	507
Rīgas 46. vidusskola	506
Rīgas 31. vidusskola	496
Rīgas 47. vidusskola	493
Rīgas 85. vidusskola	484
Profesionālās izglītības kompetences centrs "Nacionālā Mākslu vidusskola"	481
Rīgas Pārdaugavas pamatskola	475
Rīgas Daugavgrīvas vidusskola	471
Rīgas Austrumu vidusskola	448
Rīgas 15. vidusskola	442
Rīgas Lietuviešu vidusskola	435
Rīgas 53. vidusskola	419
Rīgas Valdorfskola	409
Rīgas 54. vidusskola	376
Friča Brīvzemnieka pamatskola	365
Š. Dubnova Rīgas Ebreju vidusskola	363
Rīgas 69. vidusskola	353
Rīgas Centra daiļamatniecības pamatskola	349
Rīgas 9. vidusskola	335
Rīgas Sergeja Žoltoka vidusskola	330
Rīgas Daugavas pamatskola	326
Rīgas 65. vidusskola	323
Rīgas Jāņa Poruka vidusskola	304
Rīgas Itas Kozakēvičas Poļu vidusskola	303
Rīgas Mūzikas vidusskola	302
Rīgas 28. vidusskola	289
Rīgas 66. speciālā vidusskola	282
Rīgas 5. pamatskola-attīstības centrs	280
Rīgas 2. pamatskola	271
Rīgas Ukraiņu vidusskola	266
Rīgas Starptautiskā skola	250
Rīgas 61. vidusskola	250

Rīgas 19. vidusskola	237
Rīgas Raiņa vidusskola	224
Rīgas 14. vidusskola	223
Rīgas Valda Avotiņa pamatskola - attīstības centrs	220
Privātā vidusskola "Patnis"	216
Rīgas Igauņu pamatskola	216
Rīgas 1. Kristīgā pamatskola	202
Informācijas sistēmu menedžmenta augstskolas vidusskola "PREMJERS"	200
Rīgas Katoļu ģimnāzija	192
Rīgas sākumskola "Valodiņa"	189
ŽILA VERNA RĪGAS FRANČU SKOLA	187
Privātskola "Latreia"	185
Rīgas 1. pamatskola-attīstības centrs	184
Privātā sākumskola "DOMDARIS"	172
Rīgas Avotu pamatskola	169
Rīgas 4. pamatskola	159
Rīgas Čiekurkalna pamatskola	155
Jankas Kupalas Rīgas Baltkrievu pamatskola	150
Privātā vidusskola "Klasika"	131
Rīgas Lastādijas pamatskola	130
Rīgas 7. pamatskola	128
Rīgas 3. speciālā pamatskola	125
Rīgas Strazdumuižas vidusskola-attīstības centrs	117
Privātā vidusskola "Laisma"	107
Rīgas 1. Privātā tālmācības vidusskola	93
Rīgas Ēbelmuižas pamatskola	77
Privātā pamatskola "Maksima"	75
Rīgas pilsētas sākumskola	75
RTU inženierzinātņu vidusskola	72
Privātā vidusskola "INNOVA"	60
Privātā vidusskola "Templum"	58
Privātā vidusskola "RIMS"	53
Torņakalna Privātā vidusskola	50
Privātā vidusskola "Citruss"	49
Privātā sākumskola "Namiņš"	47
Privātā Rīgas Tehnolingvistiskā ģimnāzija	46
Privātā Montesori sākumskola "Pētnieki"	43
Pārdaugavas Montesori pamatskola	43
Pārdaugavas Valdorfa pamatskola	42
Rīgas vispārizglītojošā privātā vidusskola "Evrika"	40
Privātā sākumskola "Rīgas Vācu skola"	30
Privātā vispārējā izglītības iestāde "Mīlestības Māja"	30
Habad Ebreju privātā vidusskola	29
Rīgas Kristīgā pamatskola	28
Rīgas ģimnāzija "Maksima"	25
Privātā vidusskola "Norma"	22
Rīgas Montessori sākumskola	15
Sākumskola "Lielie stāsti"	5
Kristīgā sākumskola "Ceļš"	5

Annex 8

Number of students in HEI (Ministry of Education and Science, 2019)

Nr.p.k.	Augst-skola	Studējošo skaits kopā	No tiem par maksu	Tajā skaitā				No kopskaita nepilna laika studijas (%)	Studējošo kopskaita izmaiņas pret 2017./18 (%)
				Pilna laika studijas		Nepilna laika studijas			
				Valsts budžets	Studiju maksa	Valsts budžets	Studiju maksa		
I Valsts augstskolas									
1	RTU	**14322**	5729	8593	2816	0	2913	20%	-2%
2	LU	**16714**	9220	7494	4223	0	4997	30%	-2%
T.sk.	LU	**15200**	8841	6359	3844	0	4997	33%	-2%
	LU SMK	**962**	212	750	212	0	0	0%	0%
	LU RMK	**552**	167	385	167	0	0	0%	-7%
3	RSU	**9462**	5510	3952	4276	0	1234	13%	5%
T.sk.	RSU	**8766**	5353	3413	4119	0	1234	14%	4%
	RSU SKMK	**696**	234	539	157	0	0	0%	16%
4	LLU	**3880**	1445	2434	452	1	993	26%	-7%
5	DU	**2514**	493	2021	212	0	281	11%	–
T.sk.	DU	**2302**	493	1809	212	0	281	12%	-3%
	DU DMK	**212**	0	212	0	0	0	0%	0%
6	RTA	**1753**	452	1253	228	48	224	16%	-7%
7	BA	**1398**	1335	63	1108	0	227	16%	-10%
T.sk.	BA	**1367**	1315	52	1105	0	210	15%	-8%
	BA UK	**31**	20	11	3	0	17	55%	-46%
8	LSPA	**1365**	897	468	428	0	469	34%	-2%
9	LiepU	**1373**	533	840	231	0	302	22%	1%
10	VeA	**794**	190	604	190	0	0	0%	-3%
11	LJA	**731**	476	255	188	0	288	39%	-3%
12	LMāA	**862**	0	862	0	0	0	0%	3%
13	ViA	**742**	166	576	149	0	17	2%	-3%
14	LKuA	**944**	469	475	423	0	46	5%	-3%
T.sk.	LKuA	**600**	260	340	260	0	0	0%	8%
	LKuA LKK	**344**	209	135	163	0	46	13%	-18%
15	JVLMA	**575**	55	520	55	0	0	0%	-5%
16	LNAA	**224**	0	224	0	0	0	0%	1%
II Juridisko personu dibinātās augstskolas									
1	BAT	**3518**	3496	22	1983	0	1513	43%	-4%
2	TSI	**2886**	2886	0	1489	0	1397	48%	5%
3	RISEBA	**2627**	2627	0	1397	0	1230	47%	-2%
4	BSA	**2172**	2172	0	1278	0	894	41%	-11%
5	ISMA	**1588**	1588	0	1348	0	240	15%	17%
6	EKA	**1101**	1101	0	444	0	657	60%	-2%
7	REA	**454**	454	0	454	0	0	0%	-3%
8	RJA	**352**	352	0	348	0	4	1%	-11%
9	RAI	**360**	360	0	145	0	215	60%	1%
10	LKrA	**128**	128	0	48	0	80	63%	19%
11	RARZI	**69**	69	0	0	0	69	100%	3%
12	LA	**29**	29	0	29	0	0	0%	-24%
13	RTI	**6**	6	0	6	0	0	0%	-33%

Annex 9

Forecast of population (Riga Council Development Department)

Zone	Region	2014	2015	2016	2019	2020	Population 2030
2432	Āgenskalns	1036	1039	1013	972	964	958
2434	Āgenskalns	2381	2363	2352	2342	2322	2,343
2436	Āgenskalns	2498	2458	2494	2341	2312	2,326
2437	Āgenskalns	683	684	685	821	783	779
2456	Āgenskalns	1190	1157	1187	1118	1073	1,067
2457	Āgenskalns	1268	1261	1259	1248	1205	1,198
2458	Āgenskalns	3035	2932	3046	3072	2966	3,469
2460	Āgenskalns	1941	1827	1808	1787	1790	1,824
2461	Āgenskalns	1735	1691	1642	1633	1642	1,705
2462	Āgenskalns	1207	1176	1159	1137	1117	1,130
2463	Āgenskalns	1360	1307	1274	1275	1268	1,261
2464	Āgenskalns	1506	1440	1454	1421	1373	1,391
2465	Āgenskalns	1741	1706	1677	1725	1677	1,667
2466	Āgenskalns	567	577	587	602	558	555
2467	Āgenskalns	1500	1447	1447	1394	1321	1,343
2468	Āgenskalns	9	9	8	6	5	5
2469	Āgenskalns	1915	1870	1937	2041	2024	2,012
2614	Atgāzene	786	759	897	1093	1143	1,163
2607	Atgāzene	1030	1037	1036	929	920	935
1144	Avoti	1490	1529	1537	1445	1485	1,482
1145	Avoti	1001	934	1030	1214	1277	1,274
1146	Avoti	812	759	795	733	762	760
1147	Avoti	614	542	568	881	847	845
1148	Avoti	1020	1001	996	1046	1034	1,032
1149	Avoti	1232	1167	1199	1257	1243	1,240
1150	Avoti	1840	1777	1800	1962	1994	1,989
1151	Avoti	1350	1318	1433	1591	1584	1,580
1152	Avoti	969	960	987	1012	973	971
1153	Avoti	1482	1469	1534	1769	1729	1,725
1154	Avoti	1292	1293	1348	1477	1450	1,447
1155	Avoti	1714	1715	1681	1707	1752	1,748
1157	Avoti	1813	1779	1820	1798	1831	1,827
1158	Avoti	1970	1906	1966	1976	1937	1,957
1159	Avoti	1680	1666	1732	1687	1660	1,656
2438	Beberbeķi	552	572	581	532	591	626
1420	Berģi	2958	2933	3033	3153	3205	3,387
2601	Bieriņi	1872	1880	1896	1818	1869	1,798
2602	Bieriņi	1300	1310	1340	1371	1380	1,309
2603	Bieriņi	2529	2526	2557	2536	2510	2,380
2604	Bieriņi	2779	2769	2747	2653	2629	2,521
2208	Bolderāja	2280	2285	2226	2156	2112	1,844
2209	Bolderāja	1785	1759	1704	1641	1636	1,428

2210	Bolderāja	493	438	432	444	426	372
2211	Bolderāja	1201	1212	1216	1174	1165	1,017
2212	Bolderāja	1224	1239	1231	1166	1143	998
2213	Bolderāja	7147	7025	6900	6652	6603	5,765
2214	Bolderāja	3	30	34	1	1	1
1116	Brasa	1972	1973	2007	2015	2031	1,868
1117	Brasa	1831	1732	1780	1794	1837	1,774
1118	Brasa	1331	1316	1324	1547	1596	1,468
1249	Brasa	172	170	163	150	142	131
1250	Brasa	1324	1322	1302	1410	1412	1,298
1251	Brasa	1217	1181	1266	1334	1340	1,232
1252	Brasa	1816	1668	1708	1878	1859	1,819
1253	Brasa	1543	1558	1573	1560	1561	1,435
1254	Brasa	1327	1296	1327	1354	1325	1,218
1255	Brasa	923	917	908	900	915	841
1257	Brasa	284	337	393	245	249	229
1443	Brekši	1687	1678	1649	1722	1744	1,872
1237	Bukulti	1011	994	1002	1112	1177	1,226
2201	Buļļi	284	297	296	304	327	450
1101	Centrs	821	850	919	932	946	863
1102	Centrs	538	501	531	576	555	506
1103	Centrs	1781	1791	1863	1744	1789	1,633
1104	Centrs	963	951	991	1045	1004	916
1105	Centrs	878	844	898	902	946	863
1106	Centrs	489	436	461	534	548	500
1107	Centrs	1266	1288	1308	1264	1175	1,072
1108	Centrs	867	853	900	984	960	876
1109	Centrs	1215	1203	1225	1346	1466	1,377
1110	Centrs	482	514	540	481	605	552
1111	Centrs	1077	1062	1064	1011	1071	1,042
1112	Centrs	751	733	757	881	878	801
1113	Centrs	1196	1152	1222	1259	1301	1,187
1114	Centrs	2655	2645	2704	2586	2611	2,473
1115	Centrs	1142	1118	1149	1230	1227	1,120
1119	Centrs	904	870	874	823	818	746
1122	Centrs	300	302	307	273	242	221
1123	Centrs	1078	1098	1104	1143	1118	1,020
1124	Centrs	1063	968	1014	1072	1242	1,133
1125	Centrs	459	433	394	533	556	507
1126	Centrs	948	916	863	907	915	835
1127	Centrs	1140	1152	1173	1150	1141	1,107
1128	Centrs	1422	1401	1461	1476	1459	1,331
1129	Centrs	946	944	974	1062	1080	986
1130	Centrs	1033	921	1019	1116	1104	1,008
1131	Centrs	1489	1459	1532	1690	1631	1,488
1132	Centrs	527	525	532	587	634	579

1133	Centrs	515	493	487	492	481	439
1134	Centrs	1053	954	971	1041	1018	1,061
1135	Centrs	1363	1339	1362	1380	1423	1,312
1136	Centrs	1612	1560	1547	1568	1569	1,592
1137	Centrs	874	837	851	934	920	840
1164	Centrs	193	218	223	225	245	224
1256	Centrs	2663	2629	2773	2927	3039	2,773
1258	Čiekurkalns	1240	1222	1235	1389	1415	1,419
1259	Čiekurkalns	2379	2345	2367	2248	2253	2,192
1260	Čiekurkalns	2276	2266	2391	2581	2635	2,563
1261	Čiekurkalns	109	112	113	111	106	103
1263	Čiekurkalns	1665	1695	1768	1747	1754	1,706
1264	Čiekurkalns	3	5	4	43	42	41
1610	Dārzciems	233	218	211	208	205	193
1611	Dārzciems	3360	3288	3259	3290	3296	3,107
1612	Dārzciems	1854	1857	1880	1910	1891	1,801
1613	Dārzciems	1916	1873	1840	1873	1853	1,851
1614	Dārzciems	885	906	913	853	880	855
1615	Dārzciems	3290	3171	3144	3038	2999	2,827
1616	Dārzciems	494	497	501	499	511	482
1617	Dārzciems	2879	2820	2773	2704	2648	2,496
1618	Dārzciems	2744	2730	2753	2719	2719	2,563
1619	Dārzciems	826	789	800	783	757	714
1620	Dārzciems	1232	1183	1162	1269	1250	1,238
1681	Dārziņi	205	192	210	220	227	245
1682	Dārziņi	2713	2798	3053	3714	3922	5,320
2202	Daugavgrīva	2017	1969	1978	1902	1915	1,634
2203	Daugavgrīva	2677	2607	2360	2326	2324	1,997
2204	Daugavgrīva	2892	2831	2817	2684	2636	2,249
2205	Daugavgrīva	1410	1378	1607	1568	1561	1,332
2206	Daugavgrīva	113	98	90	89	79	67
1428	Dreiliņi	15	18	16	18	17	18
1476	Dreiliņi	4747	4836	4986	7329	7411	7,398
2237	Dzirciems	2253	2264	2310	2279	2254	2,241
2238	Dzirciems	3803	3786	3833	3985	3962	3,940
2239	Dzirciems	763	756	749	1005	1007	1,040
2240	Dzirciems	949	942	935	900	902	897
2241	Dzirciems	628	628	608	661	633	629
2242	Dzirciems	2368	2352	2383	2371	2400	2,553
1138	Grīziņkalns	2362	2355	2491	2606	2649	2,503
1139	Grīziņkalns	794	750	762	745	864	804
1140	Grīziņkalns	962	971	1008	1039	1074	1,235
1156	Grīziņkalns	1012	976	967	1045	1052	979
1160	Grīziņkalns	1148	1061	1077	1026	1085	1,010
1161	Grīziņkalns	2682	2593	2540	2494	2411	2,244
1162	Grīziņkalns	1992	1957	1978	1898	1896	1,765

1163	Grīziņkalns	1834	1785	1823	1750	1747	1,688
2222	Iļģuciems	1855	1932	1903	1735	1714	1,464
2223	Iļģuciems	2785	1793	1798	2553	2527	2,159
2224	Iļģuciems	1806	1945	1925	1850	1833	1,566
2225	Iļģuciems	1369	1367	1367	1216	1183	1,011
2226	Iļģuciems	3112	3182	3146	2834	2776	2,371
2227	Iļģuciems	960	1019	1023	950	956	817
2228	Iļģuciems	485	508	503	461	457	390
2230	Iļģuciems	2181	2330	2352	2199	2227	1,902
2231	Iļģuciems	1925	2059	2082	1950	1977	1,689
2232	Iļģuciems	1484	1559	1549	1424	1419	1,218
2233	Iļģuciems	1984	1973	1959	1965	1964	1,678
2234	Iļģuciems	605	586	588	614	564	503
2235	Iļģuciems	2550	2462	2470	2402	2336	1,996
2236	Iļģuciems	2028	1990	2014	1777	1722	1,471
2401	Imanta	888	914	949	1013	1035	954
2402	Imanta	727	731	717	687	680	626
2403	Imanta	1539	1517	1504	1427	1406	1,295
2404	Imanta	2264	2189	2222	2098	2071	1,908
2405	Imanta	1649	1614	1622	1538	1520	1,400
2406	Imanta	2545	2538	2609	2524	2545	2,345
2407	Imanta	1994	1959	1931	1859	1848	1,703
2408	Imanta	2342	2083	2044	2145	2093	1,928
2409	Imanta	1805	1970	1945	1963	2020	1,861
2410	Imanta	2593	2594	2572	2465	2446	2,253
2411	Imanta	1857	1845	1926	1867	1892	2,074
2412	Imanta	2125	2063	2093	1981	1959	1,805
2413	Imanta	1529	1447	1452	1812	1780	1,640
2414	Imanta	2494	2435	2413	2400	2400	2,211
2415	Imanta	1567	1553	1579	1516	1517	1,398
2416	Imanta	1242	1204	1197	1125	1100	1,013
2417	Imanta	1153	1139	1124	1067	1050	967
2418	Imanta	1449	1417	1419	1344	1326	1,222
2419	Imanta	2416	2672	2688	2554	2527	2,328
2420	Imanta	2683	2702	2632	2547	2535	2,335
2421	Imanta	2377	2357	2294	2216	2189	2,017
2422	Imanta	1502	1481	1473	1462	1460	1,345
2423	Imanta	1298	1302	1314	1322	1336	1,501
2424	Imanta	798	782	763	728	707	651
2425	Imanta	2428	2432	2389	2318	2273	2,094
2426	Imanta	188	192	187	185	202	186
2427	Imanta	481	528	546	871	1025	944
2428	Imanta	817	1106	1123	1097	1110	1,023
1222	Jaunciems	2529	2512	2514	2479	2502	2,366
1262	Jugla	1164	1151	1150	1148	1157	1,040
1412	Jugla	2626	2582	2623	2557	2540	2,284

1413	Jugla	2228	2230	2302	2354	2348	2,111
1414	Jugla	1910	1885	1890	1847	1820	1,637
1415	Jugla	2003	1991	1985	1945	1918	1,725
1416	Jugla	3577	3573	3630	3609	3485	3,292
1417	Jugla	2255	2257	2303	2340	2334	2,099
1418	Jugla	2055	2070	2102	2076	2043	1,837
1419	Jugla	1808	1784	1790	1770	1755	1,578
1438	Jugla	132	123	118	127	131	118
1439	Jugla	526	508	511	520	521	469
1440	Jugla	4394	4382	4381	4265	4219	3,794
1441	Jugla	770	762	765	757	764	687
1442	Jugla	503	658	819	966	960	863
2627	Katlakalns	1151	1174	1286	1285	1284	1,285
2628	Katlakalns	1354	1322	1249	1580	1668	1,930
1651	Ķengarags	189	146	146	72	68	235
1652	Ķengarags	2450	2405	2393	2338	2294	2,080
1653	Ķengarags	3090	3061	3036	2790	2745	2,489
1654	Ķengarags	2973	2914	2901	2945	2870	2,602
1655	Ķengarags	1153	1161	1154	1081	1071	971
1656	Ķengarags	2031	1999	1990	1952	1929	1,749
1657	Ķengarags	943	932	928	877	880	798
1658	Ķengarags	905	904	901	881	906	821
1659	Ķengarags	2035	2010	2012	1966	1957	1,774
1660	Ķengarags	1983	1914	1921	1865	1804	1,635
1661	Ķengarags	2280	2295	2280	2341	2302	2,087
1662	Ķengarags	1934	1954	1988	2029	2089	1,894
1663	Ķengarags	2572	2464	2457	2400	2358	2,138
1664	Ķengarags	1518	1489	1528	1510	1516	1,374
1665	Ķengarags	304	296	289	280	273	247
1666	Ķengarags	1585	1554	1552	1520	1506	1,365
1667	Ķengarags	1247	1224	1191	1157	1132	1,026
1668	Ķengarags	1567	1542	1527	1495	1478	1,340
1669	Ķengarags	730	708	731	715	707	641
1670	Ķengarags	1209	1137	1095	1028	977	886
1672	Ķengarags	1807	1779	1855	1807	1788	1,621
1673	Ķengarags	1635	1588	1618	1585	1579	1,432
1674	Ķengarags	2005	1931	1907	1823	1822	1,652
1675	Ķengarags	933	920	921	937	907	822
1676	Ķengarags	2472	2458	2446	2393	2355	2,135
1677	Ķengarags	1424	1400	1421	1431	1403	1,272
1678	Ķengarags	4247	4211	4197	4084	4056	3,677
1679	Ķengarags	3928	3870	3859	3703	3622	3,284
2243	Ķīpsala	1109	1191	1287	1262	1275	1,220
2207	Kleisti	21	21	15	55	59	55
2216	Kleisti	17	30	41	24	65	60
2218	Kleisti	235	267	294	341	330	295

2219	Kleisti	836	809	810	823	832	809
1219	Kundziņsala	402	399	382	372	374	290
1201	Mangaļsala	1538	1499	1484	1394	1385	958
1141	Maskavas forštate	783	789	812	788	789	692
1142	Maskavas forštate	1042	1011	1034	1149	1189	1,043
1143	Maskavas forštate	1622	1558	1607	1620	1676	1,570
1601	Maskavas forštate	2750	2647	2614	2620	2632	2,309
1602	Maskavas forštate	1587	1473	1453	1448	1473	1,308
1603	Maskavas forštate	1779	1746	1799	1543	1523	1,336
1604	Maskavas forštate	594	567	557	677	683	599
1605	Maskavas forštate	1126	1107	1088	985	965	958
1607	Maskavas forštate	1073	1046	1105	1130	1124	1,290
1608	Maskavas forštate	3100	3016	3013	3161	3073	2,696
1609	Maskavas forštate	3689	3156	3302	3397	3453	3,038
1643	Maskavas forštate	1	1	1	1	0	0
1644	Maskavas forštate	118	124	127	121	118	502
1645	Maskavas forštate	2181	2101	2083	2045	2034	1,784
1646	Maskavas forštate	1564	1550	1540	1439	1416	1,242
1647	Maskavas forštate	3466	3137	3118	2694	2581	2,264
1648	Maskavas forštate	2491	2464	2441	2350	2309	2,026
1223	Mežaparks	39	40	41	42	48	46
1233	Mežaparks	5	5	6	9	9	9
1234	Mežaparks	1398	1343	1383	1385	1309	1,414
1235	Mežaparks	883	839	865	891	907	1,041
1236	Mežaparks	2051	2027	2112	2118	2071	2,123
1429	Mežciems	2835	2834	2848	2884	2830	2,844
1430	Mežciems	1119	1107	1087	983	981	986
1431	Mežciems	1022	992	980	909	905	909
1432	Mežciems	602	558	560	638	696	699
1433	Mežciems	1754	1776	1771	1673	1676	1,684
1434	Mežciems	2065	2030	2018	1906	1910	1,919
1435	Mežciems	1565	1568	1597	1553	1525	1,532
1436	Mežciems	3240	3208	3175	3084	3027	3,042
1437	Mežciems	1057	1095	1142	1194	1181	1,187
1220	Mīlgrāvis	1178	1151	1180	1160	1143	1,130

1221	Mīlgrāvis	2949	2919	2909	3038	3049	3,120
2447	Mūkupurvs	787	810	889	1060	1085	1,120
1242	Pētersala-Andrejsala	27	23	23	22	22	20
1243	Pētersala-Andrejsala	2250	2211	2240	2294	2328	2,095
1244	Pētersala-Andrejsala	1923	1918	1918	1986	2024	2,117
1245	Pētersala-Andrejsala	1012	1031	1046	1185	1187	1,918
1621	Pļavnieki	1070	1063	1060	1029	995	917
1622	Pļavnieki	1219	1182	1180	1125	1093	1,007
1623	Pļavnieki	1963	1914	1906	1855	1839	1,694
1624	Pļavnieki	1755	1706	1693	1640	1601	1,475
1625	Pļavnieki	1996	2012	2032	1867	1801	1,659
1626	Pļavnieki	2856	2789	2786	2693	2663	2,453
1627	Pļavnieki	2710	2625	2647	2601	2586	2,382
1628	Pļavnieki	2444	2370	2394	2356	2346	2,161
1629	Pļavnieki	1872	1840	1828	1810	1759	1,620
1630	Pļavnieki	1701	1671	1870	2299	2342	2,157
1631	Pļavnieki	199	190	191	153	149	137
1632	Pļavnieki	4753	4727	4740	4770	4840	4,941
1634	Pļavnieki	2763	2723	2789	2787	2779	2,560
1635	Pļavnieki	2166	2144	2121	2176	2157	1,987
1636	Pļavnieki	2264	2217	2229	2014	1966	1,811
1637	Pļavnieki	2086	2010	2062	2049	1975	1,819
1638	Pļavnieki	2299	2251	2217	2274	2242	2,065
1639	Pļavnieki	3555	3510	3489	3488	3481	3,308
1640	Pļavnieki	1456	1426	1406	1341	1345	1,239
1641	Pļavnieki	1996	1971	1956	1915	1863	1,716
1642	Pļavnieki	2771	2752	2733	2544	2388	2,200
2451	Pleskodāle	2090	2064	2079	2123	2113	1,989
2452	Pleskodāle	2199	2160	2157	1859	1864	1,737
2455	Pleskodāle	1664	1734	1653	1576	1641	1,525
1444	Purvciems	1984	1974	2009	1893	1835	1,606
1445	Purvciems	1413	1408	1429	1479	1455	1,273
1446	Purvciems	1791	1744	1765	1759	1751	1,573
1447	Purvciems	1419	1391	1406	1404	1398	1,224
1448	Purvciems	771	785	778	820	839	734
1449	Purvciems	1586	1602	1614	1557	1563	1,368
1450	Purvciems	1796	1749	1746	1726	1687	1,477
1451	Purvciems	2985	3012	3079	3211	3177	2,781
1452	Purvciems	2980	2998	3012	2771	2690	2,354
1453	Purvciems	2293	2274	2363	2055	2067	2,356
1454	Purvciems	2446	2408	2428	2245	2214	1,938
1455	Purvciems	1114	1164	1158	1195	1211	1,071
1456	Purvciems	1466	1485	1500	1446	1417	1,240
1457	Purvciems	894	867	864	831	822	719

1458	Purvciems	1727	1721	1694	1702	1633	1,429
1459	Purvciems	1715	1715	1710	1696	1639	1,434
1460	Purvciems	1575	1582	1626	1745	1925	2,054
1461	Purvciems	1713	1709	1711	1739	1735	1,519
1462	Purvciems	1839	1861	1884	1770	1715	1,501
1463	Purvciems	1695	1665	1673	1615	1592	1,393
1464	Purvciems	1733	1734	1732	1690	1674	1,465
1465	Purvciems	1777	1754	1745	1711	1680	1,470
1466	Purvciems	1747	1725	1704	1636	1636	1,432
1467	Purvciems	1462	1468	1415	1341	1315	1,151
1468	Purvciems	3813	3913	3922	3999	4015	3,727
1469	Purvciems	3150	3075	3056	3006	2932	2,566
1470	Purvciems	1625	1600	1584	1565	1531	1,340
1471	Purvciems	1576	1532	1521	1491	1451	1,270
1472	Purvciems	1346	1338	1320	1311	1287	1,126
1474	Purvciems	2882	2900	2903	2922	2905	2,543
1475	Purvciems	2242	2209	2211	2194	2159	1,890
1478	Purvciems	1683	1702	1670	1675	1653	1,447
1680	Rumbula	796	799	789	757	730	686
2612	Salas	79	79	81	68	72	110
2446	Šampēteris	4797	4770	4740	4798	4707	4,670
2450	Šampēteris	1823	1778	1871	1906	1926	2,181
2453	Šampēteris	1986	1969	2122	2152	2114	2,097
2454	Šampēteris	994	951	939	964	969	961
1224	Sarkandaugava	38	38	38	15	15	13
1225	Sarkandaugava	1372	1344	1318	1297	1265	1,067
1226	Sarkandaugava	1777	1723	1702	1666	1647	1,389
1227	Sarkandaugava	3331	3309	3300	3159	3115	2,627
1228	Sarkandaugava	2472	2429	2455	2443	2427	2,047
1229	Sarkandaugava	2112	2144	2158	2101	2064	1,741
1230	Sarkandaugava	2670	2637	2605	2491	2482	2,094
1231	Sarkandaugava	175	195	223	311	295	249
1232	Sarkandaugava	3527	3429	3381	3279	3221	2,836
1239	Sarkandaugava	311	292	282	278	270	228
1240	Sarkandaugava	14	13	12	14	15	13
1241	Sarkandaugava	729	710	781	484	482	407
1246	Skanste	378	365	369	369	366	360
1247	Skanste	780	986	1276	1650	1685	5,190
1248	Skanste	52	46	63	72	74	75
1649	Šķirotava	161	149	151	134	136	124
1650	Šķirotava	393	411	422	457	474	433
1671	Šķirotava	1636	1630	1638	1628	1745	1,594
2220	Spilve	16	16	16	2	2	2
2229	Spilve	86	26	26	20	13	10
1401	Teika	1619	1737	1798	1781	2105	2,085
1402	Teika	3200	3120	3185	3189	3114	3,129

1403	Teika	2158	2130	2156	2151	2132	2,121
1404	Teika	2644	2603	2656	2635	2627	2,602
1405	Teika	917	923	915	966	935	951
1406	Teika	549	573	588	612	589	583
1407	Teika	1343	1291	1316	1241	1283	1,271
1408	Teika	722	846	913	937	984	975
1409	Teika	3136	3113	3109	2915	2932	2,924
1410	Teika	2872	2825	2811	2845	2798	2,815
1411	Teika	443	435	436	411	404	400
1421	Teika	2672	2651	2638	2685	2679	2,654
1422	Teika	1526	1513	1519	1547	1540	1,696
1423	Teika	700	730	819	913	890	882
1424	Teika	2057	2032	2036	2139	2277	2,256
1425	Teika	928	927	933	953	945	951
1426	Teika	1877	1820	1816	1747	1706	1,690
1427	Teika	883	878	883	936	896	966
2459	Torņakalns	1641	1603	1635	1655	1638	1,427
2470	Torņakalns	510	505	539	478	451	393
2605	Torņakalns	1170	1094	1110	1014	1030	1,096
2606	Torņakalns	2446	2442	2436	2469	2429	2,117
2611	Torņakalns	2268	2200	2212	2119	2160	1,903
1204	Trīsciems	642	681	722	855	918	1,430
1202	Vecāķi	1549	1578	1657	1870	1875	2,050
1203	Vecdaugava	1355	1328	1339	1376	1407	1,480
1205	Vecmilgrāvis	2172	2118	2100	2069	2094	1,701
1206	Vecmilgrāvis	1737	1700	1658	1611	1610	1,308
1207	Vecmilgrāvis	1549	1536	1523	1488	1486	1,207
1208	Vecmilgrāvis	2680	2657	2668	2684	2557	2,077
1209	Vecmilgrāvis	2763	2724	2710	2467	2420	1,966
1210	Vecmilgrāvis	1721	1706	1719	1569	1544	1,254
1211	Vecmilgrāvis	475	479	456	413	413	336
1212	Vecmilgrāvis	2777	2699	2687	2430	2389	1,941
1213	Vecmilgrāvis	2819	2801	2721	2723	2699	2,193
1214	Vecmilgrāvis	2594	2572	2595	2571	2554	2,075
1215	Vecmilgrāvis	633	625	630	716	715	810
1216	Vecmilgrāvis	984	992	996	925	895	727
1217	Vecmilgrāvis	741	705	723	551	588	498
1120	Vecpilsēta	1848	1654	1691	1540	1514	1,510
1121	Vecpilsēta	602	600	628	550	537	535
2215	Voleri	22	10	9	2	2	0
2217	Voleri	76	78	73	52	47	30
2221	Voleri	229	226	222	268	269	187
2429	Zasulauks	4296	4250	4188	3563	3638	3,092
2430	Zasulauks	2189	2147	2137	2061	2005	1,704
2431	Zasulauks	306	280	289	304	314	267
2433	Zasulauks	589	565	586	691	728	638

2435	Zasulauks	858	856	829	791	768	653
2608	Ziepniekkalns	1822	1760	1717	1734	1714	1,575
2609	Ziepniekkalns	2685	2638	2623	2481	2439	2,241
2610	Ziepniekkalns	2219	2193	2158	2205	2177	2,000
2615	Ziepniekkalns	583	571	572	629	630	579
2616	Ziepniekkalns	754	732	722	909	901	828
2617	Ziepniekkalns	1917	1905	1908	1844	1806	1,659
2618	Ziepniekkalns	3916	3926	3905	3789	3719	3,416
2619	Ziepniekkalns	3436	3353	3418	3342	3275	3,525
2620	Ziepniekkalns	1047	1068	1096	1074	1048	963
2621	Ziepniekkalns	1289	1259	1277	1277	1297	1,191
2622	Ziepniekkalns	4187	4135	4165	3984	3912	3,594
2623	Ziepniekkalns	4276	4274	4351	4268	4202	3,860
2624	Ziepniekkalns	2244	2223	2217	2178	2165	1,989
2625	Ziepniekkalns	1507	1389	1370	1603	1606	1,520
2626	Ziepniekkalns	2642	2637	2749	2582	2561	2,512
2629	Ziepniekkalns	170	105	145	220	235	236
2439	Zolitūde	409	462	466	434	435	406
2440	Zolitūde	3854	3848	3739	3620	3560	3,322
2441	Zolitūde	2692	2682	2621	2753	2742	2,559
2442	Zolitūde	2406	2403	2405	2336	2293	2,140
2443	Zolitūde	2374	2357	2336	2268	2247	2,097
2444	Zolitūde	7	7	7	6	6	6
2445	Zolitūde	1041	1035	1041	1026	1013	945
2448	Zolitūde	862	908	926	941	970	1,083
2449	Zolitūde	308	313	314	319	335	321