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TRANSPORT AND TRANSPORT STRUCTURES STRATEGY OF KOŠICE CITY

SUSTAINABLE URBAN MOBILITY PLAN

FINAL REPORT

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CONTENT

1 PROJECT IDENTIFICATION

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Project: Transport and transport constructions strategy of Košice City

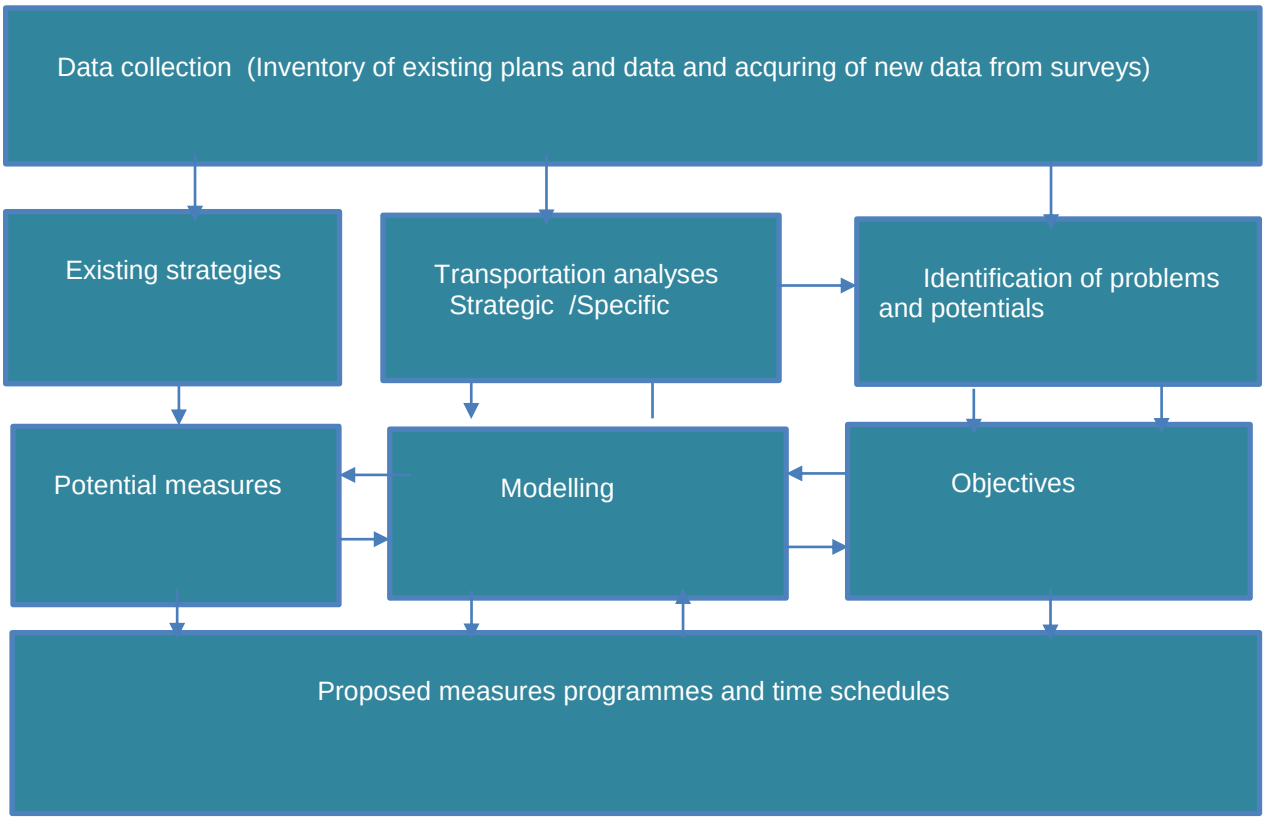
Part of project Sustainable urban mobility plan

Time: 6th November 2014 – 30th November 2015

2 INTRODUCTION

The main objective of elaborated strategy was to gather all available data, provide transport surveys results and run necessary analyses, to elaborate the traffic forecast, to define main problems of city transport system, to defining main objectives and to propose appropriate measures for the horizons 2020, 2030 and 2040. The strategy defined the conditions for future land use development as for transport infrastructure and equipment. Strategy urban mobility principals were fully respected. Traffic forecasts for the subsystems of pedestrian, bicycle, public transport and the road transport were elaborated; organisation and management items were analysed and operational and maintenance problems described. Based on all findings, elaborated transport surveys and analyses the objectives and measures for future horizons were defined.

Strategy of transport and transport structures of Košice city was elaborated in the period November 2014 – September 2015 and consisted of following steps:



3 DATA COLLECTION

Inventory of existing plans and data was done, transport surveys were elaborated and data from them analysed and acquired.

3.1 Existing strategies

3.1.1 National strategies

- Concept of land development of Slovakia, 2001
- Strategy of development of public and non-motorised transport of Slovakia, 2013
- Programme of economy and social development 2008 - 2015

3.1.2 Regional strategies

- Regional land use plan, 1995
- Feasibility study of integrated transport system, 2005
- Institutionalisation of integrated transport system, 2008
- Institutional and organisational analysis of regional integrated transport system, 2013
- Concept of regional public transport - terminals, 2013
- Transport model of public transport service for U.S.Steel and Moldava nad Bodvou, 2014
- Feasibility study of Eurovelo 11 bicycle route, 2013

3.1.3 City strategies

- Action plan for the preparation of operation period 2014 – 2020
- Strategy of noise maps, 2007
- General transport plan, 1984
- Analysis of transport development in Košice and main strategy intensions, 2007
- Parking concept EEI, 2013
- O/D relations survey, 2013
- Plan of public transport, 2009
- Public transport sustainability study, 2014

3.1.4 Potential measures proposed in existing strategies

The measures already being realised or prepared were identified as a part of current status (chapter 7.3), some of them were confirmed as part of proposed measures (chapter 7.4), some measures were dismissed or re-evaluated by this plan.

- Bypass of R2 road (potential measure on national level to be realised by NDS)
- Two new eastern access roads from R2, new bridges from Ťahanovce (2x), Masarykova prolongation, new access to Dargovských Hrdinov, connection Prešovská - Jantárová new airport access road, bypasses, new connections and road junctions
- Park and Rides Barca, VŠA, Krásna, Sever, Main Station East
- Construction of pedestrian paths, bicycle paths, lanes
- Tram train project Ťahanovce – Masarykova – Kuzmányho – Main station – Moldava nad Bodvou
- Modernisation of tram tracks, new tram tracks to Krásna, Bardejovská – VŠA Masarykova – Staničné námestie
- Trolleybus loop system
- Integrated transport terminals Sever, Main station, VŠA (+ regional Hutníky - Moldava n. Bodvou and Kysak), new railway stops

3.1.5 Urban development plans

Existing land use plan is formally valid, but it will be changed and it will be not used in the future. New land use plan will be finalised in 2018. The aim is to limit the development to outskirts of Košice and utilise the land formerly used by the industry or planned for housing in the city interior (Ťahanovce, Hornád banks, southern industrial zones). The development in the tender proposal of new land use plan is planned to the brownfields by Hornád and in the south and by Nad jazerom estate and new development is planned in Ťahanovce, KVP, Západ, Košická Nová Ves and detached neighbourhoods.

3.2 City development till 2030

It was defined, that the extent of the city development will contain the development projects already being prepared and project in new location which is very likely to be included to new land use plan and the development in next 15 – 25 can be expected there.

There is the expectation that the preference in land use development will be focused to the area with good connectivity by existing or easily extended trunk public transport lines. (e.g. Ťahanovce – Skalky or Kopa).

The projects already commenced (by preparation) are e.g.:

Nová Terasa II, Nemocnica III, Alvinczyho – Bellova, Residential park Green Slope, Garbiarska, Kankord, Baránok, Dunajská, Baltská, Klimkovičova, Heringeš, Idanská, Na hore, Strojárenská, Šafránová zahrada, Girbeš.

New expected development is possible in following locations and was considered as a part of trend scenario:

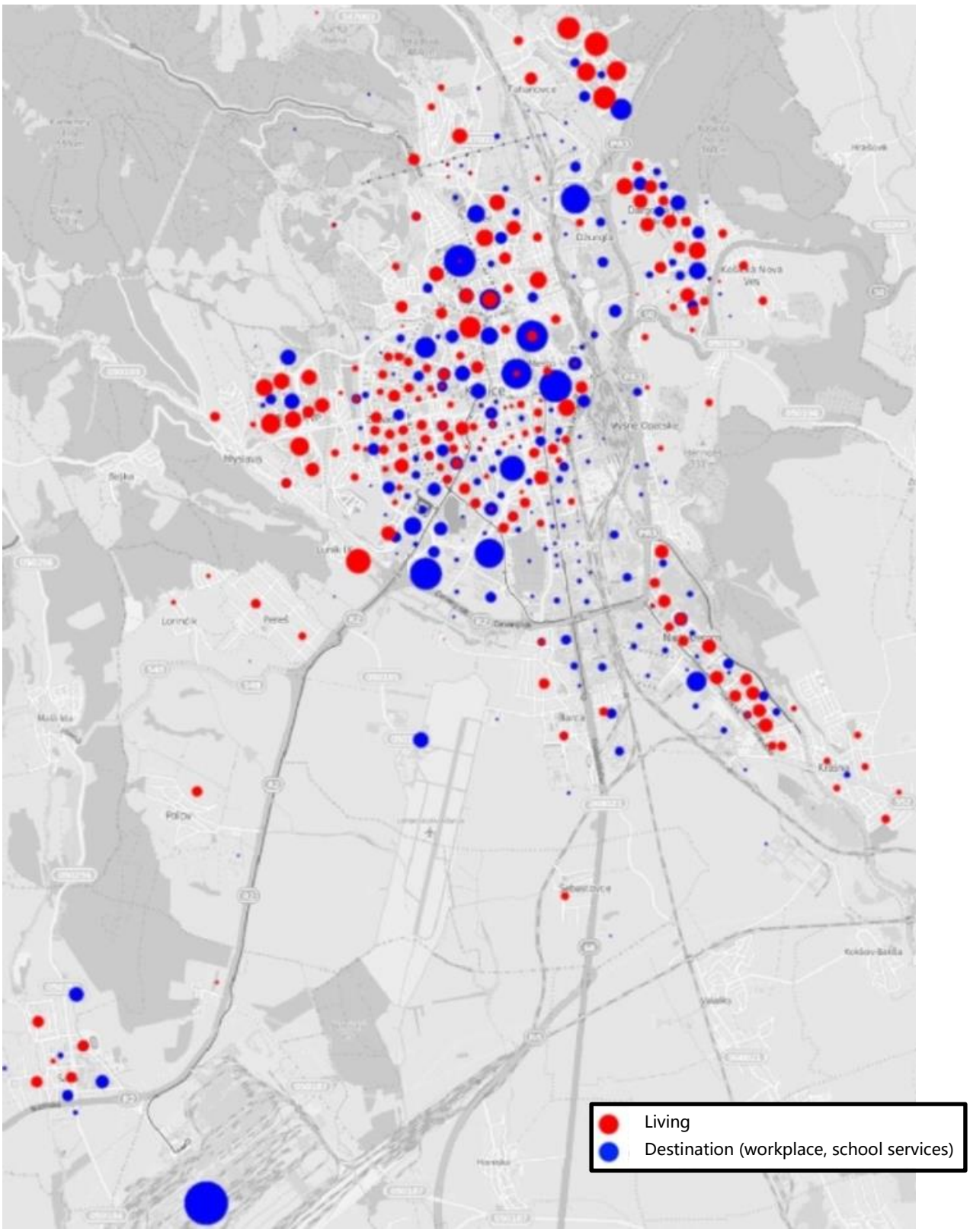
- Ťahanovce - Skalky
- Kostolianská
- Slovenská – Hornád
- Košická Nová Ves
- Nad jazerom
- Southern suburbs
- KVP - Kopa

3.3 Existing data

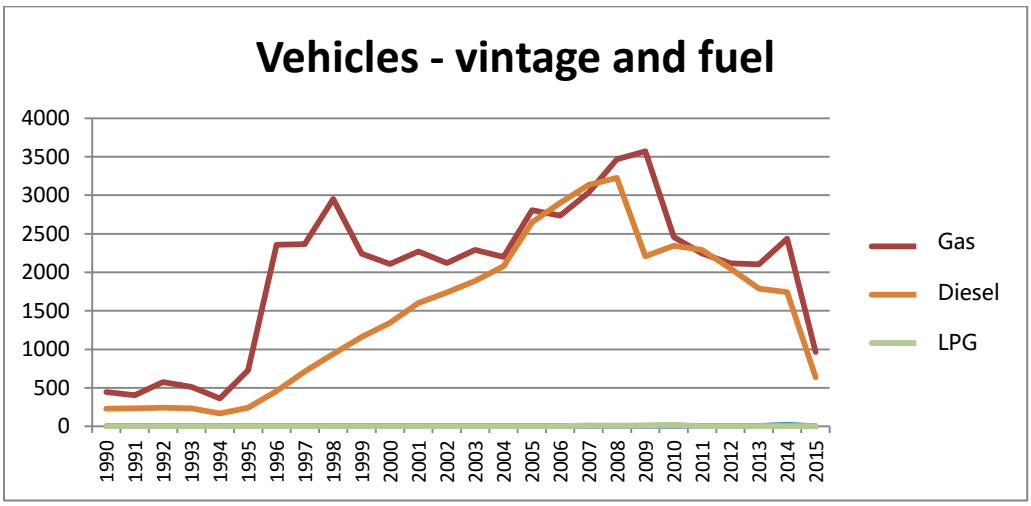
3.3.1 Demography, socio-economic data

- Košice grew from 150 thousands inhabitants in 1970 to 238 669 in 2015, annual population growth 2005 - 2014: only 1,53 – 0,95 % annually, number of expected inhabitants in 2040 is 246 339,
- 110 thousands of inhabitants are economically active people,
- There are 116 thousands working places in Košice, 18 % in central city zone, 16 % in U.S.Steel factory, most of other working places is in the city near to centre.
- Number of registered vehicles in Košice 100 747, from those registered cars 82 044
- Car ownership ration is 1:3 and is growing
- 81 % of all vehicles are cars, average age of cars is 11,2 years,
- There is one car per three inhabitants in Košice and ownership ratio is still growing.

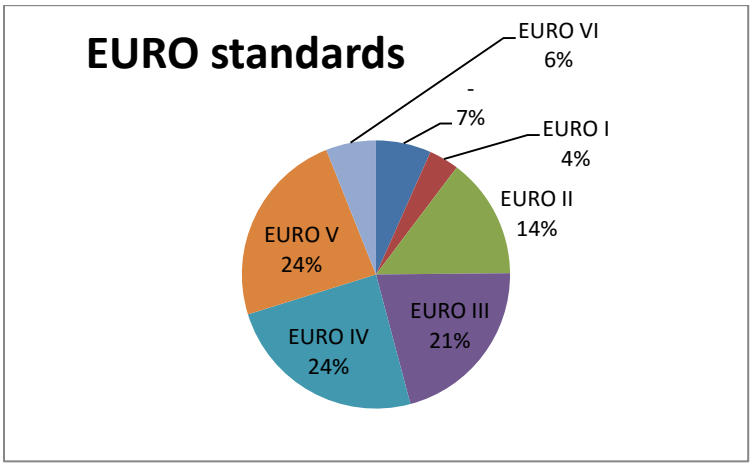
Amounts of living (red) and working (blue) people in Košice:



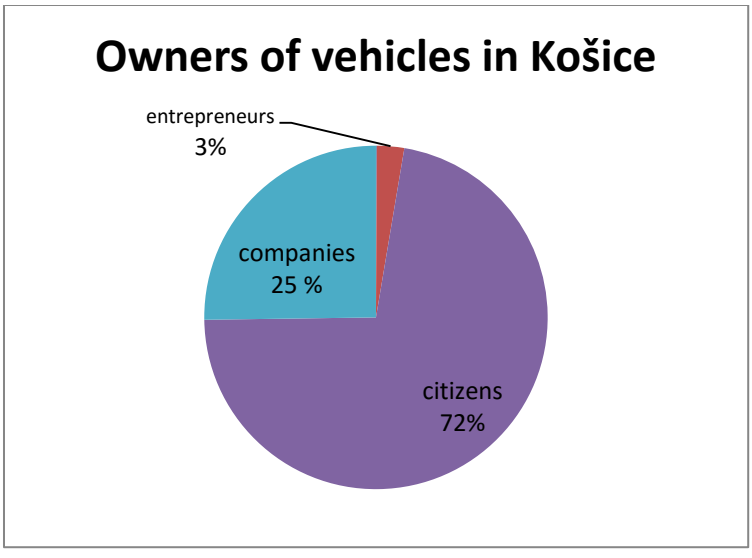
Age and fuel of cars registered vehicles in Košice:



Emission standards of registered vehicles in Košice:



Ownership of vehicles in Košice



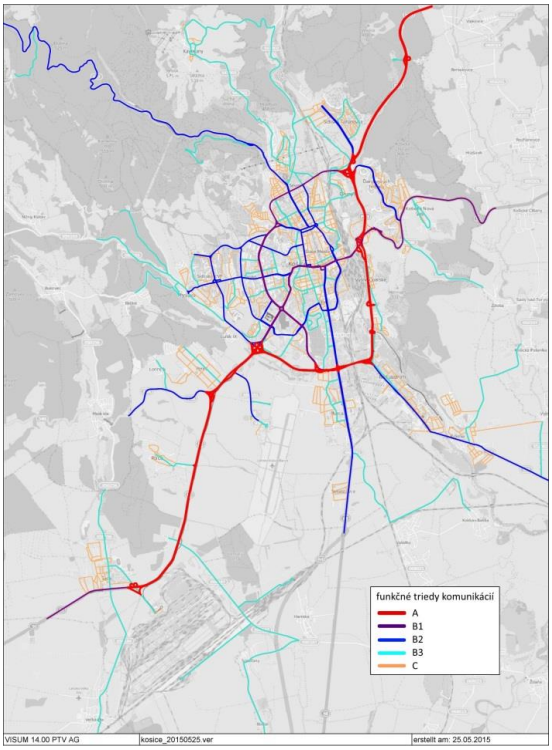
3.3.2 Commuting data

- Outbound daily commuting: 11 076 (according to SŠÚ), 50 % commutes abroad, 28 % to western Slovakia, then most of trips leads to Prešov and Kechnec
- Inbound daily commuting: 55 264 (according to SŠÚ), most trips from southern and eastern suburbs and from Prešov and Trebišov
- Daily number of incoming trips (people/day) is estimated to 85 thousand, from those 21 thousands (25 %) by public transport,
- Daily occupancy of Košice: 288 395 people

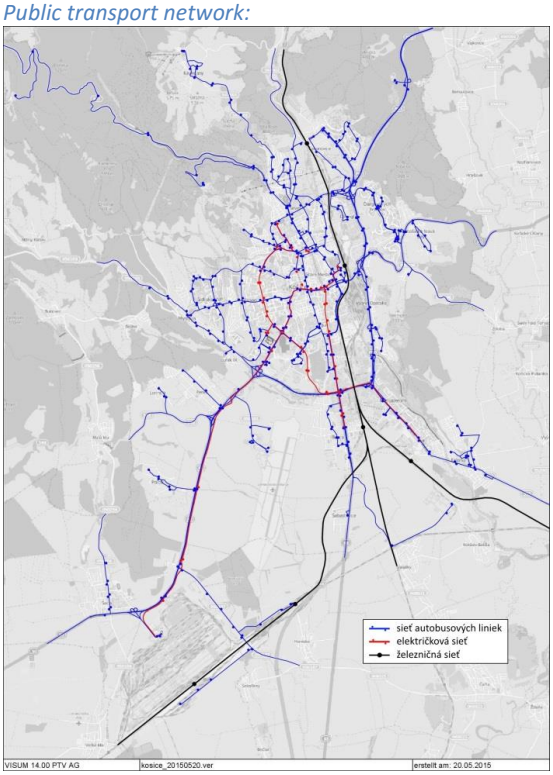
3.3.3 Infrastructure data

- Expressways D1 (from north) , R2 (from southwest) and R4 (from south) are interconnected by PR 3 road in Košice
- Roads I/68 and I/50 (from 1st August 2015: I/16, I/17, I/19 and I/20) connect Košice with west, south, east and north, all are to be step by step supplemented by expressways. New bypass road R2-D1 is in preparation.
- Main railway tracks 180, 169 and 160 connect Košice to west, south and north of Slovakia, the Czech Republic, Hungary and Ukraine, due to limited maintenance and no modernisation the quality of infrastructure is not on expected level.
- The traffic volumes on the national expressways/roads within the city according to national census 2010 vary from 23 - 38 thousands veh./day with 25 % of freight traffic
- City road system is created by radial-circle network of central circle and outer circle, which has two more parallel circle roads in the west.

Roads:



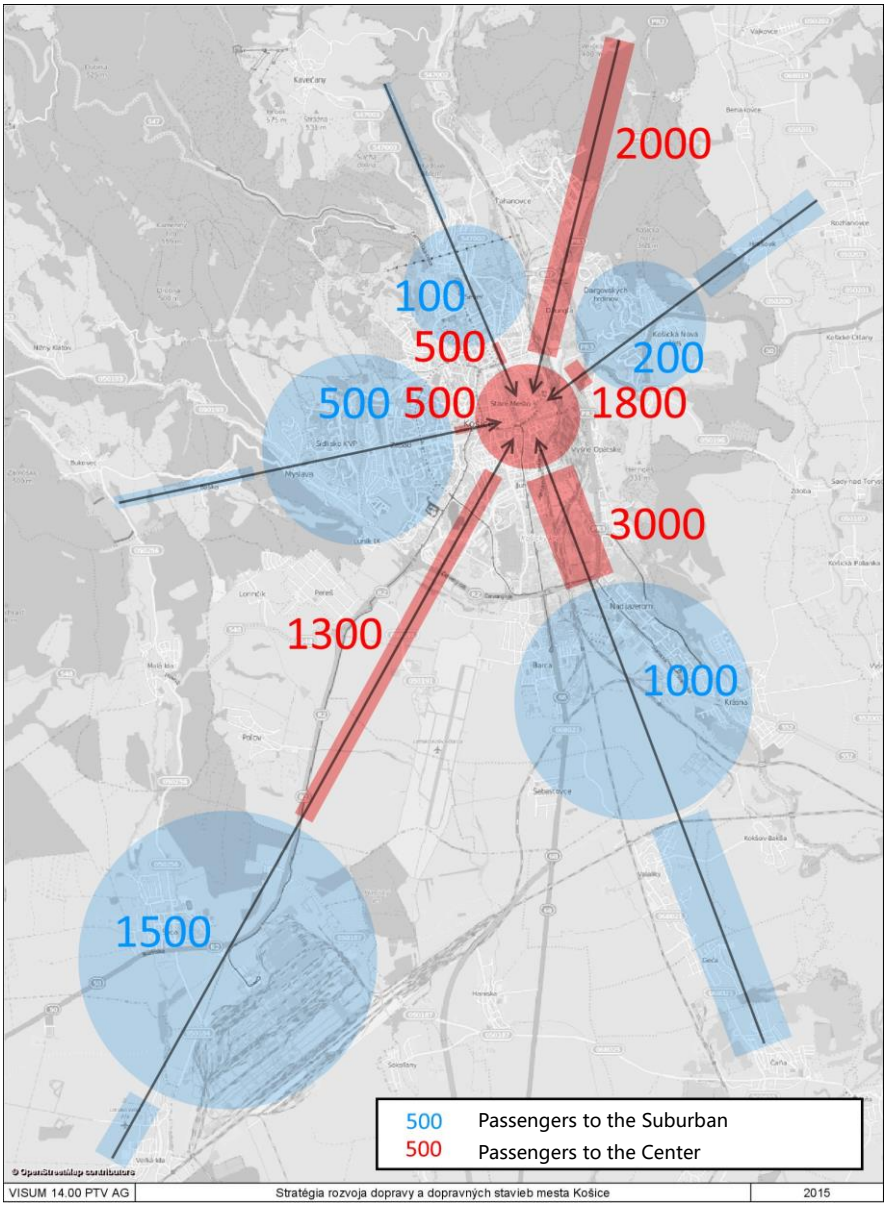
Public transport network:



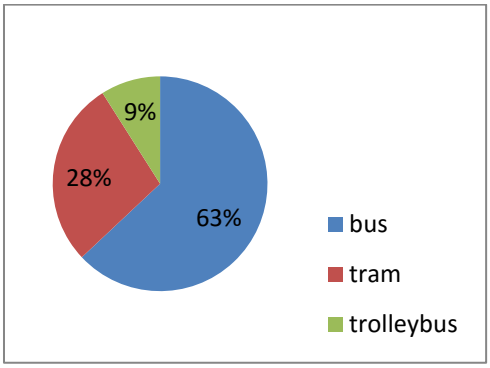
3.3.4 Public transport output and patronage data

- 9 000 people is coming by trains (regional and express together), 7 800 people is coming daily by regional buses and 4 200 passengers by long distance buses.
- 258 thous. daily municipal PT trips were done in 2014, 63 % by bus, 28 % by tram, 9 % by trolleybus,
- 300 thousands PT trips was done together (86 % from those by municipal PT)

Numbers of passengers coming by regional buses to the suburbs and centre:

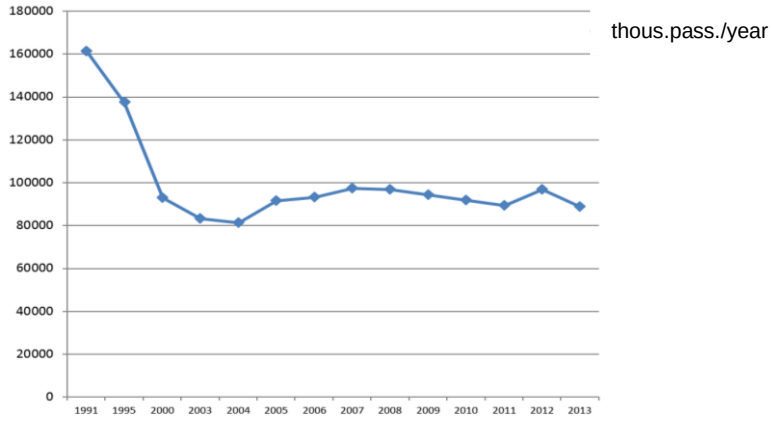


Modal split inside municipal PT

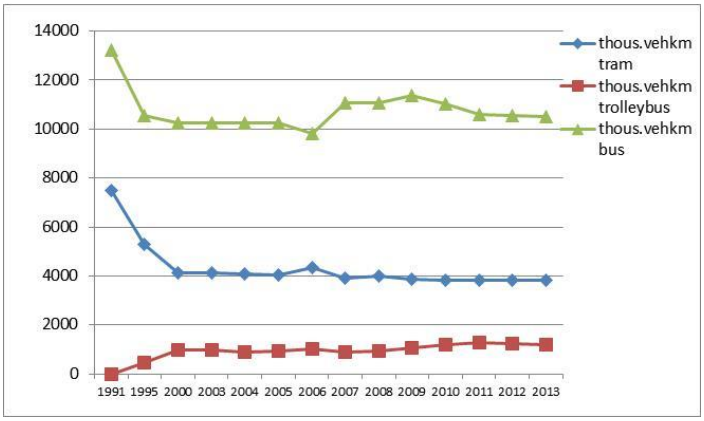


- DPMK operates 15,1 million vehicle-kilometres annually; the performance is stable over last decade. The patronage of Košice public transport is 0,083 billion passengers per year and it is slightly declining

Annual public transport volumes 1991 - 2013:



Annual public transport outputs 1991 – 2013 by modes:



3.3.5 Public transport economy data

PT outputs in 2014:

Trams:	3 793 thous. vehkm i.e. 24 %	479 716 thous. placekm, i.e. 29 %	2,65 €/vehkm
Trolleybuses: 851 thous. vehkm i.e. 5 %	851 thous. vehkm i.e. 5 %	99 963 thous. placekm, i.e. 6 %	2,29 €/vehkm
Buses:	11 071 thous. vehkm i.e. 71 %	1 071 334 thous. placekm, i.e. 65 %	2,11 €/vehkm
Complete annual cost:	34 122 788 € (incl. 4 665 975 depreciation, i.e. 13,7 %)		
Share of direct operational costs (without depreciation):	54,80%		
Share of overheads:	28,50%		
Annual income from fare:	12 249 390 €		
Other income:	1 059 360 €		
Annual compensation:	16 020 000 €		
Loss:	- 1 794 028 €		

Performance of DPMK:

Performance indicator	2014
Passengers (billions per year)	0,083
Vehicle km per staff member	14 906
Fare revenue per vehicle km (€)	0,8
Operating cost per vehicle km (€)	2,3
Proportion of total operating costs covered by fares	36 %
Proportion of total operating costs covered by subsidy (+ loss)	64 %

Comparison of performances and subsidies:

Performance indicator	Košice	Bratislava	Brno	Plzeň
PT output per inhabitant [vehkm/inh.]	65	108	95	89
Compensation per km [€/vehkm]	1,0	1,2	1,8	2,0
Compensation per inhabitant [€]	67	128	175	174

Conclusions:

- Public transport output is more or less stable with slight decline.
- Costs of public transport operation are higher than sum of fares and subsidies, fares are declining, DPMK needs improved traffic conditions by PT preference to cut the costs, what is not possible in current operational situation.
- Funding of PT by compensations is lower than in comparable cities

- There are rather high maintenance costs of trams and trolleybuses and overhead costs in DPMK.
- The costs of bus operation are rather high due to high depreciation caused by renewal of bus fleet using loans in last year.
- Depreciation is not calculated to the costs of tram operations as new vehicles are funded by EU.

3.3.6 Parking data

EEI study results:

- City centre – paid parking – free capacities available.
- Around centre – overused during day, full at night.
- Low usage of commercial parking.
- Illegal parking is common (without payment or on illegal places).
- Housing estates – overused at nights.

Utilisation of parking capacities in 2013 (including illegal parking):

	Capacity	Parking - day		Parking – night	
Centre – paid	3114	2003	64%	926	30%
paid outside centre	232	118	51%	38	16%
Centre surroundings	4409	5809	132%	4733	107%
Central area	**7755**	**7930**	**102%**	**5697**	**73%**
South	2261	2027	90%	2307	102%
North	1403	1442	103%	1555	111%
West	7327	6836	93%	7335	100%
KVP	5929	3801	64%	6502	110%
Nad jazerom	4380	3406	78%	5139	117%
Dargovských h.	5473	3664	67%	6362	116%
Ťahanovce	4355	3193	73%	5813	133%
Housing est.	**31128**	**24369**	**78%**	**35013**	**112%**
Košice	**38883**	**32299**	**83%**	**40710**	**105%**

Conclusions:

- There are free capacities within paid zone in centre in spite of common illegal usage of paid parking spaces, surrounding of the centre is overused during the day.
- Housing estates within city (North, South, and West) are slightly overused at nights
- The detached housing estates are strongly overused at nights.
- The demand is higher at night (due to daily parking by places of employment).

- There are 108 610 registered vehicles in Košice, from those 82 695 are cars, 50 % cars are parked in public space during the night. Only 30 % of cars (owned by inhabitants + visitors) are parked on public spaces during the day, other are on parking places provided by working places.

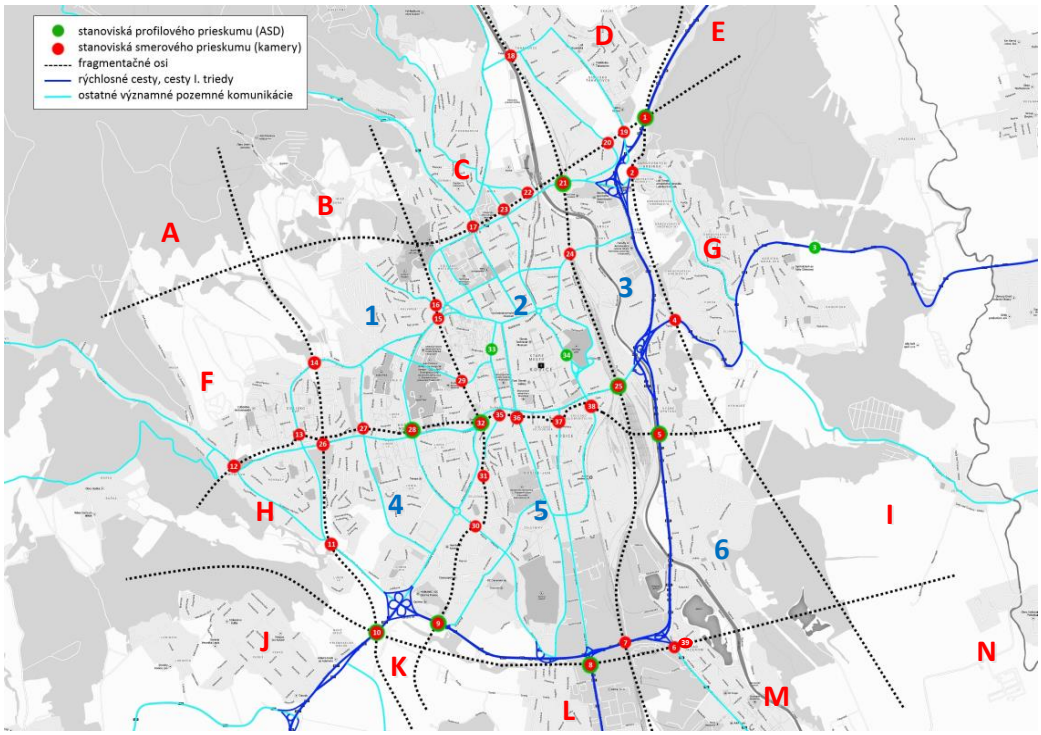
3.4 Transport surveys

3.4.1 Screenlines and O/D road traffic surveys

Methodology:

- There were the traffic counts realised on 11th March 2015 on 42 profiles, on 35 of them camera records were elaborated from 6:00 till 18:00, on 12 profiles automatic radar counters were used for 4 weeks 24 hour a day, 7 profiles were common,
    - The traffic counts were recorded to the transport model, recalculated for 24 hours and used for the calibrations of the situation with reconstruction closures
    - The traffic volumes changes during the day and week were recorded and described, this evaluation was used to recalculate the counts for 11th March
    - OD/ traffic survey was realised on March 11, 2015 in the situation with the closed roads in the centre (Hviezdoslavova, Kuzmányho, Štúrova). Camera records were obtained from 39 profiles for the period 05:00 – 18:00.
    - The period 5:00 – 11:00 was evaluated and matrices for period 06:00 - 18:00 were recalculated by mirroring of radial relations.
    - Traffic volumes obtained in the time of reconstruction of major roads in centre (Hviezdoslavova, Kuzmányho, Štúrova) were used for calibration of transport model and for evaluation of the influence of eventual closure of Štúrova, normal traffic volumes were calculated by transport model

Screenlines and profiles for traffic survey:

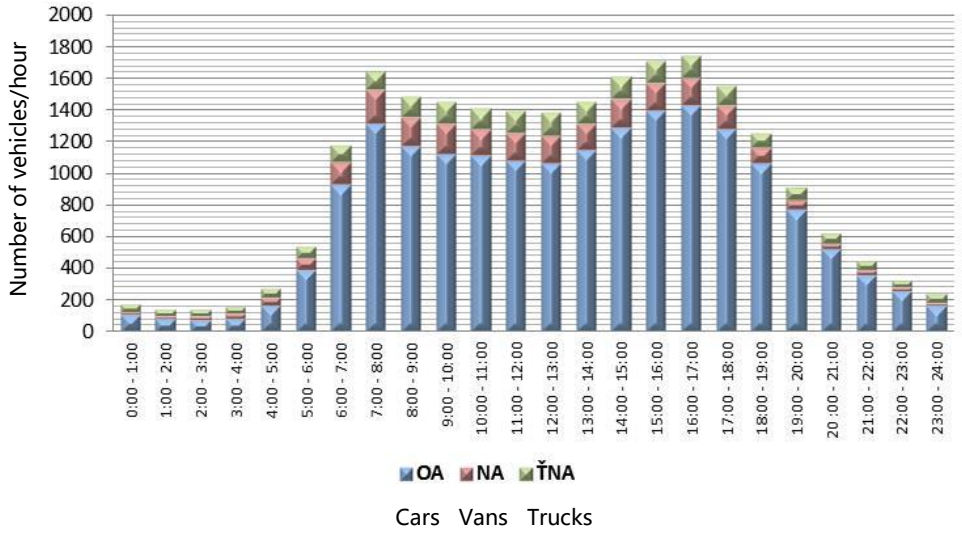


Findings:

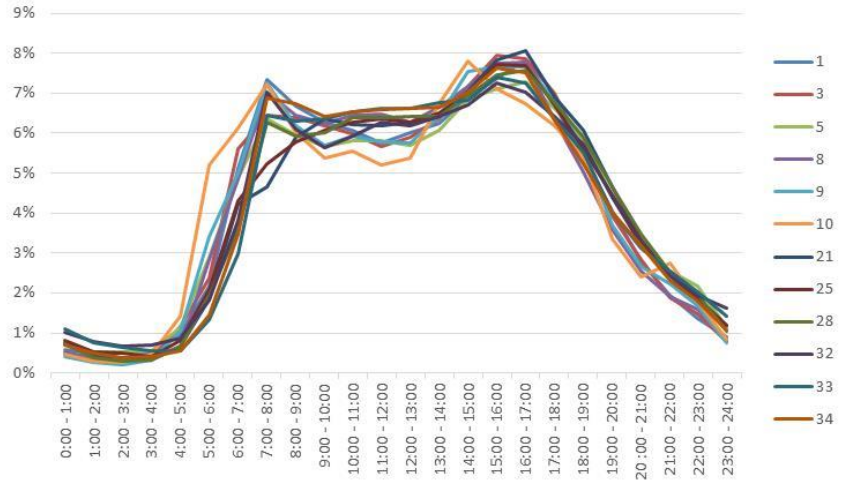
- The most significant influence of the closures was increase it the traffic volume on circle road SNP from 40 to 58 thousands veh./day and on left bank of Hornád on PR3 from 34 to 37 thousands veh/dey.
- Extremes (with closures due to tram reconstructions):
  - Nižné Kapustníky 47 thous./day
  - Palackého: 31 thous./day
  - Hlinkova: 39 thous./day
  - Južné nábr.: 30 thous./day
  - SNP by Festivalové nám.: 58 thous./day
  - SNP by Toryská: 39 thous./day
  - Alejová: 45 thous./day
  - Jantárová: 37 thous./day
- Average daily traffic volume on 12 automatic counted profiles varied from 15 200 on Sunday (with 10 % share of freight vehicles) till 27 000 on Friday (with 10 % share of freight vehicles),
- Average 6:00 – 18:00 volumes calculated on 5 camera recorded profiles 8550 veh./12 hours on 11th March 2015, the share of freight vehicles was 13 %, share of buses was 2 %.

- Peak hours reached 7,2 % of 24 hours volume in morning peaks (7:00 – 8:00) and 8 % in afternoon peaks) 16:00 – 17:00

Average hourly traffic volumes during the day on 12 automatic recorded profiles



Shares of hourly volumes of the daily volumes on 12 automatic recorded profiles:



There were recorded the total daily peaks of car trips in the afternoon hours 15:00 – 17:00, this is not copying the transport behaviour of the inhabitants of the city as for the questionnaires (the peak is in the morning) and it leads to the conclusion, that cars are used for more complex travels schemes then just work to home in the afternoon, what creates more car trips in modal split.

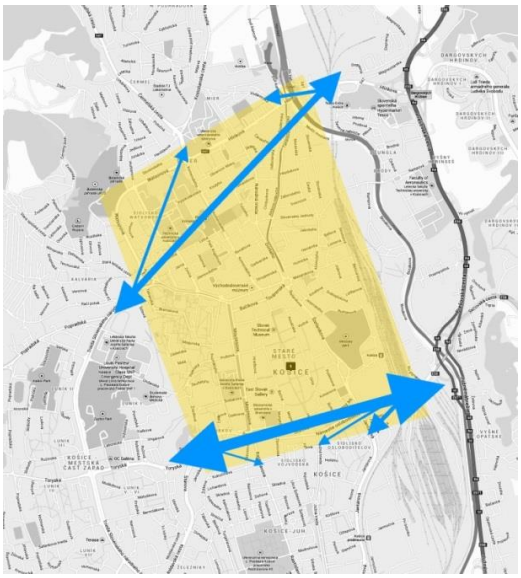
The OD/relations for 10 different O/D matrices were calculated for the period 06:00 – 18:00

- Central city zone matrix traffic volumes survey contained 60 thousands trips shorter than 20 minutes in the period 06:00-18:00, highest O/D relations were Wilsonova –

Hlinkova (5,2 thous. in both directions), Vodárenská – Hlinkova (1,6 thous.) or Palackého – Jantárová (5,3 thous.).

- The matrices were utilised for the verification of the transport model of the situations with the closures

Major O/D relations passing through the city centre according to O/D survey (higher than 2000 veh/day in both directions):



Traffic volumes with closures for reconstruction:

Recalculated volumes for normal situation:

Conclusions:

Highest traffic volumes were counted and recalculated for normal situation on the expressway road PP3 – R2 through Košice, Hlinkova – Watsonova – SNP – Alejová "outer" circle road and on the access roads towards city centre Palackého, Protifašistických bojovníkov, Jantárová and Moldavská cesta.

There are two major transit routes through city centre using Hlinkova – Watsonova and Štúrova streets.

Influence of the closures in March 2015:

- Low volumes in the centre (Toryská, Moldavská cesta, Štúrova, Kuzmányho, Moyzesova)
- Much higher volumes on Watsonova, SNP, Alejová, Gemerská, Rastislavova and Letná and on PR3 expressway feeder

Non-motorised transport:

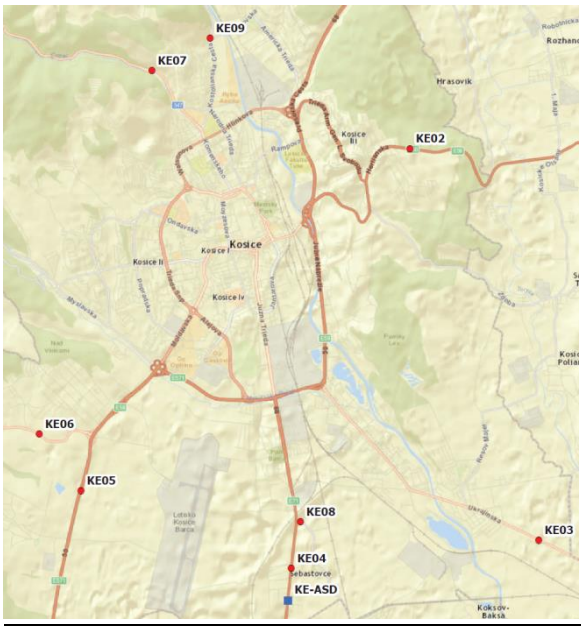
- Bicycle – highest volumes (in May 2015)
  - Hlavná: 739 bicycles/day
  - SNP: 674 bicycles/day
  - Komenského 587 bicycles/day
- Pedestrians – highest volumes (in May 2015)
  - Hlavná: 3961 pedestrians/day
  - SNP: 2058 pedestrians/day
  - Komenského: 777 pedestrians/day

3.4.2 National O/D survey

Methodology:

Origin destination survey on national roads was elaborated in April 2014 by company HaskoningDHV CZ. The survey was elaborated by stopping and questioning of the sample of vehicles coming to Košice from north, east, south and west. The questions were focused to the type of vehicle, origin, destination purpose, regularity of journey and number of people in the vehicles. Questions were given 10th March from 6:00 to 10:00 and from 14:00 to 18:00.

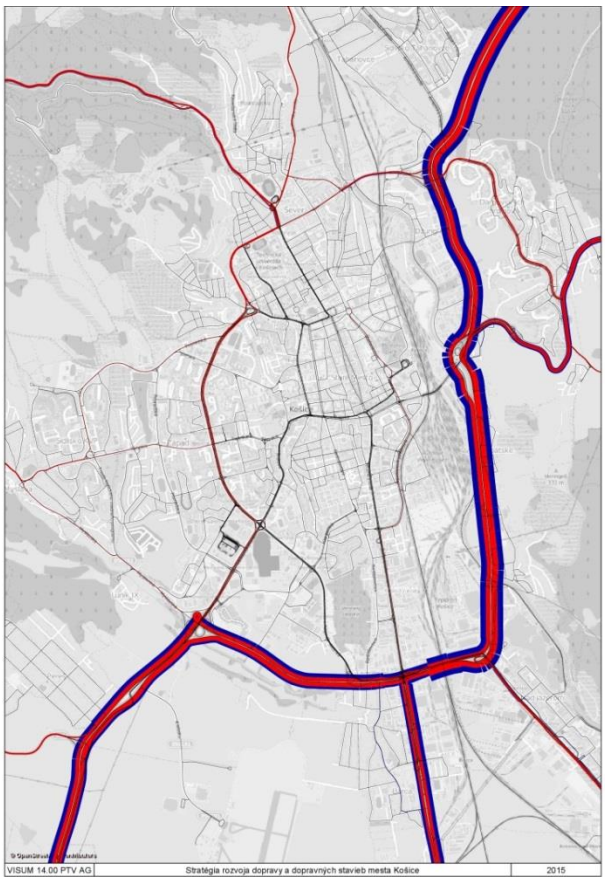
The profiles of questioning:



Findings:

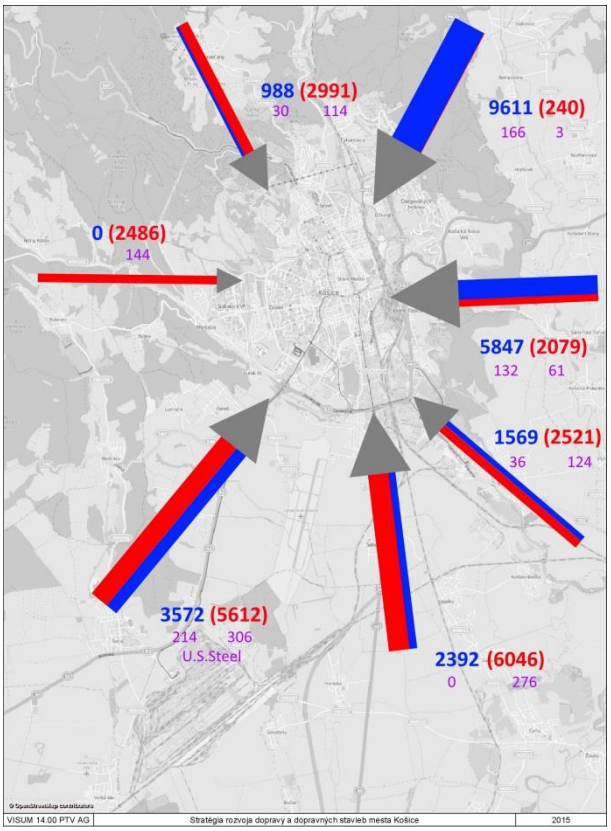
- There is 4 700 car trips and 5 000 freight vehicle transit trips daily through Košice only
- Transit car traffic creates only 1,5 % of trips, transit of freight traffic creates 16 % of all trips, together there is 3 % of transit transport,
- Strongest transit relations for cars are related to Prešov (1 300 trips, i.e. 30 % of all car transit), strong relation of transit trips is also related to the area of southern suburban villages Valalíky – Milhosť - (1 100 trips, i.e. 23 % of all transit car trips),
- Strongest transport relations for freight transport are related to Prešov and to Rožňava, from foreign countries Hungary is the strongest.

Transit transport assigned to the city network (red=cars, blue=freight vehicles):

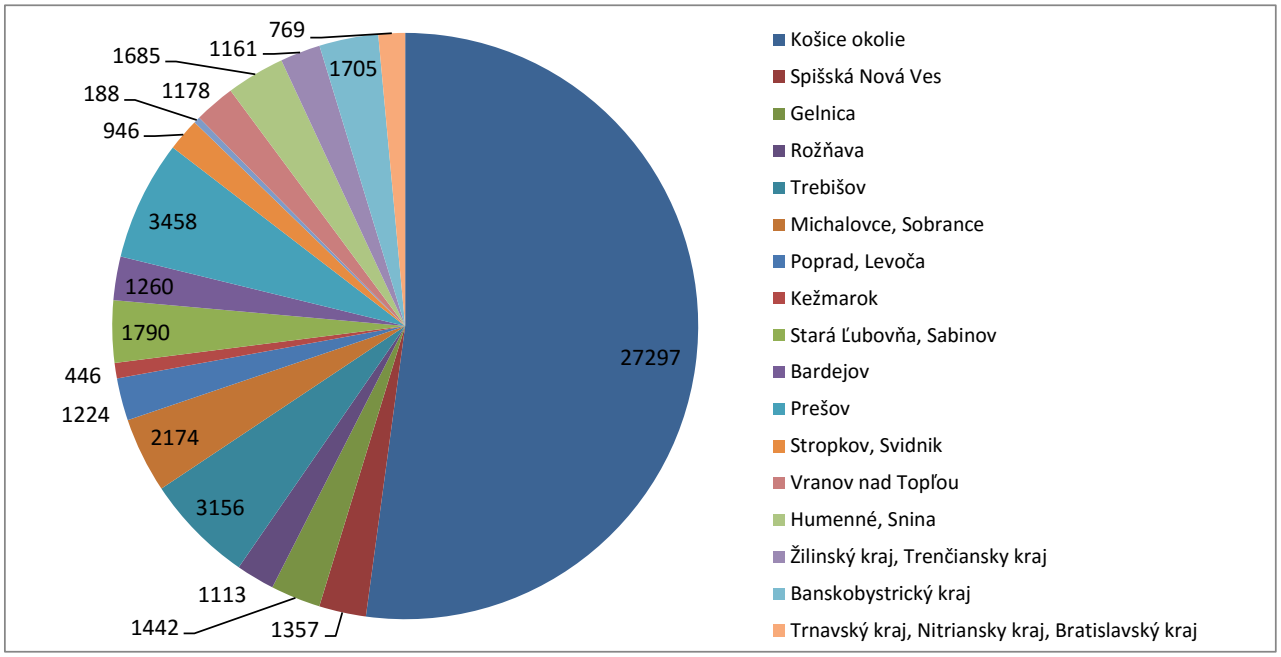


- Incoming and through traffic is created by 86 000 cars and 16 000 freight vehicles daily, vehicles coming from the region make together with transit 27 % of all cars a day and 62 % of freight vehicles
- 52 % of incoming trips originate in Košice district, 4 % in Prešov
- Transport relation from Prešov is highest from all relations outside of Košice region (4 320 commuting, 2 655 incoming cars daily)

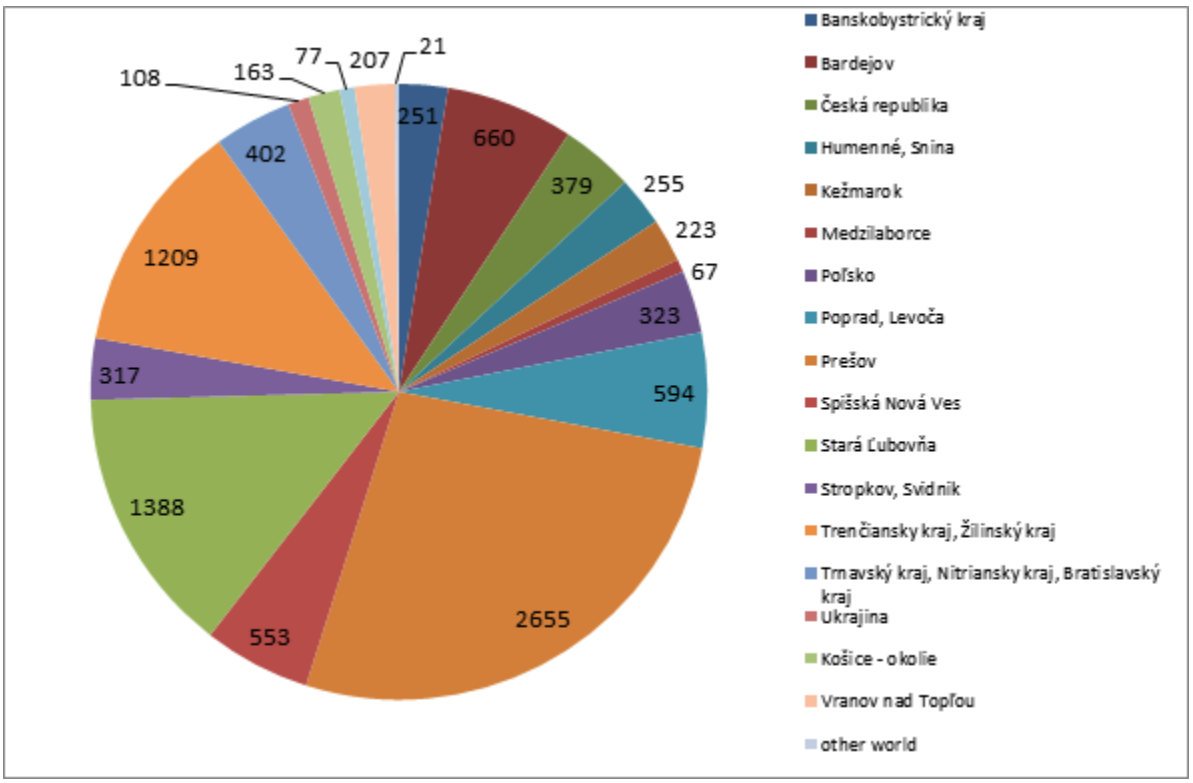
Scheme of incoming transport (blue = all long distance relations, red=all relation to/from Košice - surrounding district O/Ds, violet = from above mentioned - the relations heading to U.S.Steel):



The division origins of incoming persons – daily commuting to work to Košice as for national census 2011:



The division of origins of car trips coming from D1 to Košice – incoming car trips/day:



Conclusions:

- Amount of transit traffic through Košice is very low 9 700 veh./day, 3 % of all traffic, 1,5 % of car volumes, it reaches max. 10 % on some roads by city limits and on Prešovská (PR3)
- The only road with significant share of transit traffic is PR3 expressway with 1300 veh./day (30 % of transit car trips)
- There are 10 % of transit trips of all journeys using Prešovská street (RP3 expressway), if it is eliminated, this link can be used for incoming and city trips.

3.4.3 Public transport volumes survey

Methodology:

The traffic volumes survey was organised in the period from 18th December 2014 till 6th February 2015 so that the survey is organised before the closures of the tram tracks. The track in Kuzmányho street was however closed before the commencement of the survey, supplement bus was subject of the survey instead. There were defined 20 representative profiles to be used as the screenlines for the calibration of the traffic model. The survey was done by marking of the vehicles by the steps of occupancy 1 – 5, it went on from 6:00 till 8:00 and from 15:00 till 17:00. The occupancy of the vehicles was calculated with the consideration of the capacity of particular vehicles.

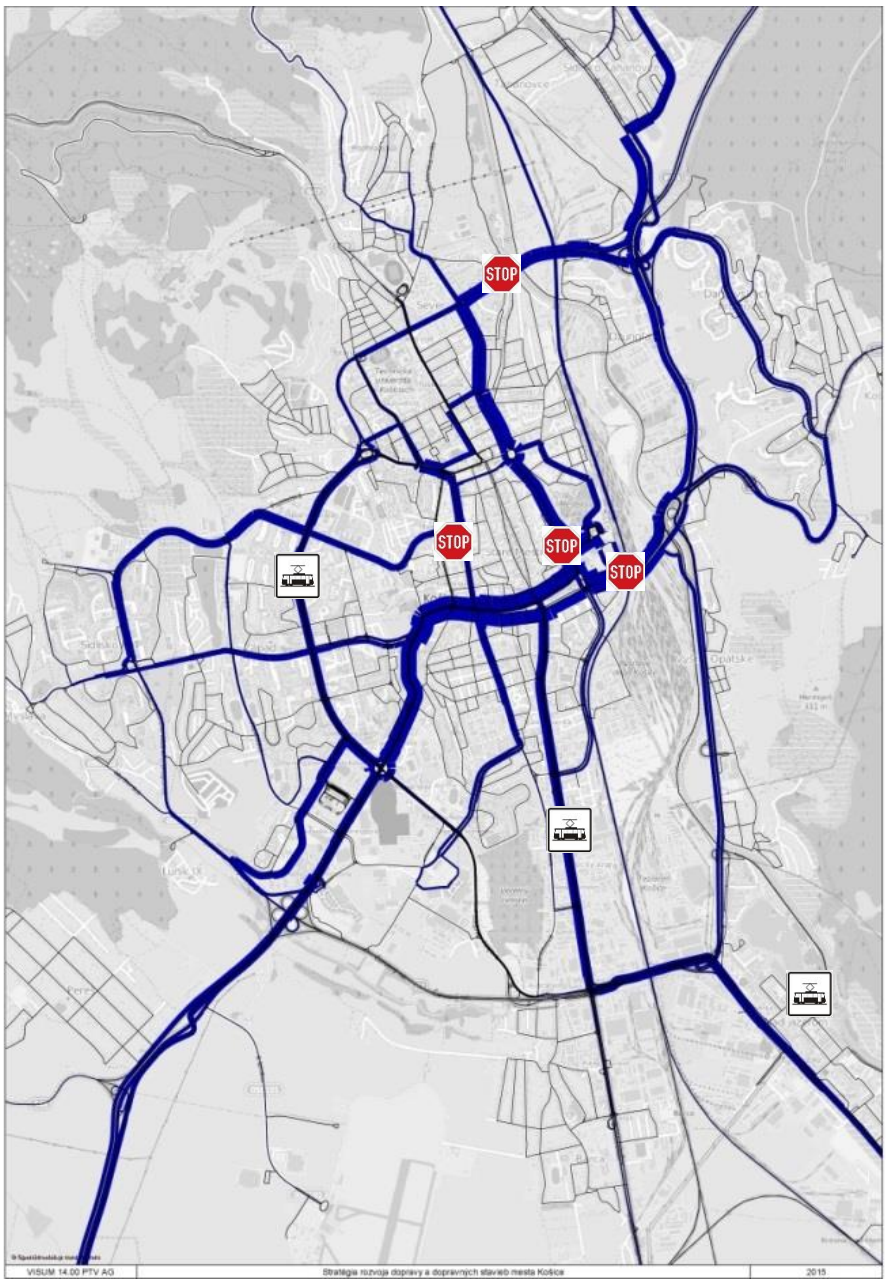
There was the traffic survey organised also in 2009 in the period 04:30 – 19:00, the development of the volumes though the day was taken from this (peak hour 7:00 – 8:00: 12,8 % of daily volume, 2015 survey: 35,9 % of daily volume)
The staff of transport department of DPMK elaborated another survey also in 2014. The critical profiles were defined:

- Heavily used lines: 16,17, 24, 25, 27, 29, 31, 36, 55
- Low usage: 5, 6, 14, 21, 22, 26p, 28, 30, 33, RA2

Findings:

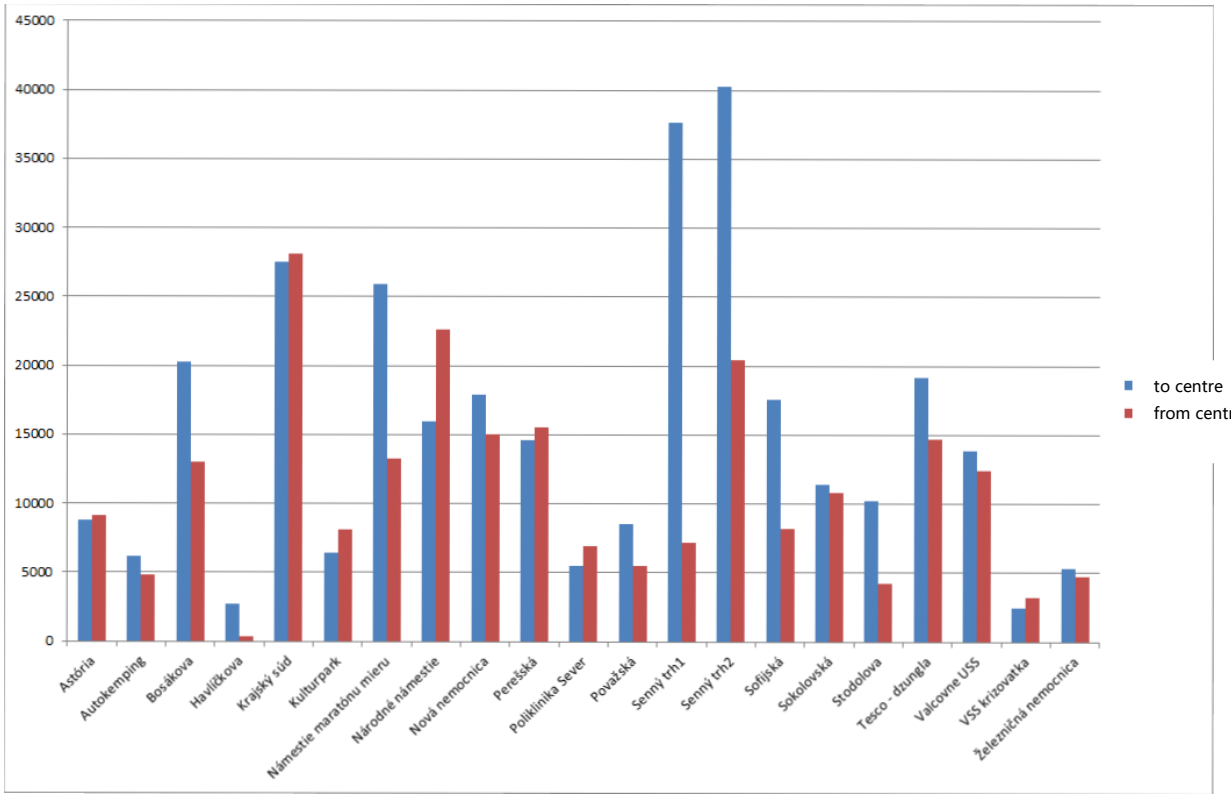
- Highest volumes (all PT modes together):
  - Senný trh 2: 60,9 thous/day
  - Krajský súd: 55,7 thous./day
  - Senný trh 1: 44,9 thous./day
  - Námestie MM: 39,3 thous./day
  - Národné nám. 38,6 thous./day
  - Bosákova: 33,3 thous./day
  - Válcovne U.S.S. 26,3 thous./day
  - Nová nemocnica 23,9 thous./day
  - Sofijská 25,7 thus./day
  - Astória 17,9 thous/day
- The traffic volumes were used for the calibration of public transport model
- Major radial routes: Prešovská, Sečovská - Palackého, Hlinkova – Národná - Štefánikova, KVP
- Vojenská, Toryská – Štúrova, Petzvalova, Moldavská cesta, Gemerská – Rastislavova, Slanecká –Južná/Južné nábrežie
- Extreme patronages observed (situation in vehicles – capacity 5 passengers/ m^2):
  - 71,72 – Krajský súd 100%
  - 25,71 Národné námestie 75 %
  - 55,71,72,55 TESCO Džungľa 73 %
  - 27 Sofijská 73 %
  - 15, 52, 56 Senný trh 73 %
  - 25 Krajský súd 73 %
  - 17,55,56,72 Sokolovská 73 %
  - 3 max 70 %
  - 4 max 45 %
  - 6 max 70 %
  - 9 max 70 %

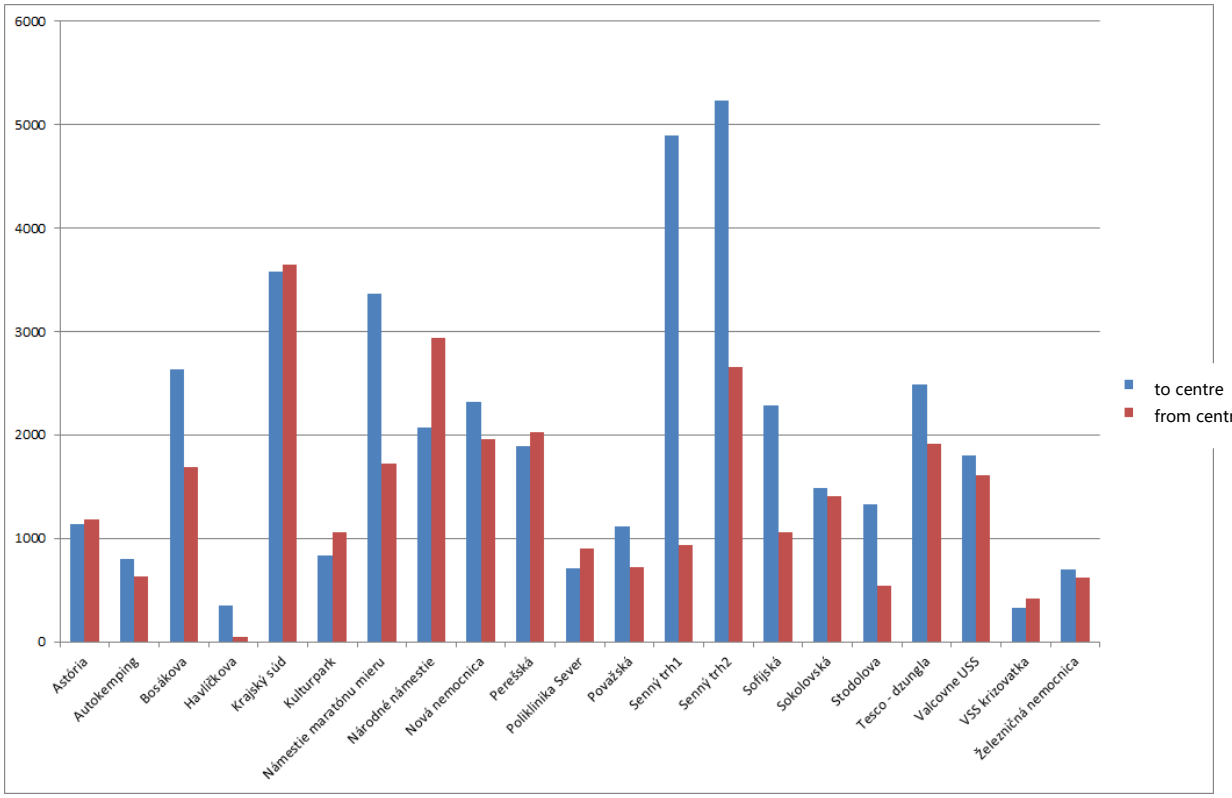
Public transport traffic volumes January 2015 – calibrated model:



- Highest PT traffic volumes are on the axes: North-east – South-west – parallel to highest road traffic PT volumes – mainly served by buses (trolleybuses)
- STOP Highest delays are in 4 junctions - all on major bus radial roads
- Tram-only links are loaded less then buses/trolleybuses – significant loads are however on south-eastern line and on tram bypass on SNP street.

Public transport traffic volumes 2015 – number of calculated passenger within 4 hours, graphs show the volumes recalculated to 24 hours (upper) and peak hour 7:00 – 8:00 (lower):





3.4.4 Questionnaire transport behaviour survey - households

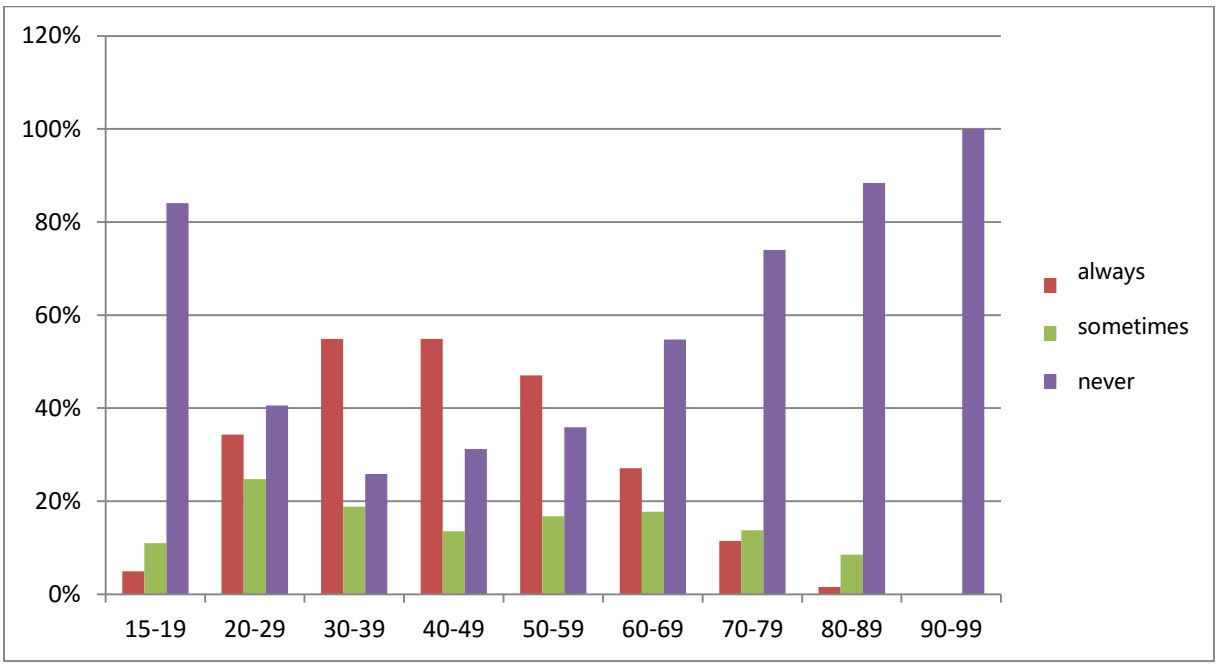
Methodology

The questionnaire survey was done by interviews in the households in December 2014 – February 2015,
The households were equally distributed among 179 urban-transport zones by random-walk method,
All members of households older than 6 years were questioned,
6516 from 228,4 thousands inhabitants above 6 years were questions, i.e. 2,85 %,
1610 of public transport passenger questioned, i.e. 1 %, the questioning took place at 20 transport nodes, BRAWISIMO methodology was used.

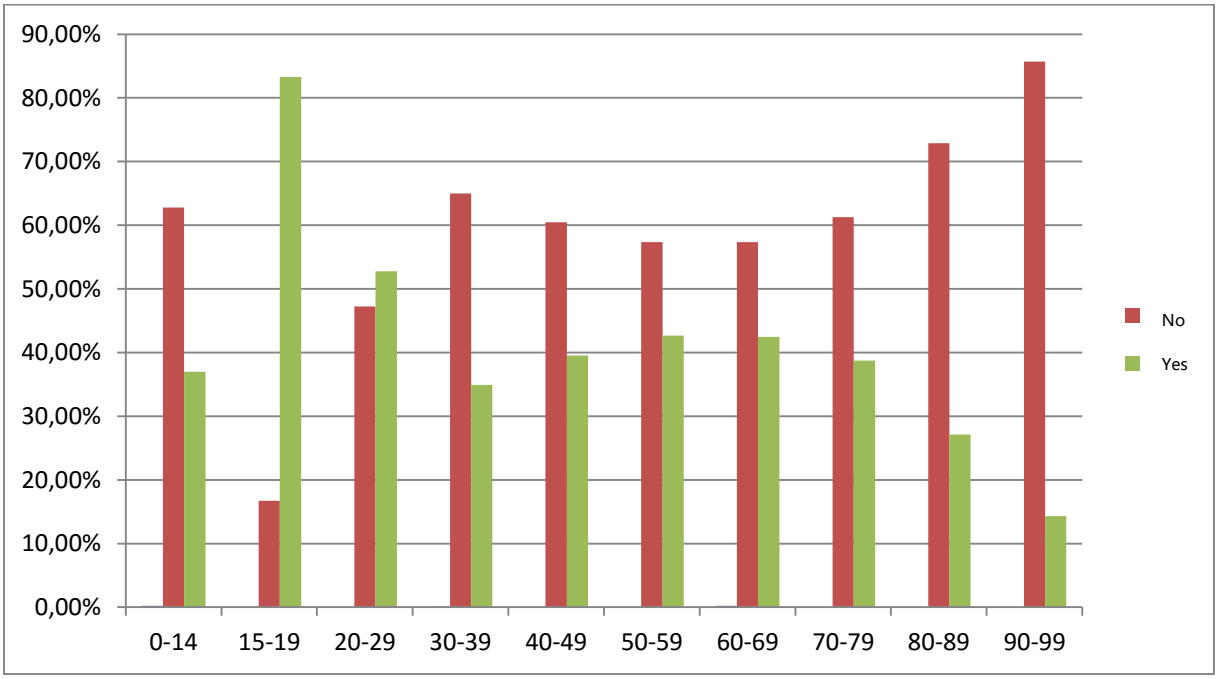
Findings – households:

- 152 thousands of inhabitants made some trips,
- Inhabitants of Košice city made 347 000 trips per day, 74 % of them did 2 daily trips,
- Mobility was only 1,51 trips per inhabitant according to interviews,
- Modal split: 43:43:1:13 (car:PT:cycle:pedestrians),
- Motorised modal split: 50:50,
- 74 % of inhabitants makes two daily trips,
- Car availability - always: 35 % (30 – 50 years of age: 55%),
- Bike availability - always: 13 %,
- Pre-paid PT ticket: 82 % (15 – 19 years), 35 % (30-39 years),
- Parking home: road 11%, garage 25 %, parking lot 44 %,
- Parking work: road 8 %, garage 3 %, parking lot 44 %

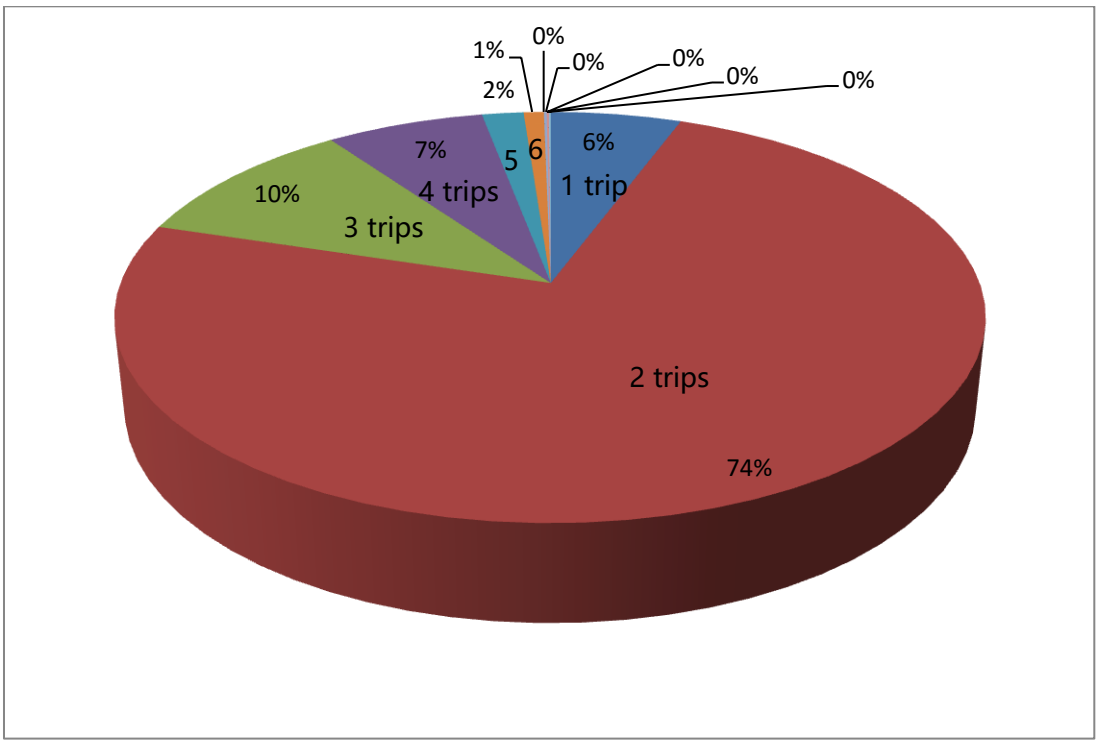
Availability of car for age categories:



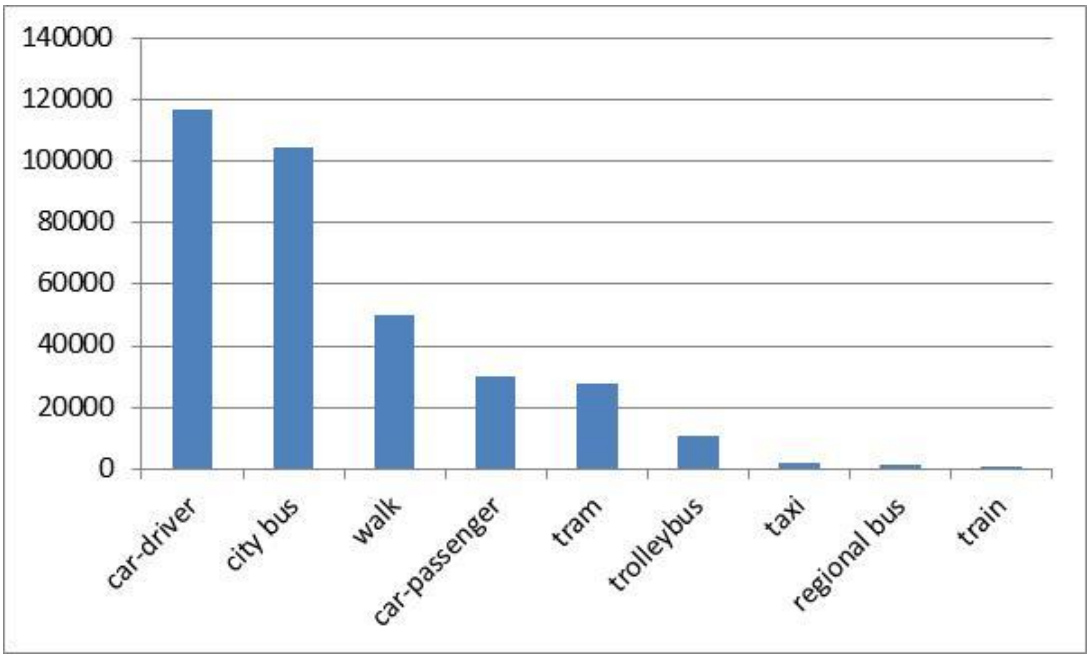
Ownership of pre-paid ticket for public transport for age categories (red=no, green = yes):



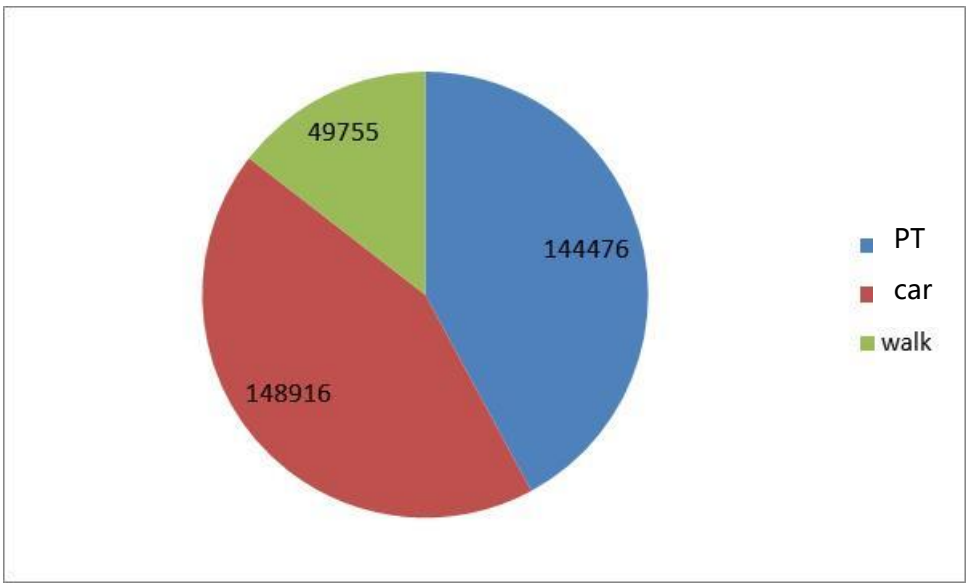
Numbers of trips per day per inhabitant:



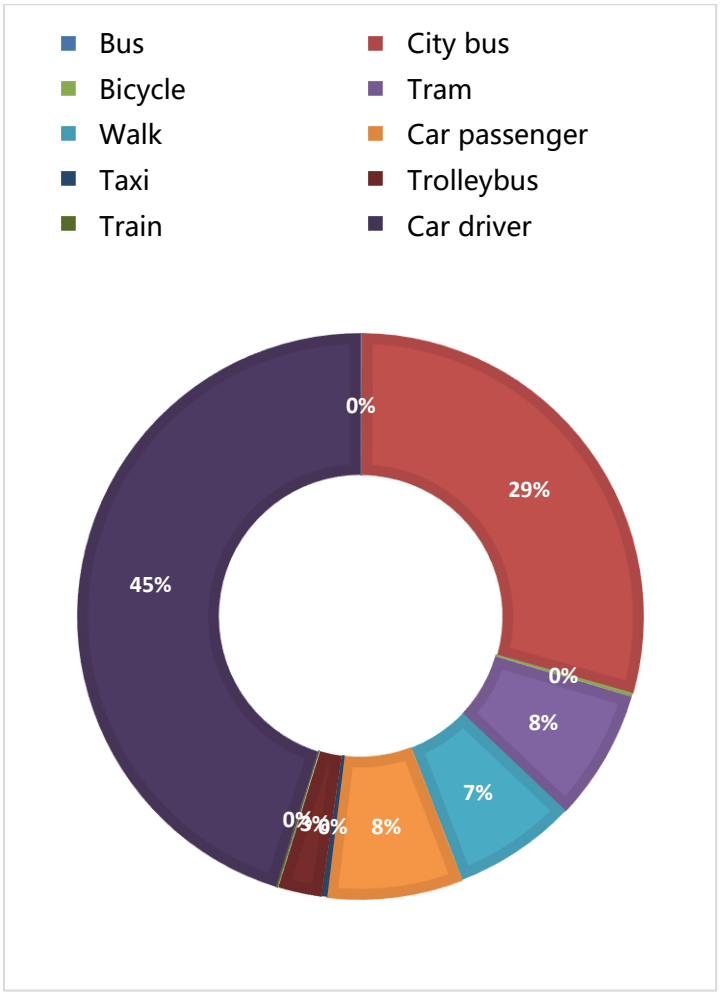
Numbers of daily trips by means of transport – Košice inhabitants only:



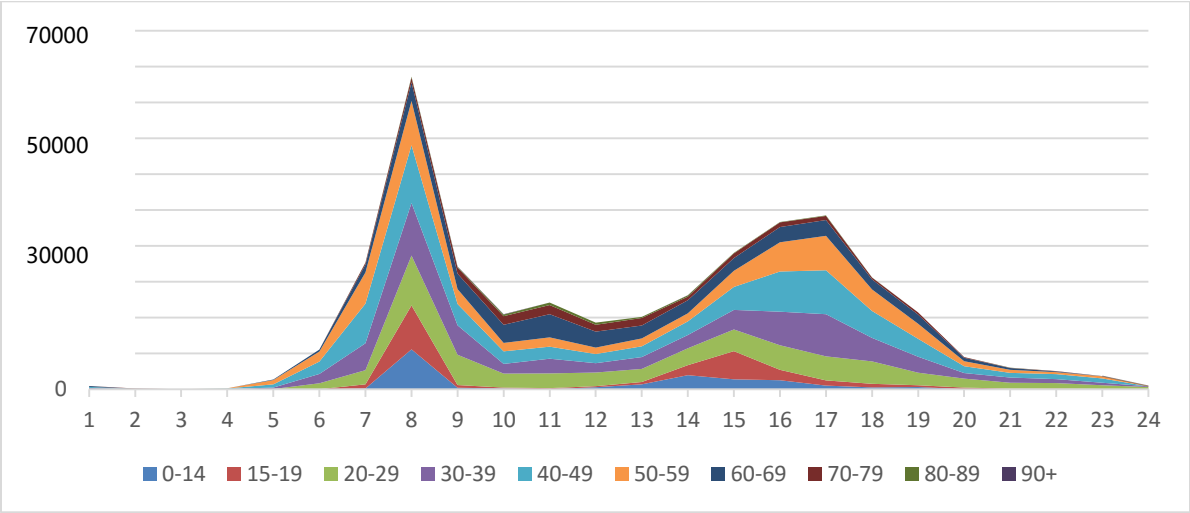
Modal split – Košice inhabitants only:



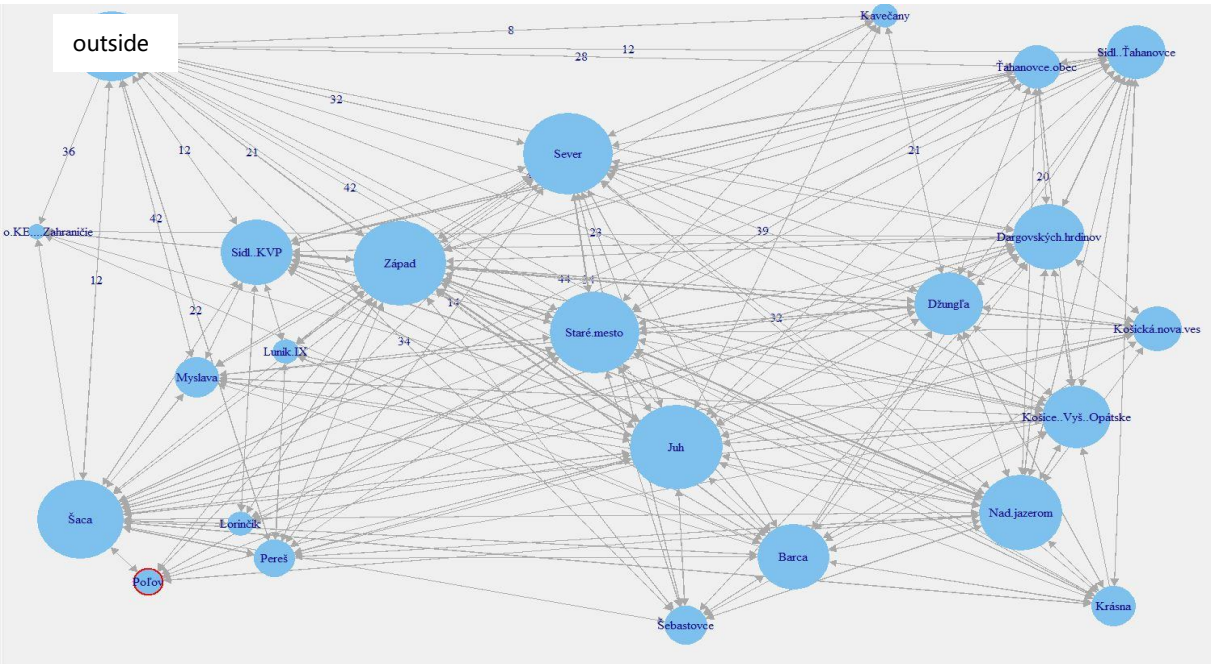
Modal split – commuting trips:



Number of trips per hour and age category:



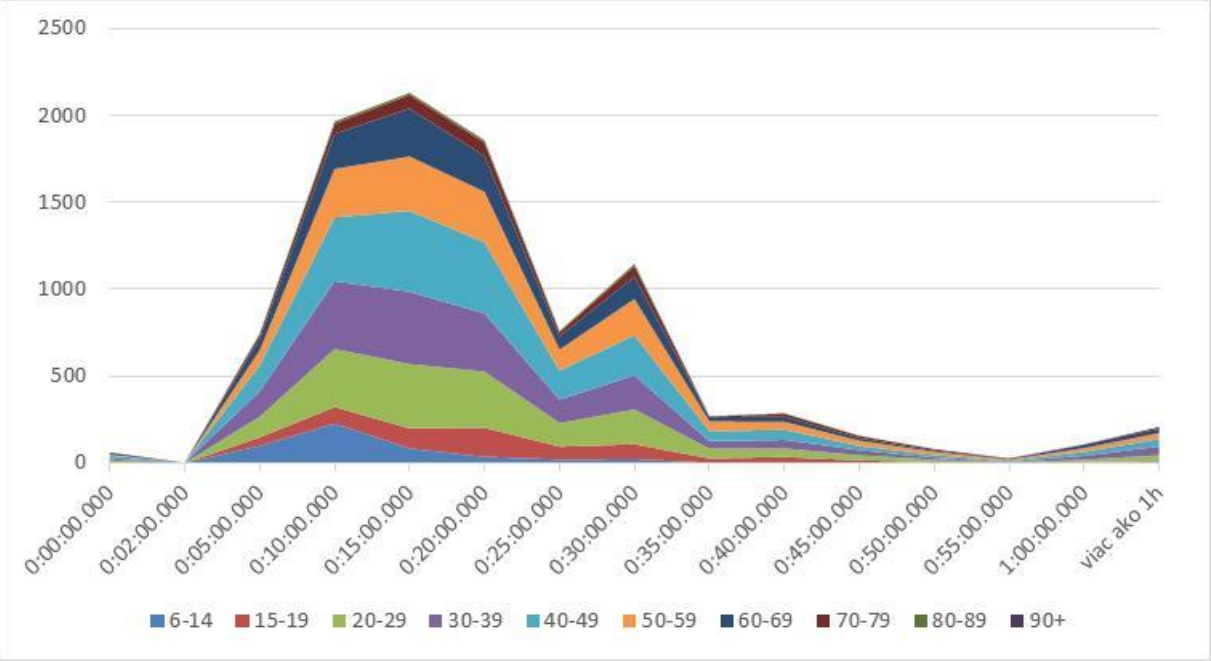
O/D relations among city neighbourhoods from questionnaire survey:



Conclusions:

- There is high share of car users in Košice
- Questionnaire results led to very sharp morning peak and limited number of afternoon trips (not only work – home trips) – unlike division of car trips (more afternoon) and PT (more in the morning).
- In off-peak 10:00-13:00 hours people below 29 and older than 60 create half of trips.
- Main O/Ds: Staré Mesto (centre), Sever, Západ, south of Dargovských hrdinov, Nad jazerom (housing estates), Šaca (U.S.Steel)

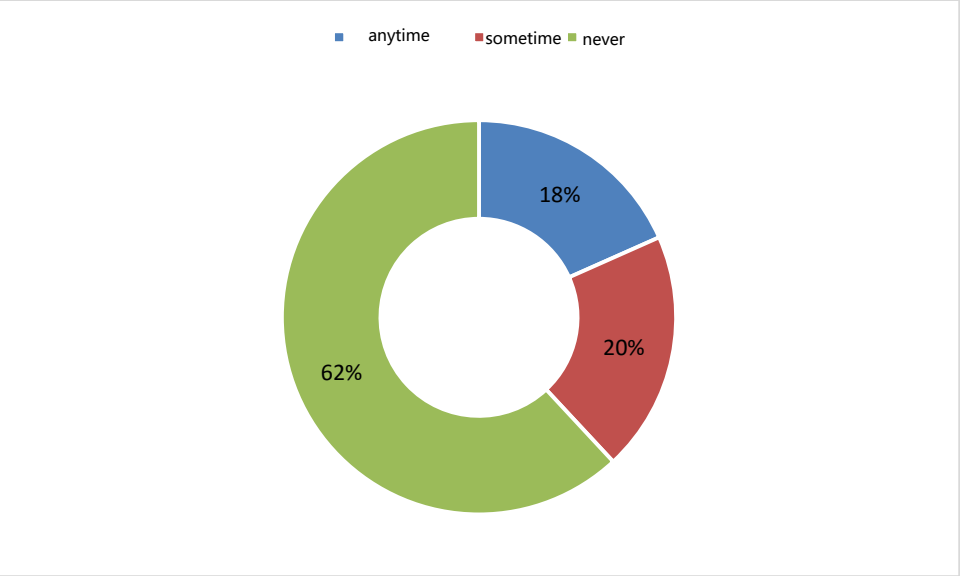
Lengths of trips in minutes with the division to the age categories:



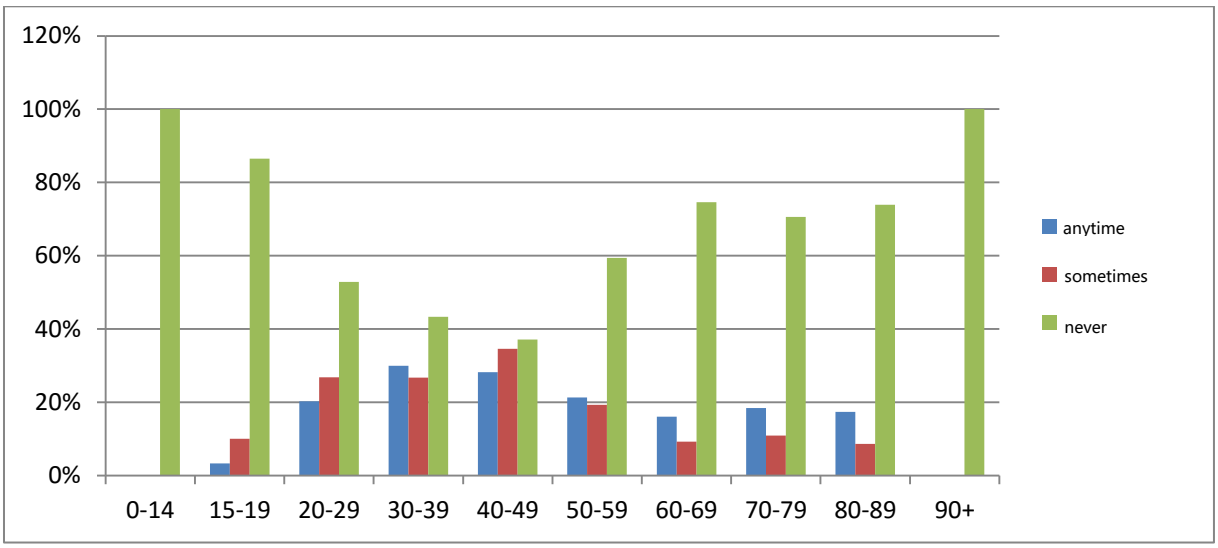
3.4.5 Questionnaire transport behavior survey – public transport stations

- The sample of 1610 passengers consisted of 59 % women and 41 % men, prevailing age category was 15 – 25 years, most frequent social status was student.

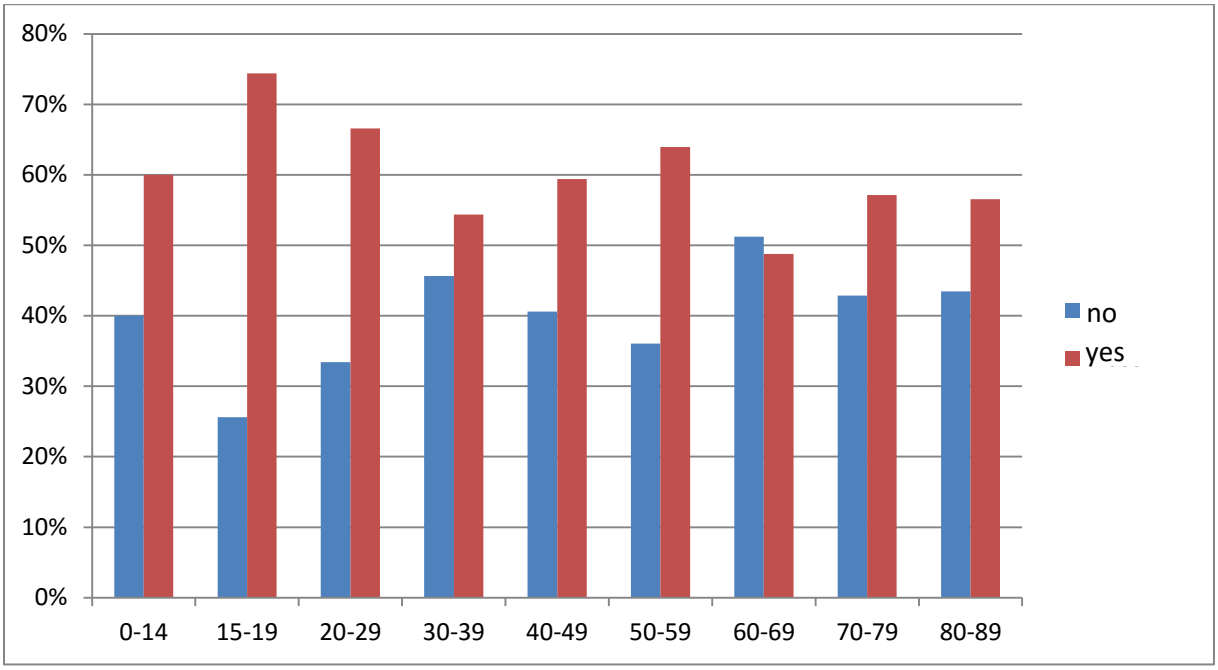
Availability of car:



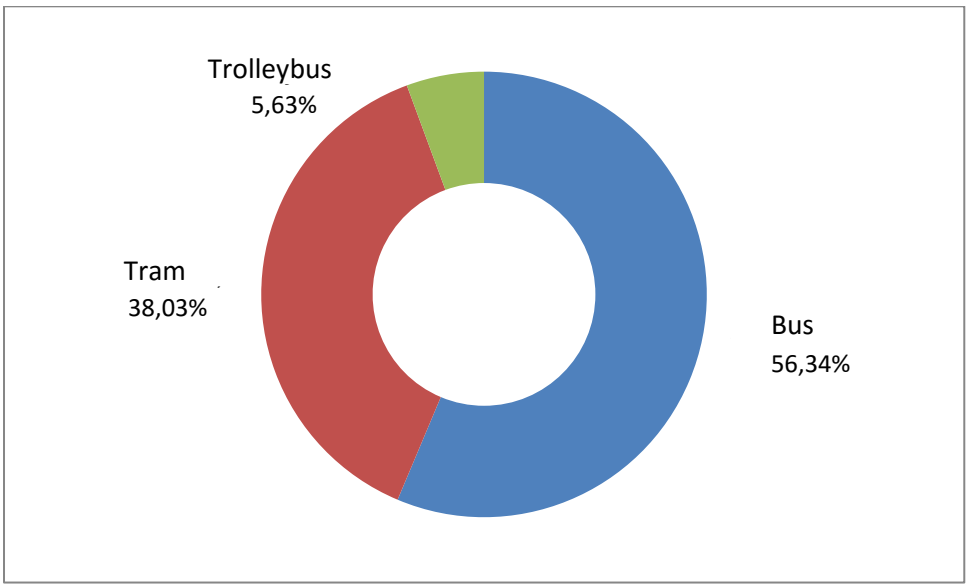
Availability of car by age categories:



Ownership of pre-paid ticket for public transport by age categories:



Used mean of transport for commuting (public transport modal split):



Conclusions:

- Only 18 % of public transport users can use car anytime,
- In age category 20 – 50 25 % can use car anytime
- In category above 50 it is less, more than 60 % of people above 50 using public transport have no other choice even occasionally
- Around 60 % of PT users is riding with pre-paid tickets
  38 % of people are using trams for commuting, trams are however offering only 24 % of vehicle-kilometres, popularity of trams is relatively high even with limited quality

3.4.6 Parking survey including car registration analyses

Methodology

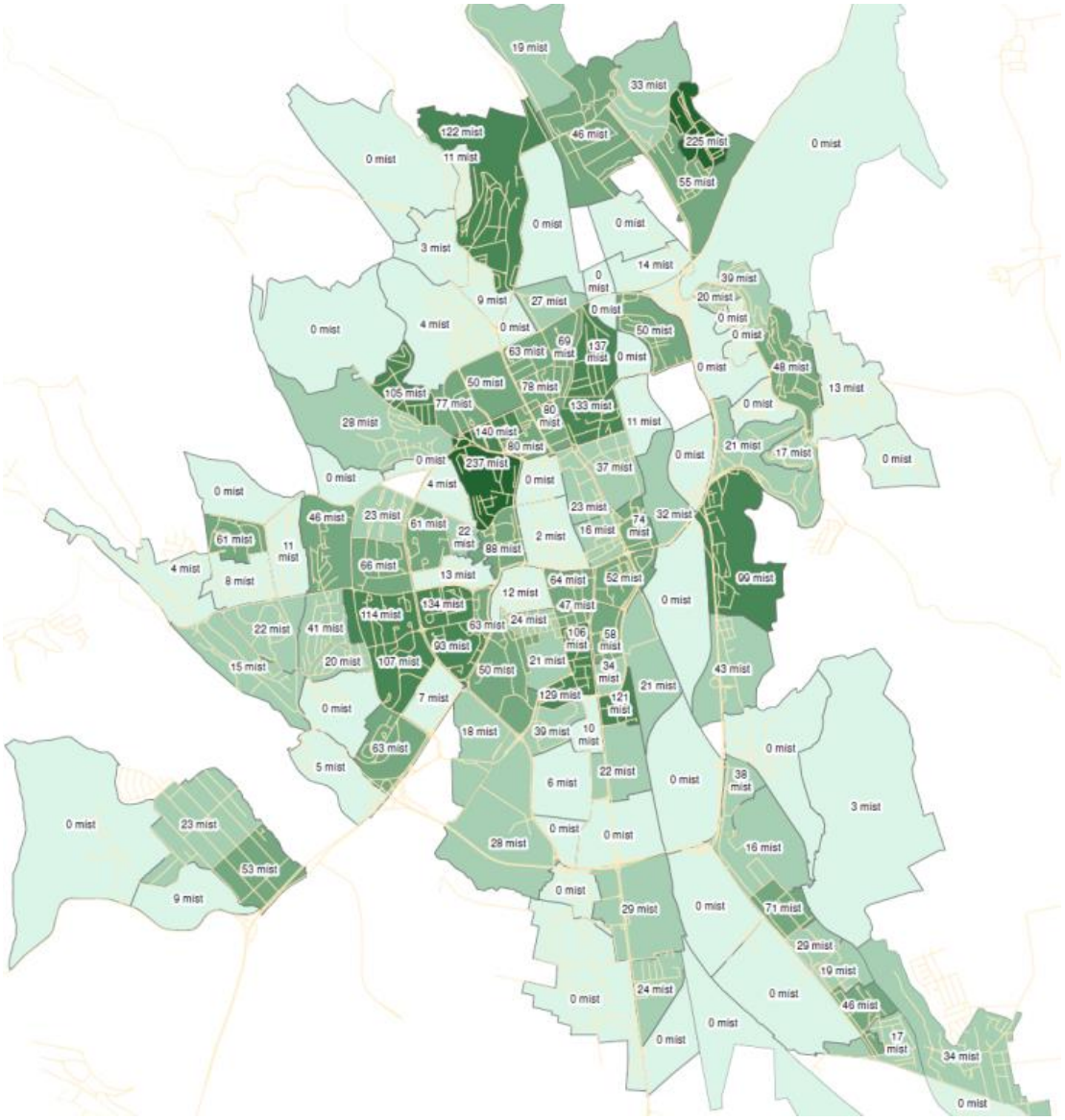
Survey was elaborated 10 - 12th March 2015 by camera recording of car plates. All location was recorded four times during the day and once at night. The database of all cars and their parking locations was obtain from Ministry of Interior, the numbers of registrations in the zones were compared with the capacities.

Findings:

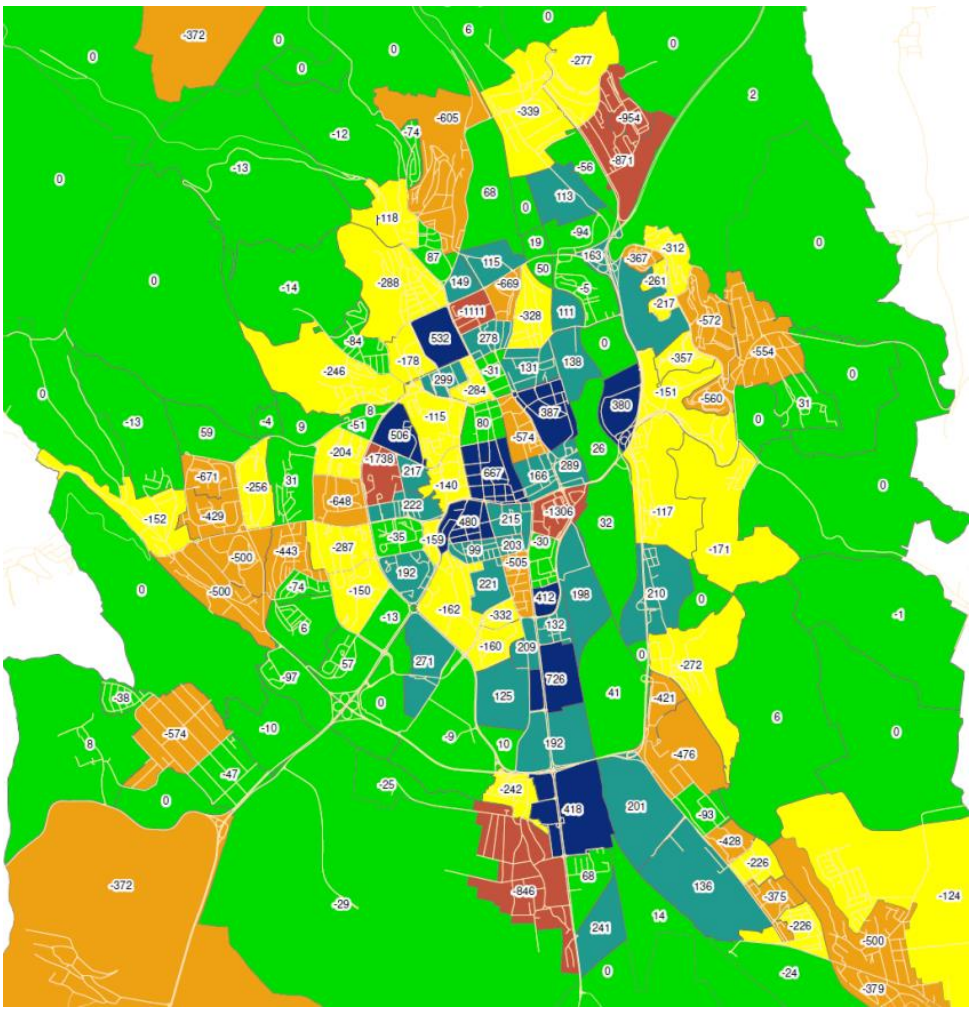
- Centre – regulated, stabilised, deficits only on some location, high exchange of cars, lower exchange in minor roads
- Around centre: Park+Go function observed, living quarters used for commuting parking - blocked off for residents during the day, capacity utilised at nights
- Ťahanovce, capacity 4600 cars, deficit 300 cars in day, 1350 cars at night (149 % of demand at night)
- Nad jazerom – capacity 4830 cars, deficit 220 places in day, 690 places at night (119 %)

- Dargovských hrdinov– capacity 5500 places, deficit 120 places, night deficit 760 places (116 %)
- KVP – lot of reserved parking places, capacity 6250 places, daily deficit 100 cars, night deficit 440 places (108%)
- Západ – many reserved parking, capacity 8530 places, daily deficit 770, night deficit 630 places (104%)

Parking deficits in the zones (dark colours show higher deficit):



Comparison of registered cars with zone parking capacities (red, brown and yellow are highest deficits):



Conclusions:

- There is stabilised situation in the centre even with illegal users present with structural problems in usage of different types of stands, the rights of inhabitants are very limited, there is no advantage given to local entrepreneurs and property owners
- The locations around centre are overused, parking for local inhabitants are blocked by visitors
- Most of incoming cars used for commuting are parked in private parking places
- Situation in eastern housing estates and parts of western estates is critical at nights, there is no free space and high share of parking is illegal

3.4.7 Transport safety

Methodology:

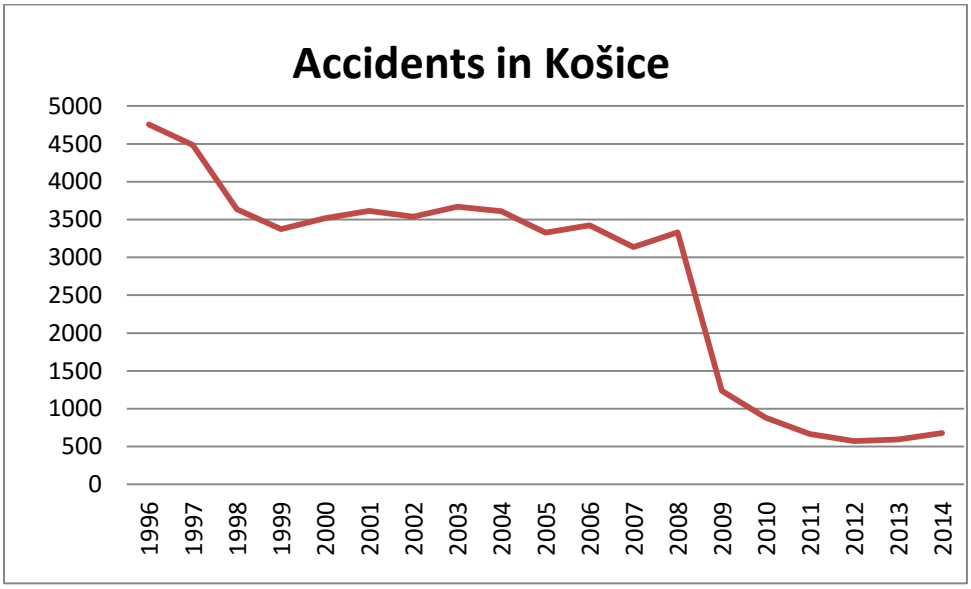
Data were obtained from Traffic Police report from 2001-2015 and from the interviews with Police.

Findings:

- Dangerous spots with recorded accidents:
  - Junction Komenského – Hlinkova and Národná - Hlinkova pedestrians use to cross on red light
  - Festivalové námestie – not adequate road design
  - Wrong solutions of junction Štefánikova - Hviezdoslavova – Gorkého (Jumbo)
  - Čermeľská street – to wide. too high speeds
  - II/548 in Pereš, dangerous junction and road layout
  - Missing traffic control Popradská – SNP
  - Dangerous junction Panorama on state to road I/19
  - Košická Nová Ves – missing bypass
  - Missing bicycle paths along Moldavská cesta
  - Dangerous link by Nižné Kapustníky, division of road needed
  - Južná – Podnikateľská – Kubíkova junction is dangerous with bus stop on the junction
  - Krásná nad Hornádom – missing bypass
  - Slanecká cesta – accidents after third lane implementation
  - Safety risk can occur in connection of Park Anička to Vodárenská
  - Jakabov palác, many minor accidents, probably slippery road.
- Further dangerous pedestrian location:
  - Hlavná by Rosseveltova and Bačíkova
  - Junction by Jumbo
  - Festivalové námestie
  - Lack of crossings on SNP
  - Južná street
  - Around Optima shopping mall
- Further dangerous spots or Public Transport:
  - Sečovská x III/3410
  - New hospital
  - Kostolianská x Cesta pod Hradovou
  - Sečovská x Herlianska x L. Svobodu
  - Luník VIII – Petzvalova
  - Šaca I/16 x Železiarnská

- Further dangers spots for car transport:
  - Popradská x Ipeľská– missing traffic lights
  - Toryská x Moldavská cesta – missing traffic lights
  - Roundabout Moldavská cesta x SNP
  - Junction on KVP street
  - Multilevel junction Slanecká x Nižné Kapustníky
  - Junctions on Slanecká
  - Lane changing by Jakabov palace

Overview of numbers of accidents in last 40 years (change of legislation in 2008 caused sharp administrative decrease of number of accidents due to no recording small accidents any more):



Conclusions:

There is often dangerous and inconvenient position of pedestrians on most of crossings, accidents do not occur so often only due to limited rights of pedestrian to cross the street.
Dangerous spots occur due to old fashioned layout of some junctions and many uncontrolled junction on high capacity roads with high speed and volume of transport.
Dangerous are some of multilevel junctions – especially Nižné Kapustníky with undivided road section.
There are dangerous conflicts of bicycle/pedestrian paths with roads on city outskirts and by main junctions.
Heavy traffic via neighbourhoods with through traffic on access roads to the city causes dangerous situations.
Dangerous connections occurred on the connections of some new housing projects.
Some recent capacity enhancements caused more accidents (e.g. Slanecká)

Dangerous spots are mostly of following types:

- Curved roads with fast traffic
- Complicated junctions with aged dangerous details
- Uncontrolled junctions with multilane roads
- Dangerous uncontrolled pedestrian crossing across more lanes
- Crossing on red lights caused by very long waiting times in complicated junctions with many transport islands

3.5 Organisation, management and financing

Methodology:

The review of organisation and management of transport affaires in the city of Košice was elaborated based on official sources and interviews. The figures on financing were taken from municipal budget 2015.

Findings:

- The organisation and management of transport system is multi-level and rather complicated Slovak republic, ZSR, NDS, Košický samosprávný kraj, Okresný úrad Košice and city Košice involved, but there is at the lack of institutional capacity to manage municipal transport in Košice in the most important authority – Municipal office of city of Košice (both organisation of road transport and management of public transport). The system works only due to high efforts of limited staff in Main architect and Transport subdivisions
- Lack of financial resources for infrastructure maintenance, no system of infrastructure management
- Lack of financial resources for public transport operations according to benchmarking with similar cities
- Management of public transport (non-existing on municipal level) and of public transport company does not sufficiently react on critical situation in financing
- No integration with suburban public transport, parallel services of two systems have negative economy impact, Memoranda with regional office are being signed, but practical cooperation is not going on at first due to limited capacity of Municipal authorities
- The municipal budget of Košice for 2015 – 126 mil.€ means 525 € per inhabitant and year, Transport gets around 23 mil.€ (19%), i.e. 95 € per inhabitant (to compare: Plzeň has 1430 € per inhabitants and allocates to transport 25 % of the budget, i.e. 357 € per inhabitant),

- Košice has only 6,75 mil.€ (28 € per inhabitant) for maintenance of transport infrastructure – this does not allow to realise any investment or major improvements of the infrastructure without external sources.

Conclusions:

City of Košice lacks institutional and financial capacity to organise and manage its transport system. The financing of compensations of public transport does not allow providing competitive public transport.

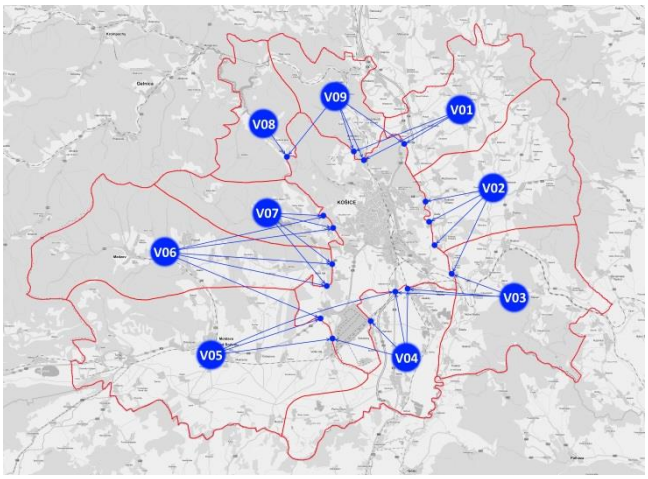
4 CURRENT STATE MODEL

Conventional four-step demand transport model was created in the software PTV VISION containing all main infrastructure networks. The transport behaviour is elaborated on the level "trip" . There have been elaborated these models:

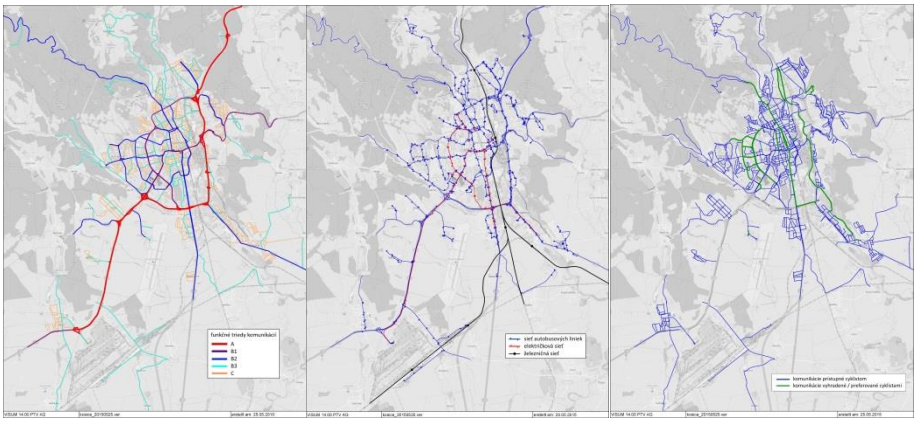
- Cars transport
- Public transport
- Bicycle transport

4.1.1 Transport demand model

179 traffic zones were created. These zones without rest cover the entire area of the city and there are further 32 external zones from those 9 zones defined closest surrounding of Košice:



Three networks were defined – road, public transport and bicycle:



Road network:

The road network consists of roads from functional groups A, B, C1 and other selected service roads. Impassable areas of network were excluded. Categorization of communications is based on the current spatial plan.

Public transport network:

Public transport network consists of three parts: rail network, tram network and bus (trolley-bus) network. Trains and trams have their own network and they are greatly independent of the road network. Core of bus lines network is a part of road network. Operation of public transport is allowed on selected links and stops are placed on these roads. On this network are stretched lines, which are described by complete sequence of stops and timetable.

Cycling Network

Network to cycling is based on road network, from which are excluded roads only for motor vehicles and added trails for non-motorized transport.

4.1.2 Connections of zones and transport networks

Each zone is connected to a network with several connectors which can be used for all or only for selected transport modes. The basic division of connectors is on connectors for individual transport (PrT) and connectors for attendance at public transport stops (PuT).

4.1.3 Calculation procedure

In first two steps (trip generation and trip distribution) were created matrices for all demand layers, which were divided in the third step (mode choice) for partial matrices for different transport modes. In the last step (assignment), these matrices are allocated to the transport networks with limited capacity. Algorithm Equilibrium is used for assignment in car and bicycle models and algorithm Timetable is used in model of public transport.

5 TRANSPORTATION ANALYSIS

5.1 Transportation system overview

Transport system of city of Košice consists of the road subsystem owned by NDS, railways owned by ŽSR, partly privately owned airport, city roads, public transport network, bicycle paths network and pedestrian paths. Motorways and the roads of 1st class are owned by state, the roads of 2nd and 3rd class are owned by Košický samosprávny kraj, but all responsibilities for its maintenance and development was shifted to Košice city – in practice there are two road subsystem – national and municipal as for responsibilities and financing (with some differences in road administration).

Tram and trolleybus tracks are developed and managed by DPMK owned by city of Košice, than there is the system of regional bus lines managed by Košický samosprávny kraj and railway lines managed by Ministry of Transport. Bicycle and pedestrian paths are municipal; the development of regional bicycle paths is to be coordinated with region authorities.

The main problem of municipal road system is connected with limited administrative capacity and limited resources for road administration maintenance. The systems is very well developed as for its capacity, nevertheless it will need the upgrade of traffic control system, some local improvements and modernisations and regular maintenance. The resources of the city are not sufficient for these activities.

In the field of public transport, there was already in data collection partly described the problem of limited resources for compensation payments and the fact, that the city is not able to maintain properly public transport infrastructure.

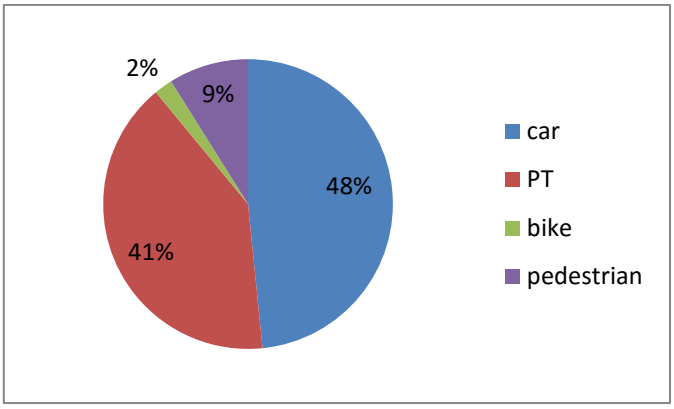
Another proven fact is that there is no possibility to develop integration of municipal and regional public transport in existing status of management of transport systems, when DPMK manages itself the PT concept and operational scheme.

The main horizontal problems are therefore lack of administrative and funding capacity of Municipality of Košice, missing transport policies as public transport preference or support of sustainable non-motorised transport and lack of capability to develop integrated public transport system.

5.2 Travel patterns

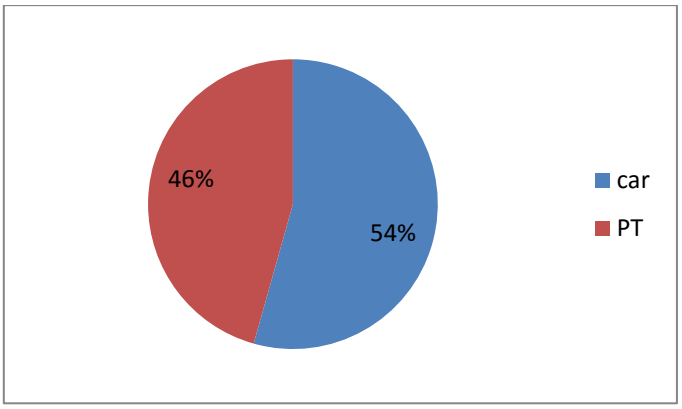
According to elaborated transport model there are 730 thous. daily trips – which means mobility 3 trips per inhabitant (it is double in comparison with household surveys results due to higher share of non-traveling people in the sample visited during working day and high mobility of visitors). 649 thous. trips (89 %) are motorised trips, 353 thous. trips are realised by cars daily and 300 thous. by public transport, 258 thous. is served by municipal transport daily.

Modal split in Košice in 2015:



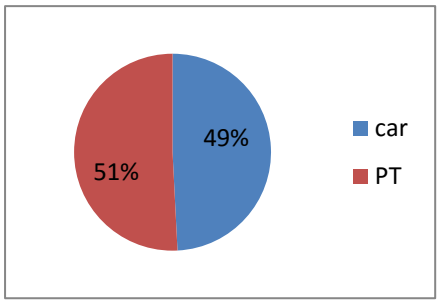
- Non-motorized transport is used only for 11 % of trips, 48 % of all trips are car trips

Modal split in Košice in 2015 – motorised trips only:

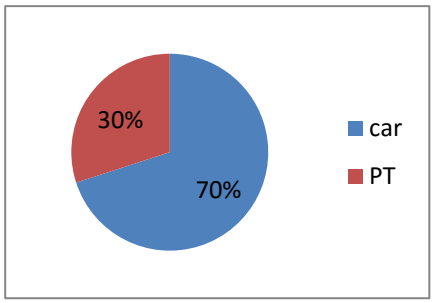


- Share of car transport on all motorised trips is 54 % if all trips (intra city, outer and transit) are considered. City dwellers use cars for 50 % of trips.

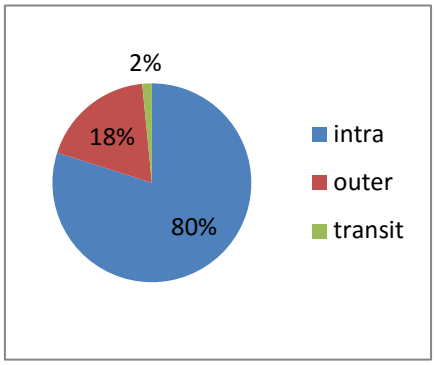
Modal split - internal trips:



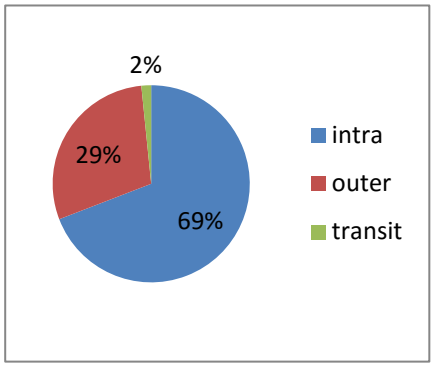
Modal split – outer trips:



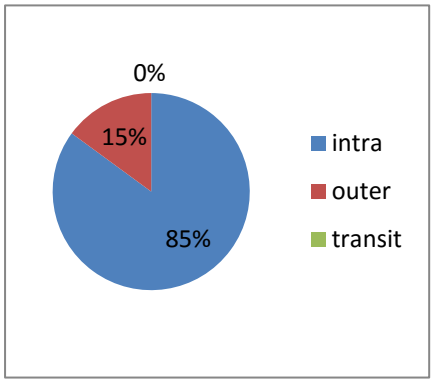
Types of trips - all passengers:



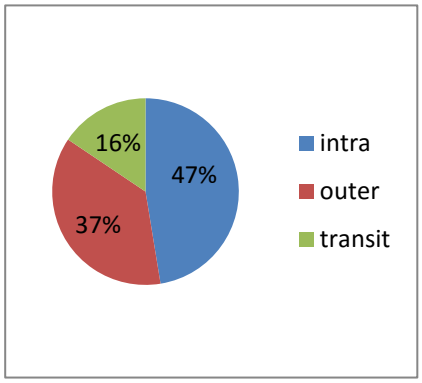
Types of trips – passengers in cars



Types of trip - public transport:

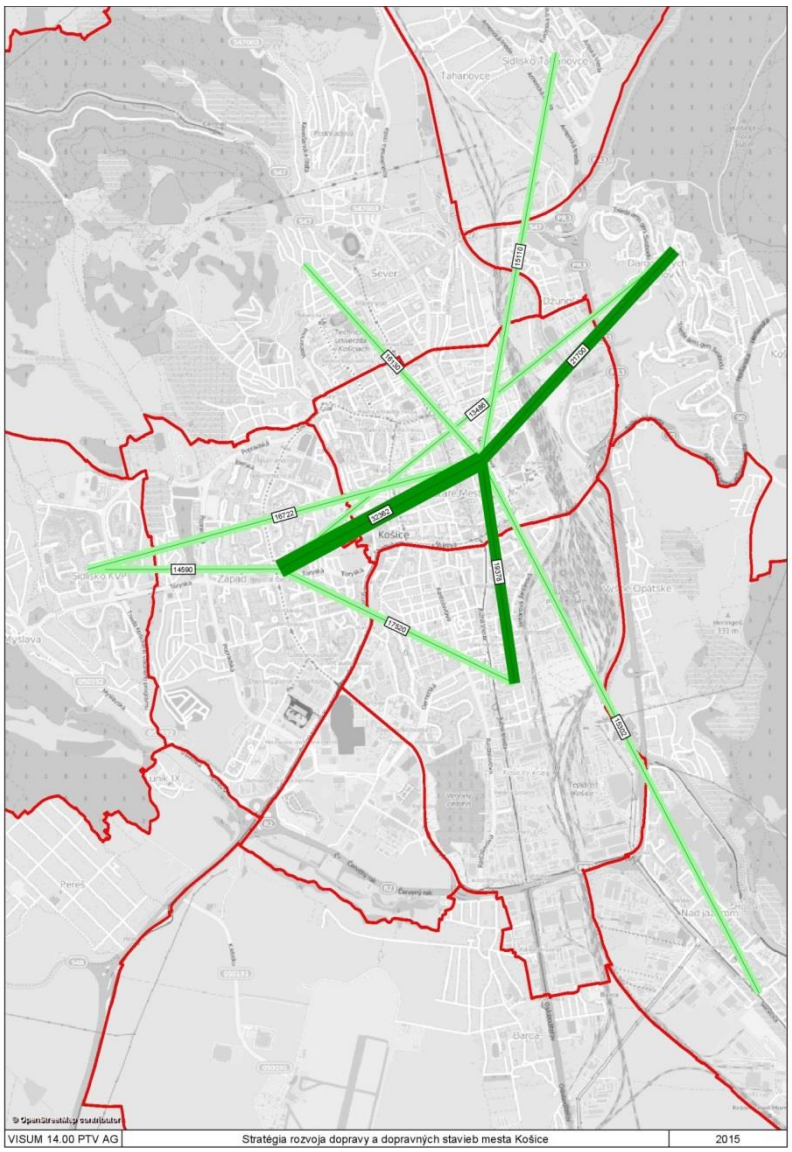


Types of trips - freight transport:



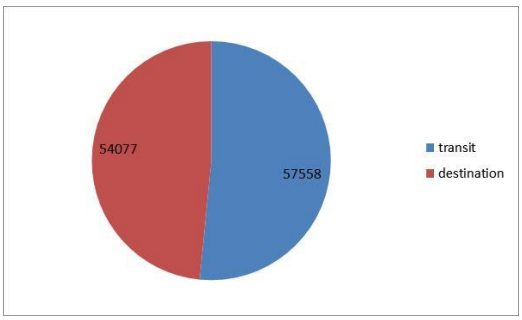
- There is done 353 thousands of car trips daily in Košice, from those 240 thousands (70 %) by city citizens, 40 percent of trips are trips crossing the city limits (outer and transit trips),
- Transit car traffic share is only 1,5 % of trips, transit of freight traffic creates 16 % of all trips, together there is 3 % of transit transport,
- The traffic output of passenger road transport is 1 902 294 vehkm daily, transit creates 4,3 % of transport output.
- The traffic output of freight road transport is 246 924 vehkm daily, transit means 20 % of output.

Numbers of internal daily car trips between city segments (10 strongest O/D relations):



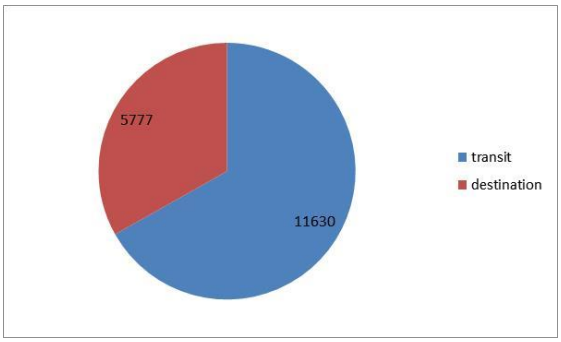
- The strongest transport relations are from Západ, Juh and Dargovských hrdinov to the centre.
- There is 111 635 car trips entering daily the central zone, more than 50 % from them is transit through centre:

Central zone:

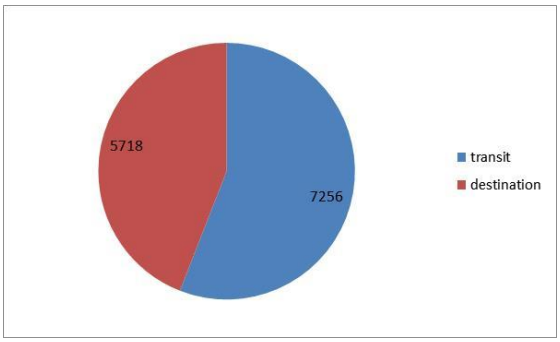


- Highest shares of transport through centre are on Hlinkova and Palackého street
- Through traffic is using streets of old town (Bačíkova, Zbrojničná, Rooseveltova, Senný trh),

Hlinkova:



Palackého:



5.3 Road infrastructure analysis

There is visible from the traffic model volumes scheme that by capacity and its usage there are three major access roads to Košice:

- North-eastern PR 3 feeder (connection I/68 or I/20 and D1) from Prešov
- South-eastern II/ 552 from Slanec
- South-western R2 (also I/50 or I/17) from Rožňava

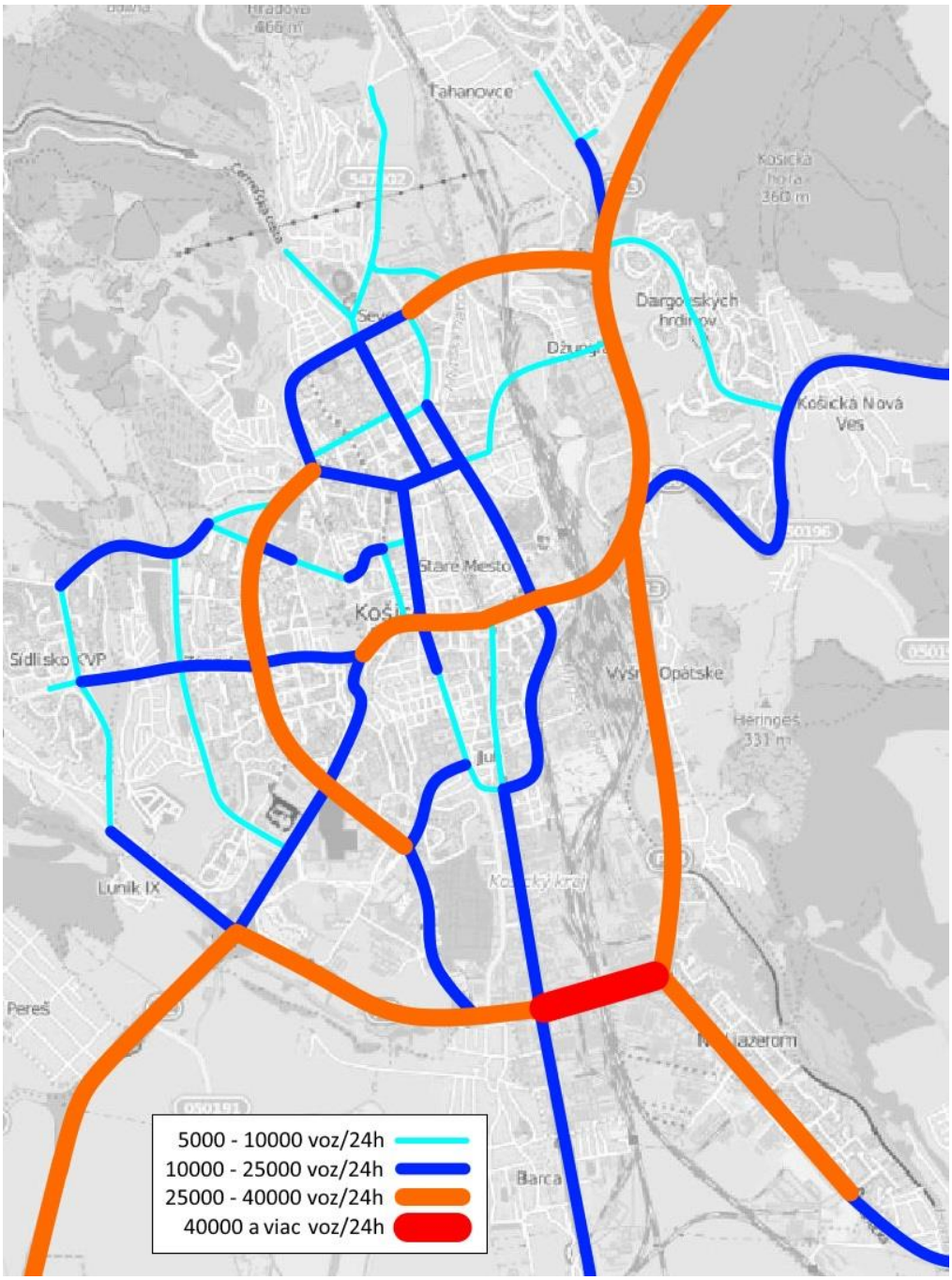
Two major access roads to the city centre from the East:

- Hlinkova (II/547)
- Palackého – Štúrova

These roads are interconnected by heavily used circles:

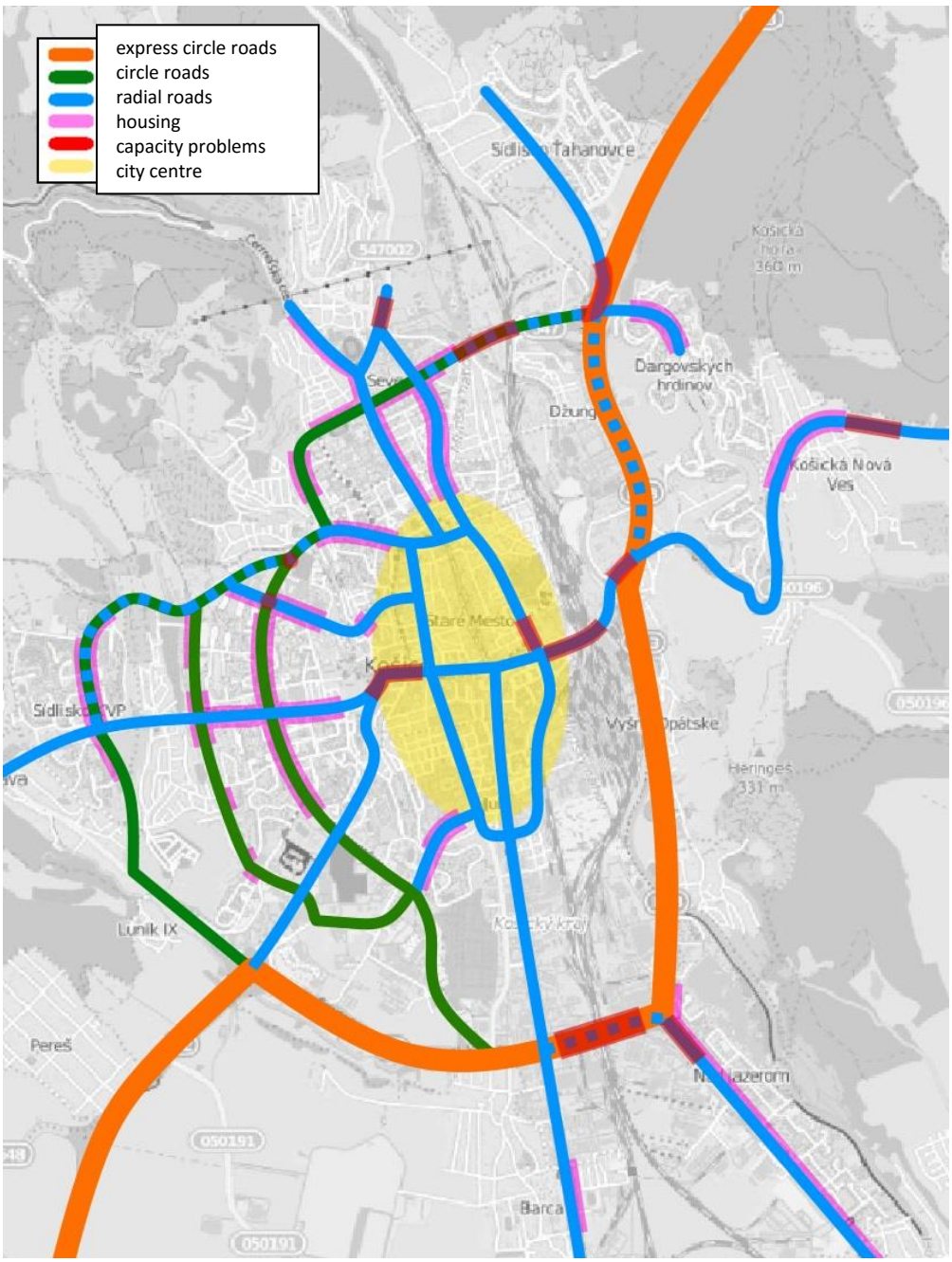
- Eastern express transit road PR3 – R2: Prešovská - Južné nábrežie – Nižné Kapustníky
- Western city circle road: SNP street

Scheme of current traffic volumes in Košice



All major bottlenecks are in the spots, where limited capacity of controlled junctions or multilevel junction ramps with single lane occur on the roads with traffic volumes higher than 25 thous. veh/day.

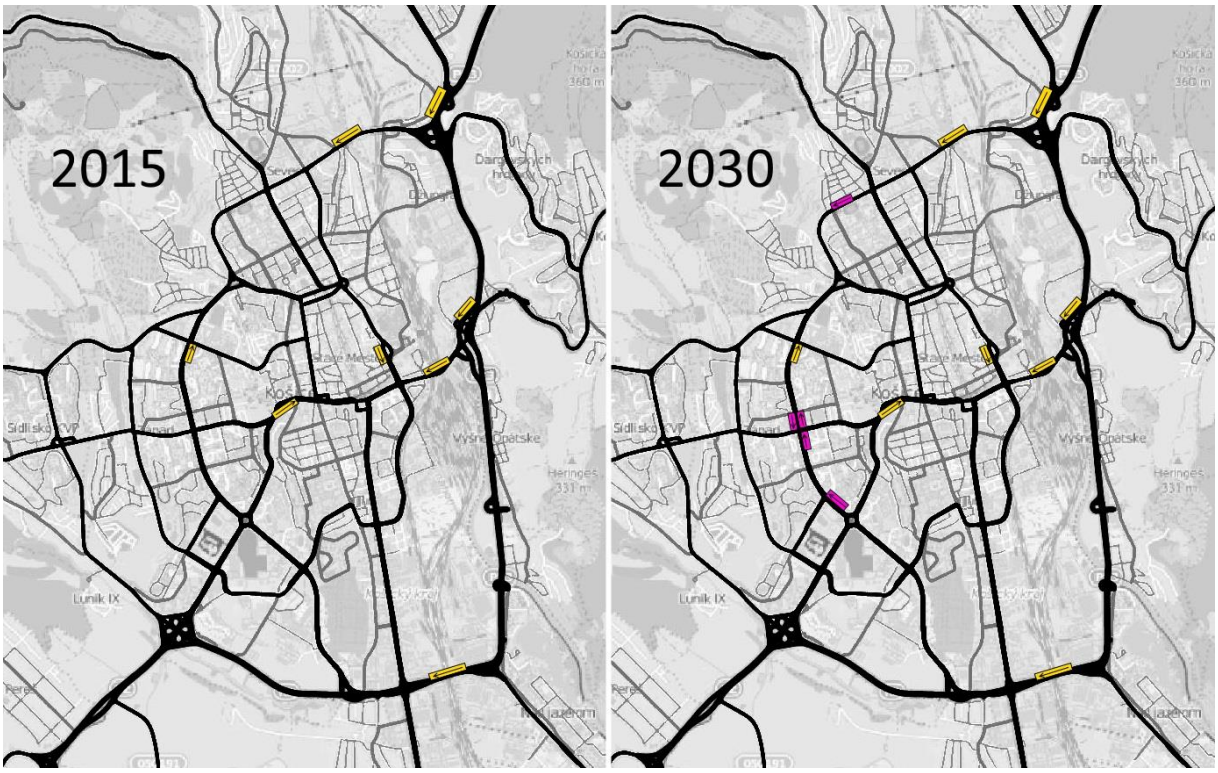
Functional analysis of road infrastructure 2015 and its surrounding environment



- Northern parts of circles are used for radial trips too and thus are overloaded
- There are three diameters passing through the centre causing high transit volumes
- There is generally high capacity express circle available but not used for intra city and destination trips enough due to high attractiveness of through roads, local bottlenecks causing delays (Prešovská – Sečovská and Nižné Kapustníky junctions) and difficult accesses from express road to the centre from the east (only three bridges over Hornád and railway, all with local bottlenecks).

- Western circle road SNP – Alejová passes through the dwelling zone and it is not best position for its function, but there is not possible to build bypass and its layout allows, that it can be used by high volumes of road transport as it has no conflicts with public and bicycle transport and its capacity is reasonable. Environmental threats remain, the aim is to attract pore traffic o eastern branch of the circle. Other western circles roads Popradská and Trieda KVP have local functions and they should be protected against the growth of traffic volumes.

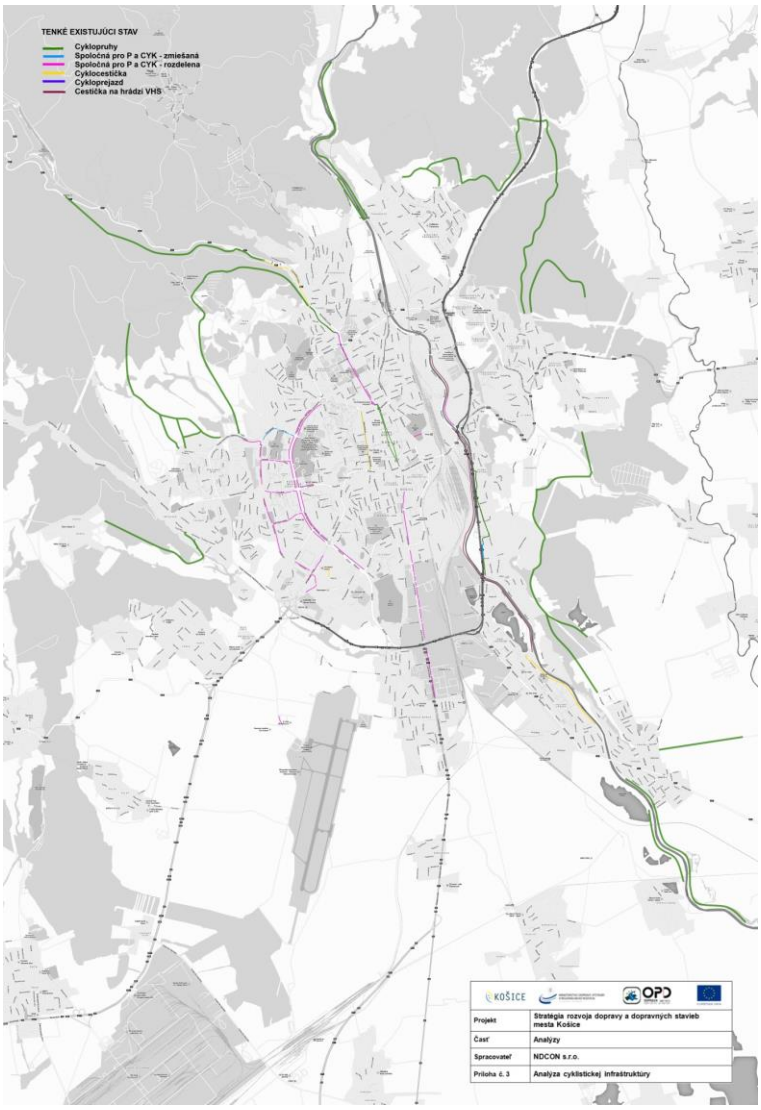
Analyses of road infrastructure capacity and usage in 2015 and 2030 (no project option)



- There are five junctions and two sections overloaded in morning peak hours in 2015
  - Hlinkova – Vodárenská from the east
  - Palackého – Bajzova from the east
  - Protifašistických bojovníkov – Rooseveltova from the north
  - Štúrova – Kuzmányho from the west
  - SNP – Ondavská from the south
  - Multi-level junction by Džungľa from the north
  - Multi-level junction Prešovská – Sečovská from the north
  - Multi-level junction Nižné Kapustníky from the north to the west
- Three more junctions are expected to be overloaded by 2030 with no projects
  - SNP – Bardejovská from the south
  - SNP – Toryská from the south and north
  - SNP – Laborecká from the south

5.4 Bicycle transport analyses

Extent of bicycle infrastructure 2015:



Košice has limited extent of bicycle paths by Hornád (from Nad jazerom till centre), south – north paths on sidewalks of Južná – Hlavná – Komenského and the paths on sidewalks in Západ housing estate, Dargovských hrdinov estate has no suitable bicycle access.

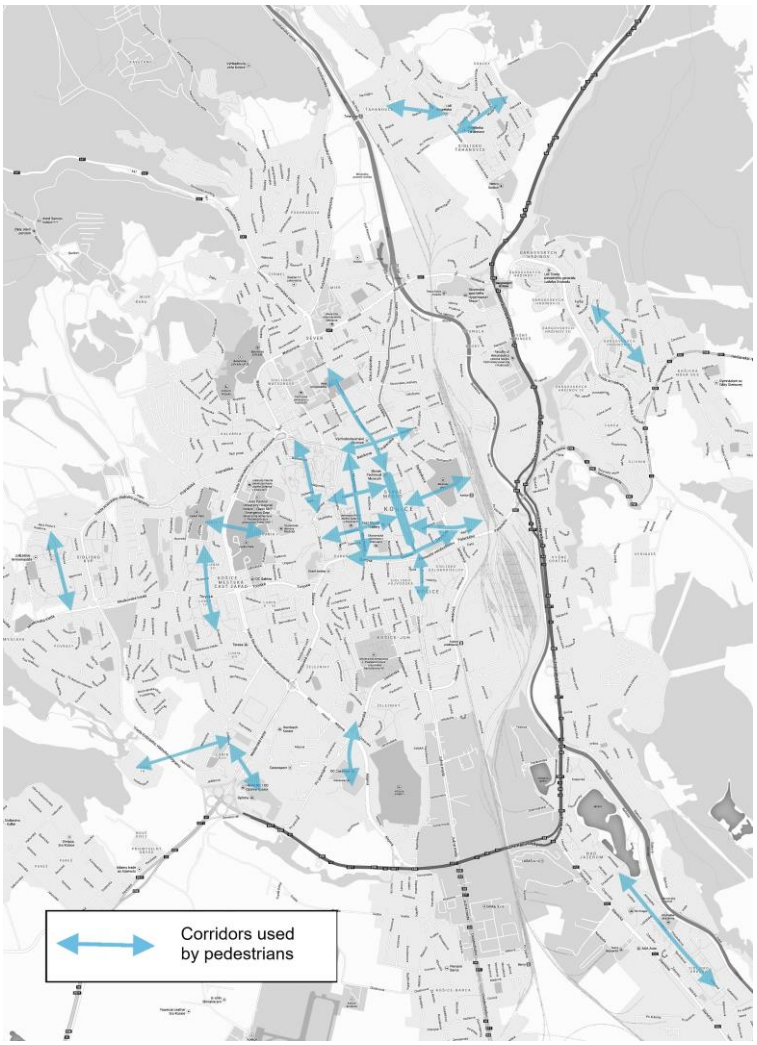
There are no bicycle lanes and bicycle use in housing estate prevails on sidewalks.

Recreational paths are not well connected to the city paths. Crossing with roads are often dangerous, controlled crossing usually causes long delays for pedestrians.

Share of bicycle trips is approx. 2 %, but it is rapidly growing. The arrangement of the sidewalks with allowed usage of bicycles will face the problems with conflicts between two groups. Hlavná street with bicycle lanes faces problems with conflicts between bicycles and pedestrians already now.

5.5 Pedestrian transport analyses

The corridors used by pedestrian traffic 2015



Most people walk inside the old town, where large pedestrian zone was created in 1996. Its quality is high, but there are several disturbing and potentially dangerous crossings with car traffic (Bačíkova, Zbrojničná, Roosveltova, Senný trh) and car traffic is allowed in the section between Kasárenská and Bačíkova in one direction.

Other strong pedestrian relations head from the centre towards railway station, to the business district by Cassovar in the west, along Komenského and to the south. There are important pedestrian links in the housing estates connected to local commercial centres and public transport stations. Some of these relations have not suitable available infrastructure and pedestrians are forced to cross main roads without safe pedestrian crossings.

5.6 Public transport analyses

- The costs of public transport operation including depreciations are growing and are higher than revenues, PT company DPMK creates losses
- Subsidy by the city reached 67 € per inhabitant per year, i.e. three times less than in comparable city of Plzeň (CZ)
- Bus depreciations create 15 % of public transport costs, trams depreciations are not concerned (EU funding)
- Line system offers mostly direct connections by many lines in relatively long headways, tram lines do not serve neither backbones nor coordinated system with guaranteed interchanges, there are long and unequal headways even on trunk tram lines
- Parallel service tram/bus and PT/regional transport
- Big part of the city is served by buses only, special peak hours lines are operated, the capacity of vehicles is used up to 100 %. Problematic public transport service to some neighbourhoods (Sídlisko Ťahanovce, Luník IX). Sídlisko Ťahanovce has exceptionally high usage of public transport but slow PT access to the centre in morning peak is slow, there is missing high capacity fast PT line to Sídlisko Ťahanovce uneffected by heavy car transport. Luník IX bus line operation is available only with 30 min. peak headline, but the problems of the service are more social than transport ones.
- Some less frequent bus lines are used to low extent (direct lines from small neighbourhoods to the centre)
- Price of bus of operation is declared as high due to new fleet purchased in last years
- Low quality of trolleybus infrastructure and rolling stock and unreconstructed tram infrastructure
- Missing transport control on U.S.Steel high speed line (tram track in the country landscape might run faster with train traffic control system) missing interchange terminals for bus connections to trams, inefficient operations is oriented to commuters to U.S Steel only
- Nearly no preference of public transport in the junctions and missing bus lanes causes low speed of trams and delays of buses/trolleybuses in peak hours
- Limited access to the historical centre (no traffic on Hlavná, limited traffic on Moyzesova)
- Missing well designed interchange stations, low quality of stops
- Missing integration with suburban transport, missing terminals of suburban transport outside the centre, although up to 35 % of journeys in public transport is created by city visitors, cars usage by them is prevailing (there is 17 % of regional transport trips used by commuters and similar number of journeys is likely to utilise municipal transport).
- Low density of suburban trains, no trunk function of trains

- No transport management system
- Buses on motorways with high speed of cars and toll as outer circle road (PR3) and radial road from Šaca (R2) were defined as a part of national expressway system with the speed limit 80 – 130 km/h and necessity to pay toll for buses.

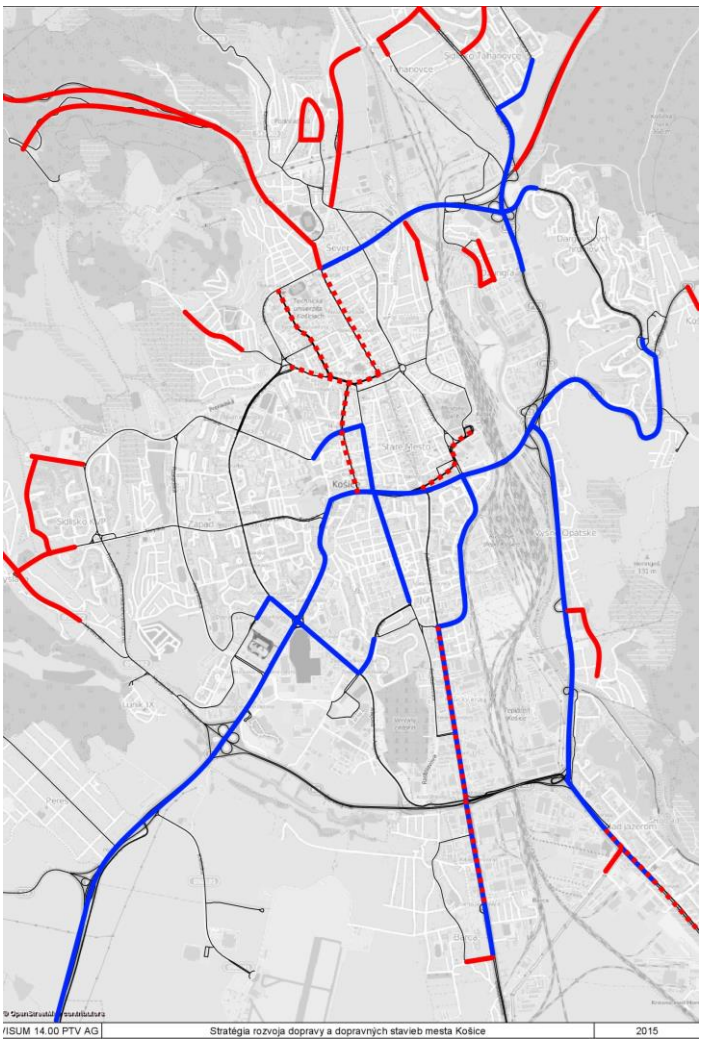
Main flows of municipal public transport in morning peak hours

VISUM 14.00 PTV AG	Stratégia rozvoja dopravy a dopravných stavieb mesta Košice	2015

Accessibility of PT stops 0 – 5 minutes of walking:

- There is poor accessibility of public transport stops from Hlavná street, eastern and western edge of Dargovských Hrdinov estate, Turgenevova street in the South, Nám. L. Novomeského and Bratislavská street in the West, Textilná street by Nad jazerom estate, parts of Pereš and Šaca. The rest of the city has very good accessibility.

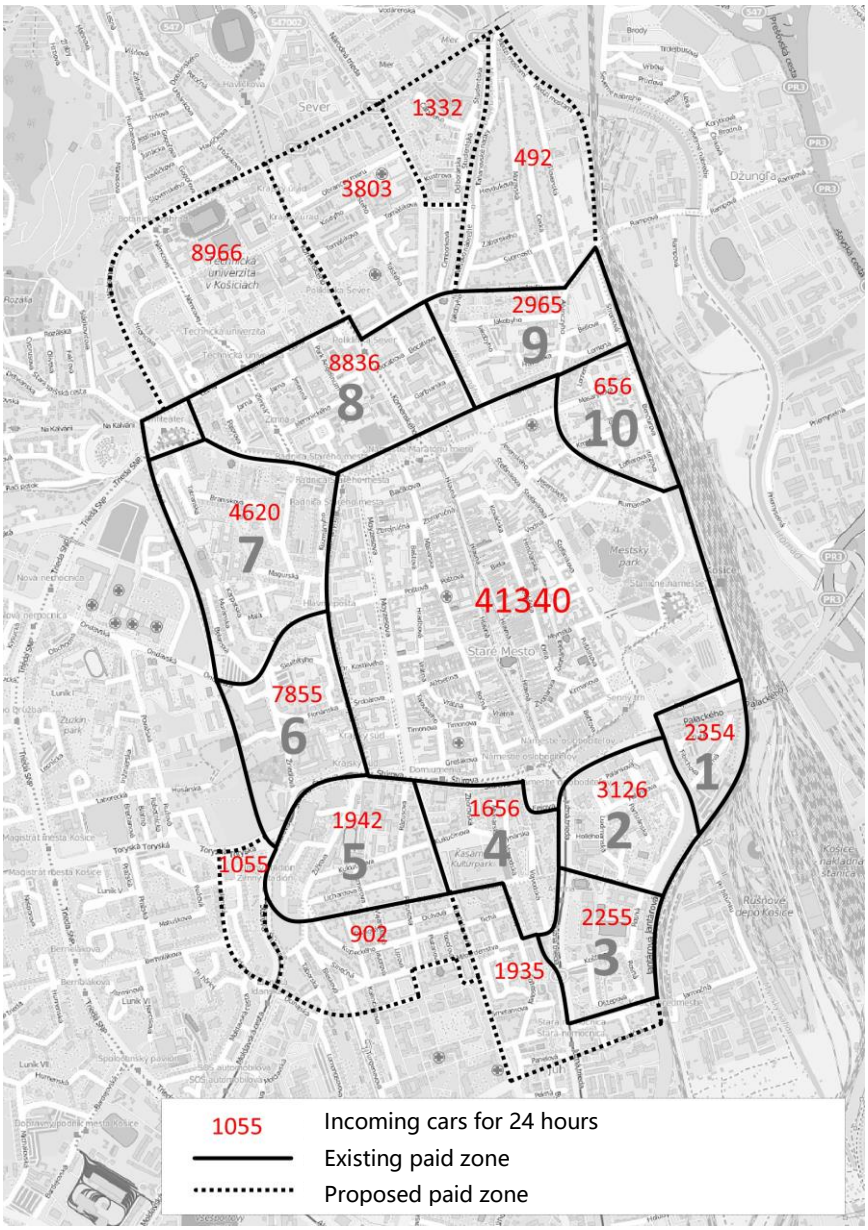
Usage of offered capacity in peak hour below 25 % (red) and above 75 % (blue)



- Offered capacity of public transport is not utilised in the terminal sections of the lines, in the sections connecting small neighbourhoods (Vyšné Opátske, Jahodná, Bankov, Košická Nová Ves, Džungľa) and due to dense parallel bus services also on tram tracks on Kuzmányho, towards northern terminals, on Južná street and on the track towards Station square.
- Tram tracks on Štúrova, Moldavská cesta, Alejová and Trieda SNP are sufficiently used.
- Bus lines on Ázijská, Americká, Hlinkova, Moldavská cesta, Štúrova, Popradská, Rastislavova, Jantárová, Sečovská and Južné nábrežie are used over 75 % of their capacity in the peak hours. This means economically efficient line definition, but limited attractiveness of fully used lines.
- Generally - bus lines from Sídlisko Ťahanovce, Dargovských hrdinov, Šaca, Barca and Nad jazerom tend to be used to capacity limits in the peak hours,

5.7 Parking analysis

Numbers of car trips terminating in the central transport zones during the day:

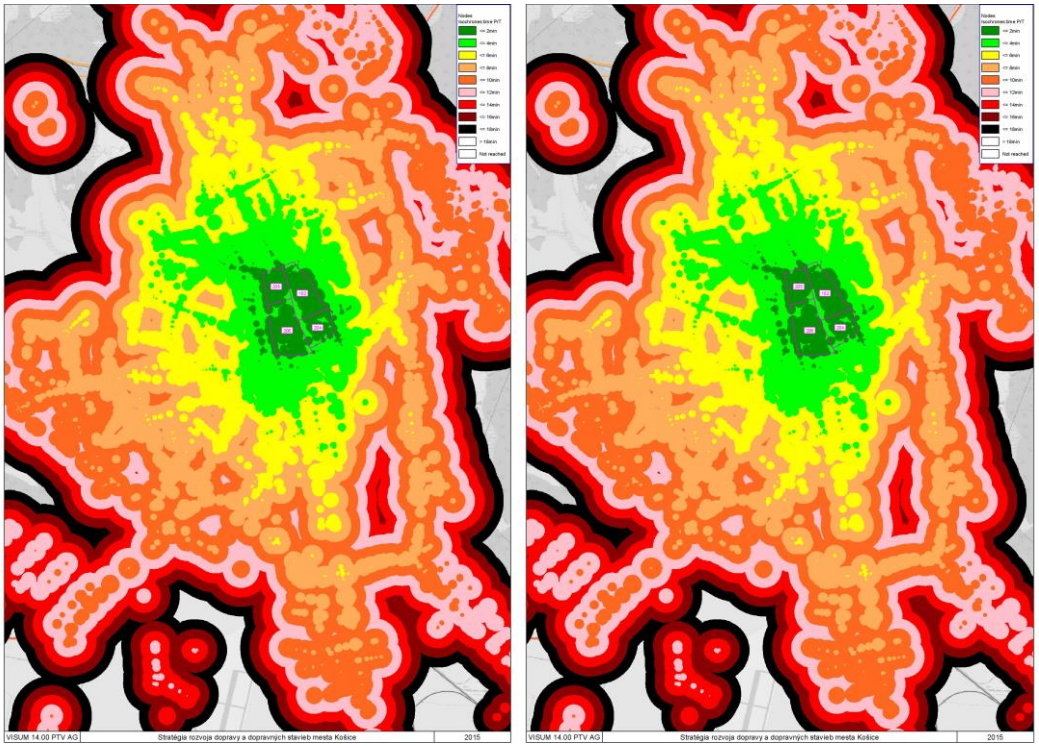


- There are 7755 public parking spaces in the central area of Košice (+ 10 – 15 thousand private parking spaces in the yards, garages, private lots etc.), but there is daily amount 77 605 car trips terminating to the centre. Considering usage of parking spaces by 4 cars during the day approx. 20 thousand parked cars in peak hour is the demand. Paid central zone causes overuse of the parking spaces in living area (marked 1 – 10 in the picture).
- Paid parking system in the centre is oriented to paying visitors with limited advantage for local inhabitants and no advantage for local entrepreneurs, there is high number of company reserved spaces.

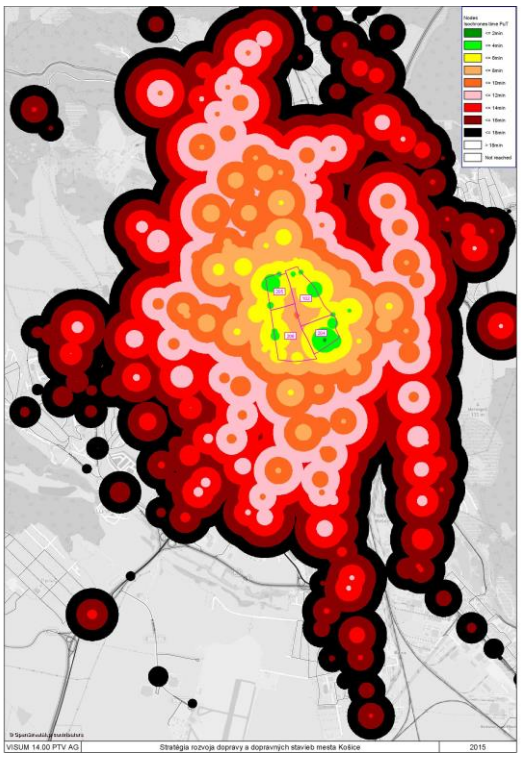
- Unregulated parking around the centre during working time causes high level of commuting by car to the centre
- Paid parking lots and garages on the edge of the centre are not used
- Parking places in the centre and its vicinity are used in high extent for long term parking during the day
- Night parking in the housing estates is problem everywhere with differentiated level of overuse in particular locations (Sídlisko Ťahanovce is the worst, Dargovských Hrdinov and Nad jazerom are bad too).
- Regulated central parking zone is too small and with limited impact due to unpunished long term parking in minor roads, on sidewalks and in roads attached to the zone
- No park and ride (P+R) principals are used

5.8 Accessibility analysis

Accessibility of the city centre by car in 2015 and 2030 (from 2 to 18minutes):



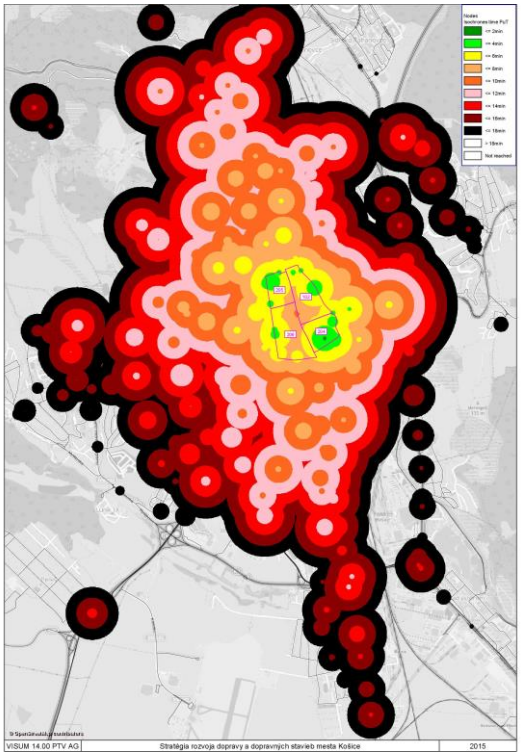
Accessibility of the city centre by public transport 2015 (from 2 to 18 minutes - off peak):



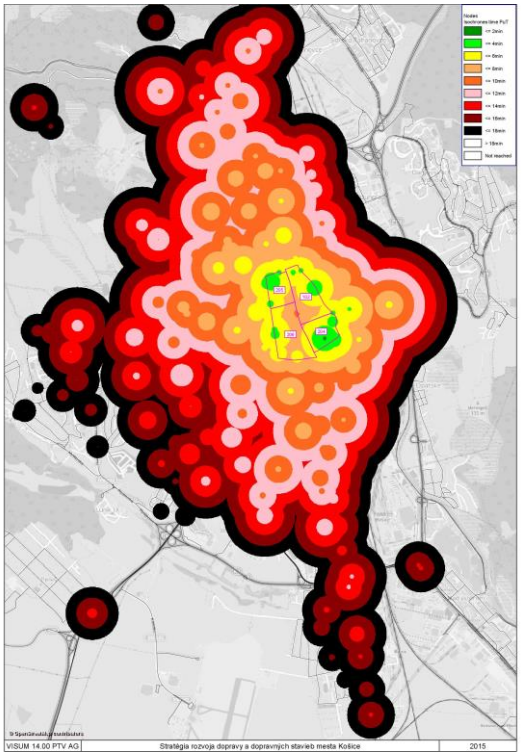
- Accessibility of the centre by car is better from south and north and between 2015 and 2030 has not changed significantly. Prolongation of travel times from outskirts of the city is up to one minute. Accessibility by car is about 4-7 minutes faster than by public transport in off peak times.
- Accessibility of the centre by public transport is very good from the north and south, Západ housing estate and Hornád valley (below 15 minutes.) and reasonably good from housing estate KVP, north of Nad jazerom, south of Ťahanovce and northern and southern edges of Dargovských hrdinov and from Barca, Pereš, Kavečany and Panorama (below 18minutes), other city edges have accessibility over 18 minutes. Accessibility in peak hours can be longer due to congestion of car traffic, which obstacles buses, what is shown in following pictures.

Accessibility of the city centre by public transport – calculations based on capacity restrained PT modelling:

Peak hour 2015

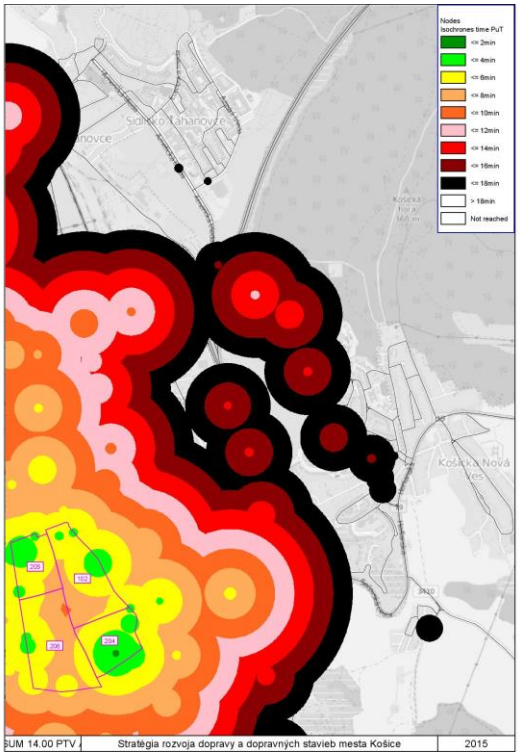


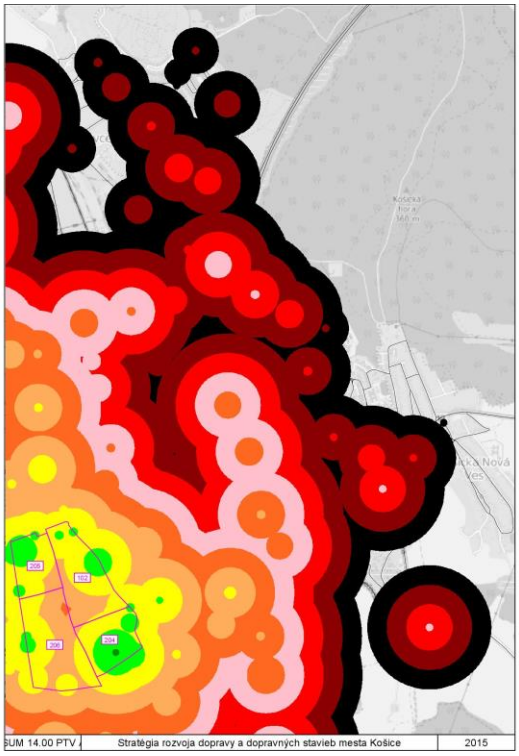
Peak hour 2030



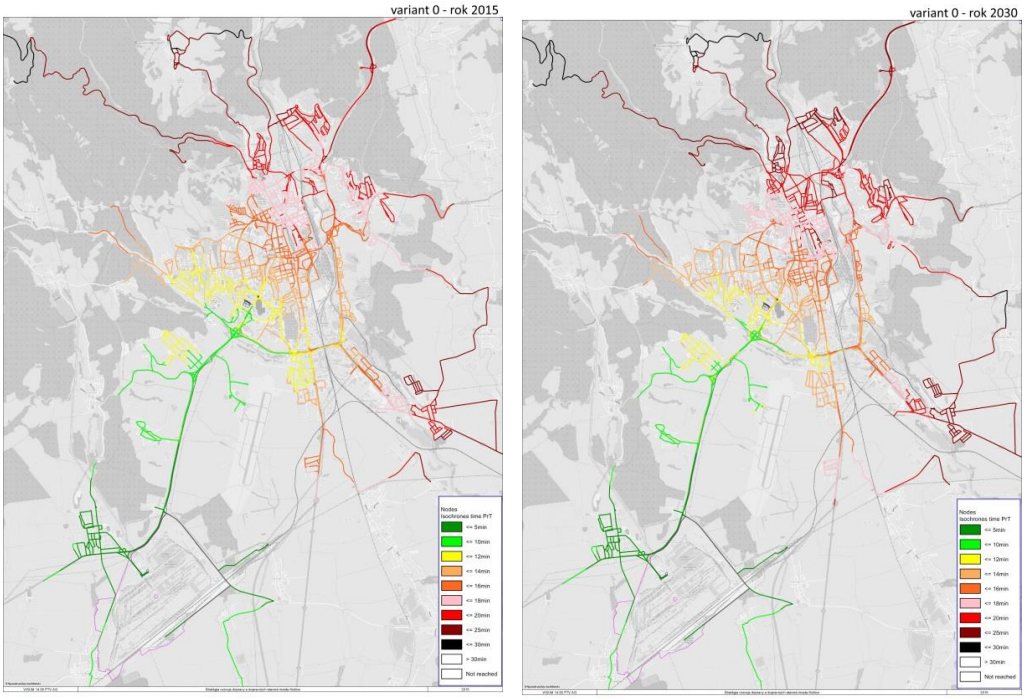
- It is visible, how the congestions during peak hours lead to increase of travel time by bus from eastern suburbs, delays are even higher in 2030 without projects, highest from Sídlisko Ťahanovce and Dargovských hrdinov, access by trams and from southwest and west are not being delayed.
- Accessibility in peak hours is 15 - 20 minutes from eastern housing estates compared 10 – 15 minutes off- peak, accessibility is another 4 – 6 minutes worse in 2030.

Accessibility of the city centre by public transport in 2015 peak and off-peak (from 2 to 18 minutes - details of eastern housing estates):

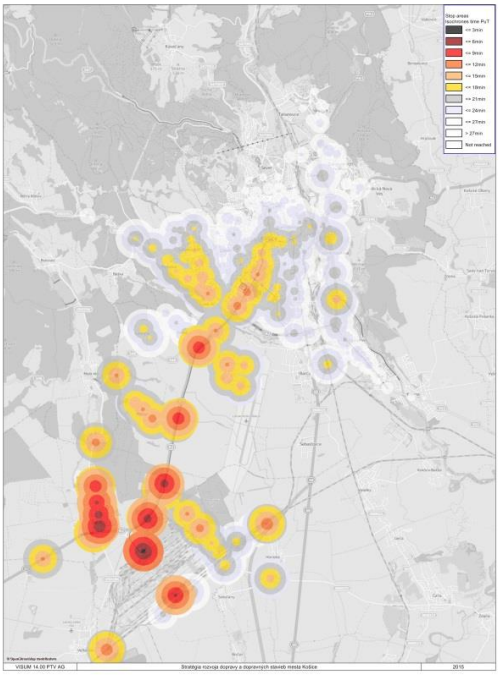




Accessibility of U.S.Steel ironworks by car in 2015 and 2030 (from 5 to 30 min.):

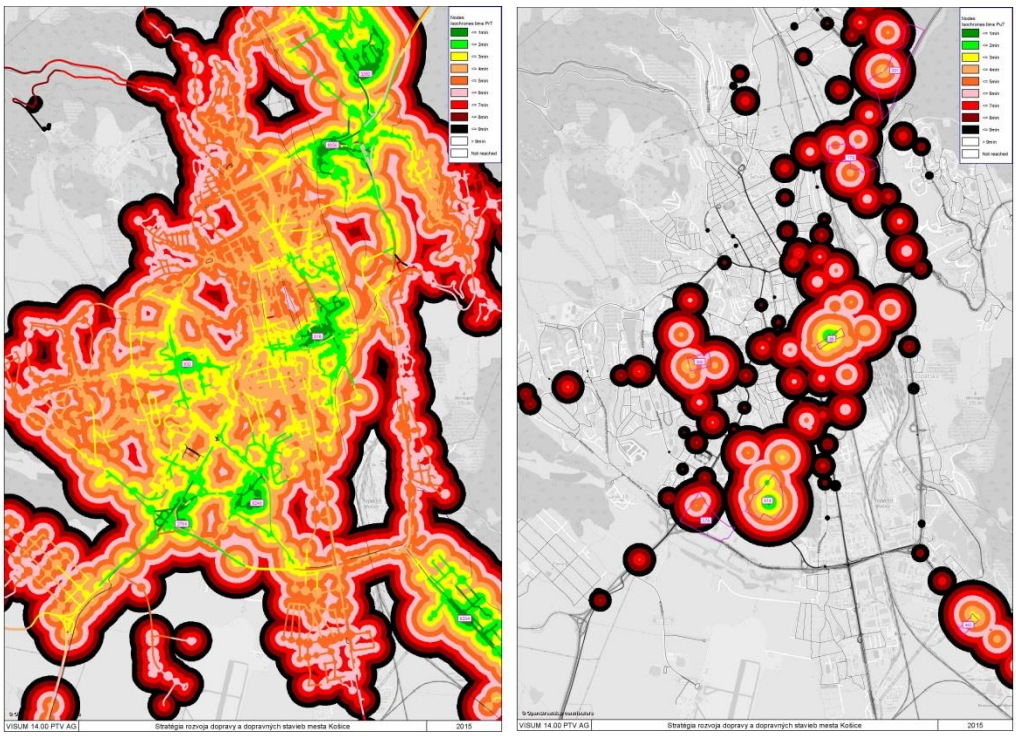


Accessibility of U.S.Steel ironworks by public transport (from 3 to 27 minutes):



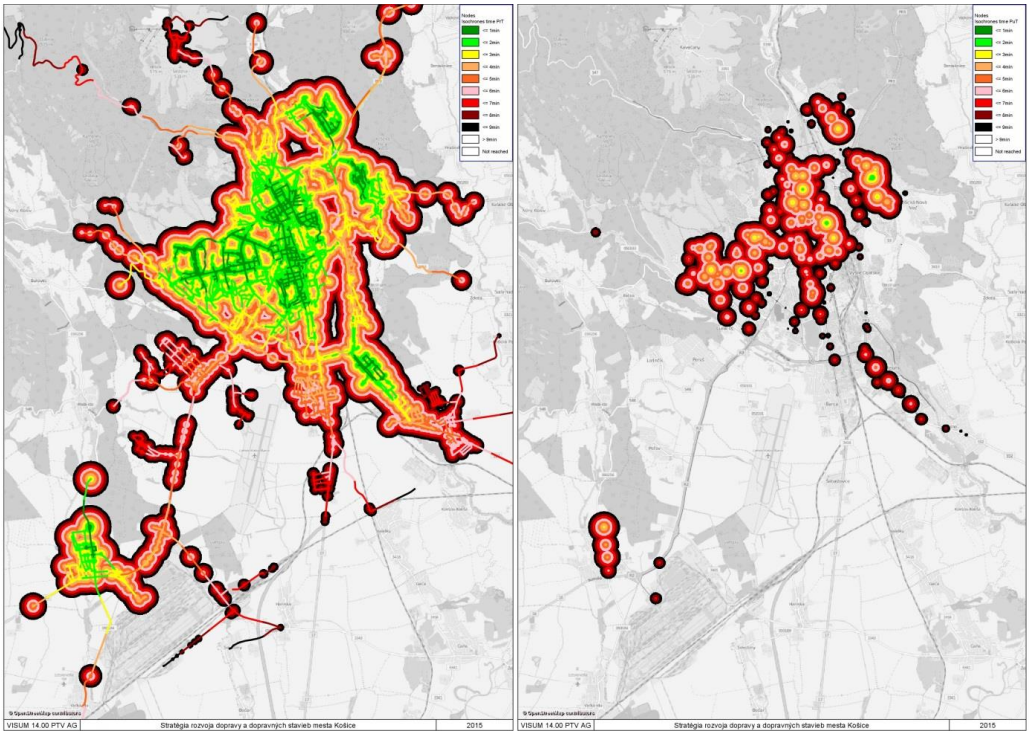
- Accessibility of the ironworks by car between 2015 and 2030 has not changed significantly. Prolongation of travel times from settlements is up to one minute, especially from housing estates Ťahanovce and Dargovských hrdinov. Accessibility by car is approx. 8 min. faster than by public transport. Šaca and other areas close to the feeder tram line from U.S.Steel to the city are exceptions, where public transport is competitive to cars.

Accessibility of big shopping centres by car and public transport (from 1 to 9 min.):

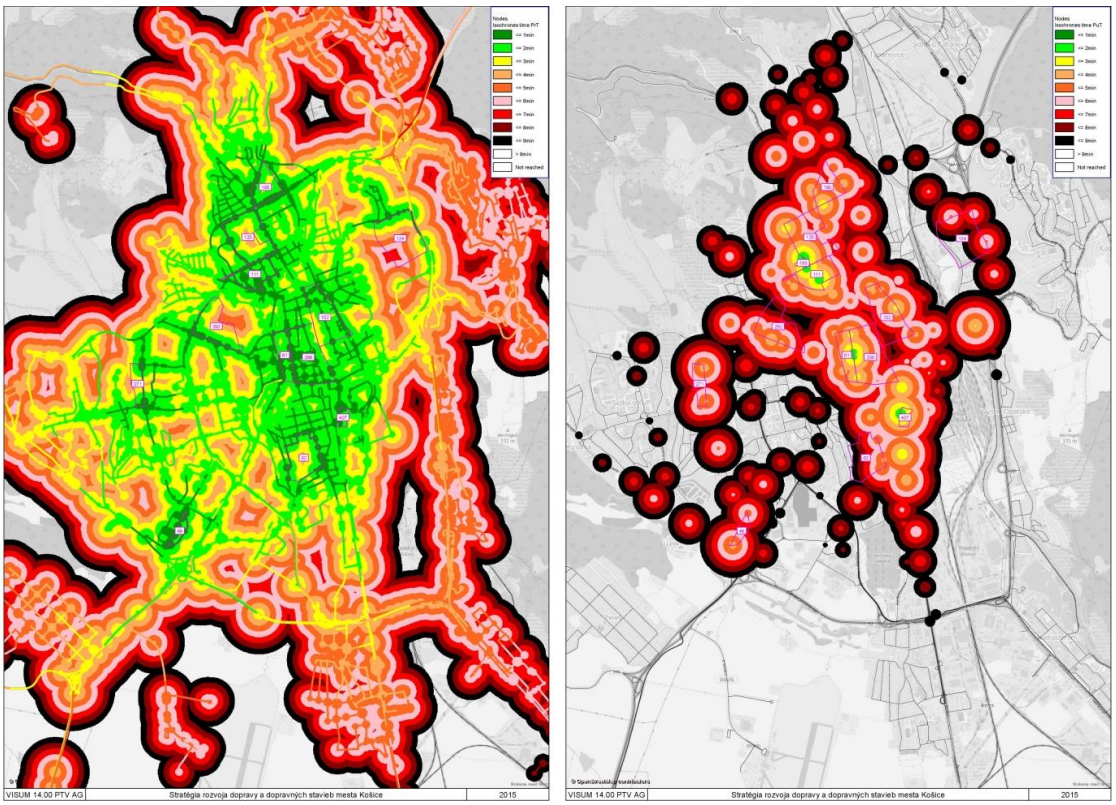


- Comparison of accessibility of big shopping centres shows that is much better by cars. In most of cases important reason is longer walking distance to the shopping centre from bus/tram stops than from the parking.

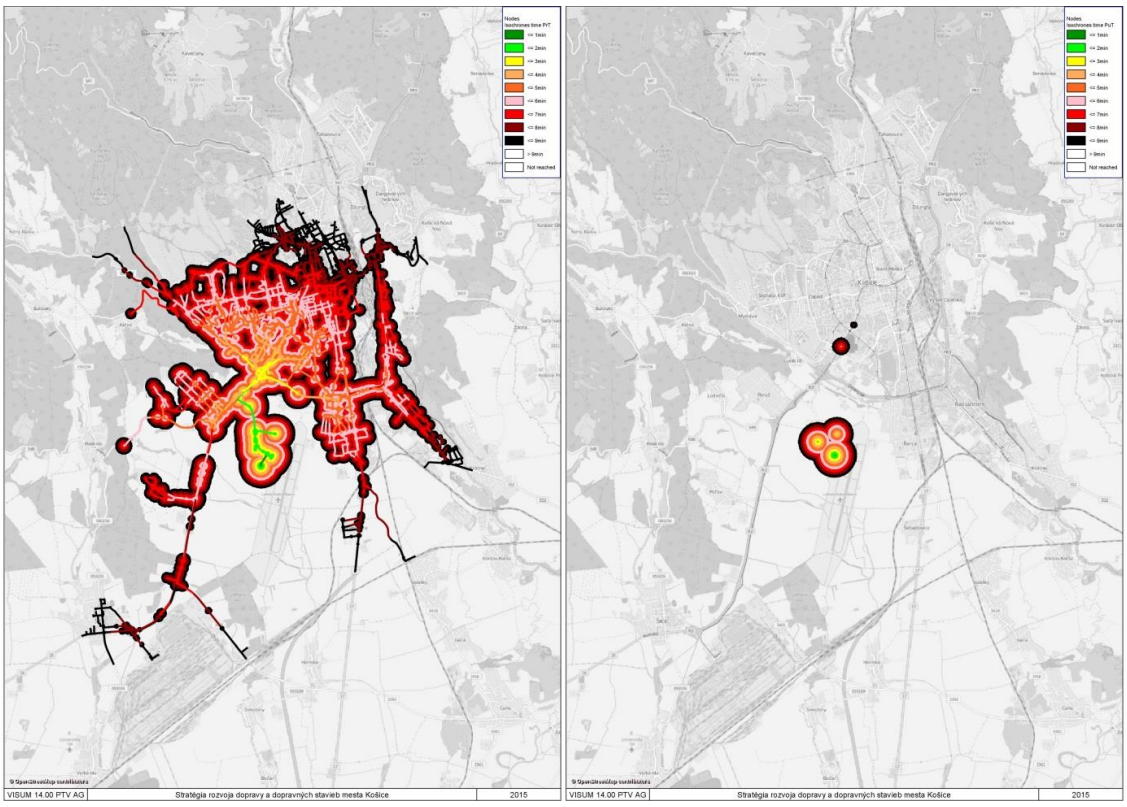
Accessibility of health services by car and public transport (from 1 to 9 min.):



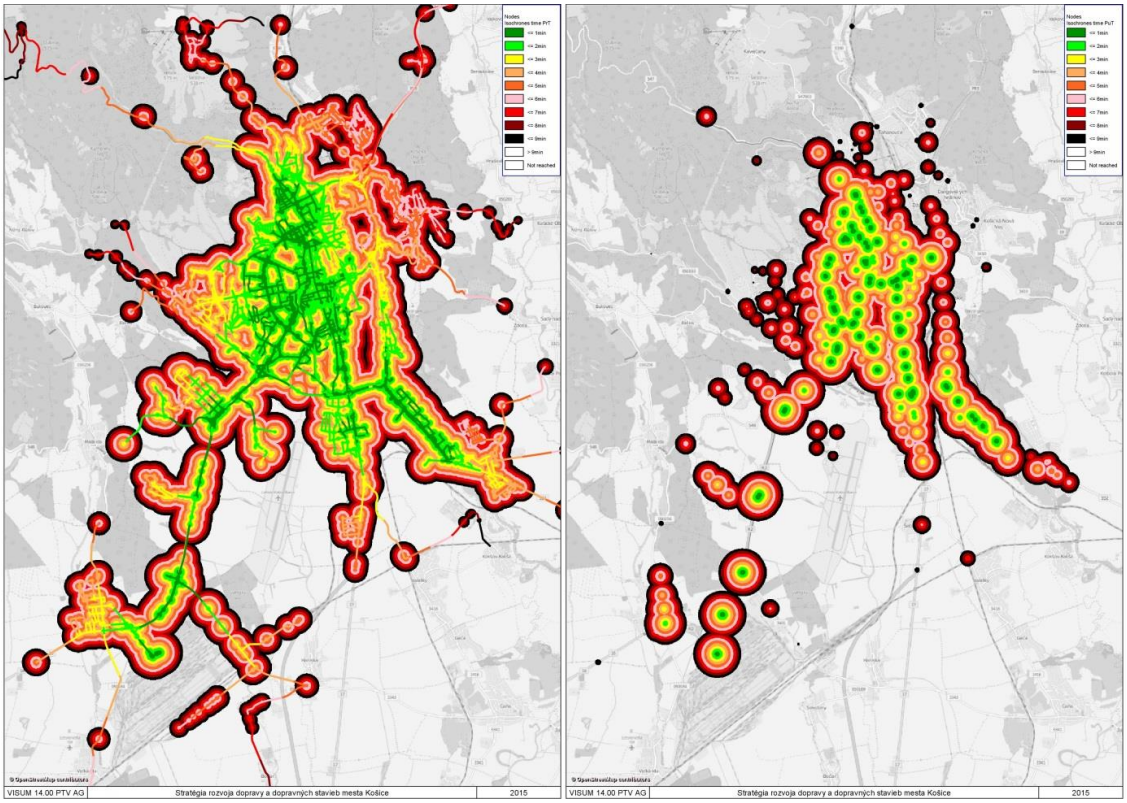
Accessibility of universities by car and public transport (from 1 to 9 min.):



Accessibility of the airport by car and public transport (from 1 to 9 min.):



Accessibility of tram stops by car and public transport (from 1 to 9 min.):



- Accessibility of the destinations as hospitals, universities and airport localised outside the city centre and accessibility of the tram stop locations throughout the city is much faster by car (often 10 to 15 minutes faster) and there is no chance to compete this access time by public transport.

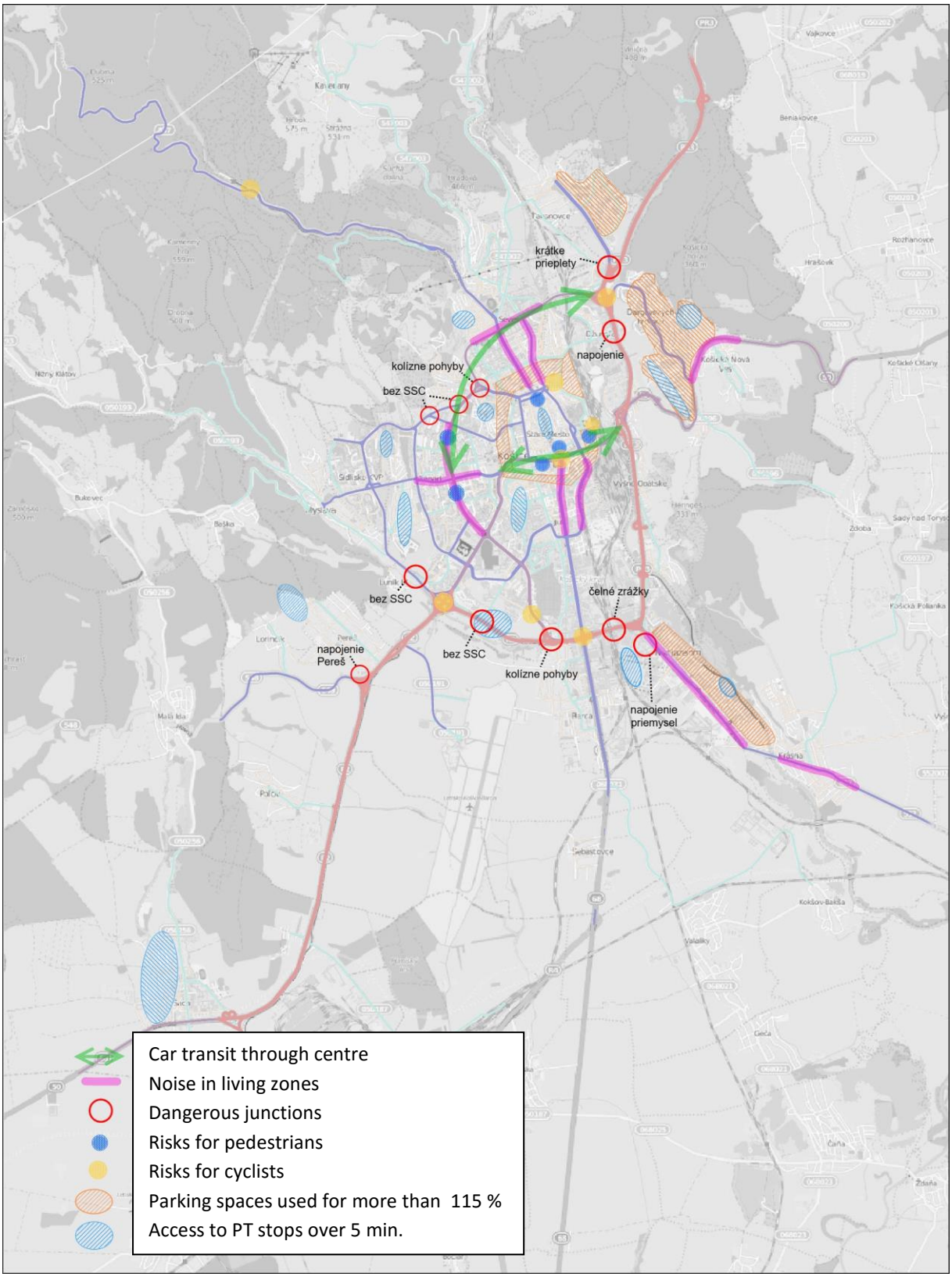
5.9 Future possible problems without measures – main risks

City of Košice does not have sufficient funds for transport infrastructure development, even its maintenance, so it needs very targeted planning and additional funds. Transport management on the city level is not well organised, so the only working areas are land use planning, solving problems with infrastructure collapses and heavy aging and routine operation of public transport. No conceptual transport planning is being done. City transport is oriented to car transport, public transport is understood as the service for the people currently not able to use cars. Walking has a lot of obstacles, city infrastructure is not very friendly for biking. This results to continuously rising road traffic volumes leading to bigger congestions, slowing down public transport and pedestrians and disabling bicycle usage. Regional public transport usage is also decreasing, but its timetables cannot be much downgraded, only possible downgrade of public transport operation would lead to new losses of passengers.

If no measures are accepted, the transport system will remain unsustainable, this is likely to happen:

- Longer and more sever congestions
- More of illegal parking
- Severe economy problems of public transport
- Decreased quality of public transport service even with good rolling stock
- Dilapidation of the infrastructure due to lack of maintenance
- Increasing of environmental damages and conflict between cars and public transport/pedestrians/cyclists
- Pressure for more public space for road transport
- Uncontrolled extensive parking in some parts of the city, pressure for reserved parking spaces for those, who can afford it
- Decreasing of usage of suburban public transport and resulting in "shelling" of the city by incoming cars of suburban commuters

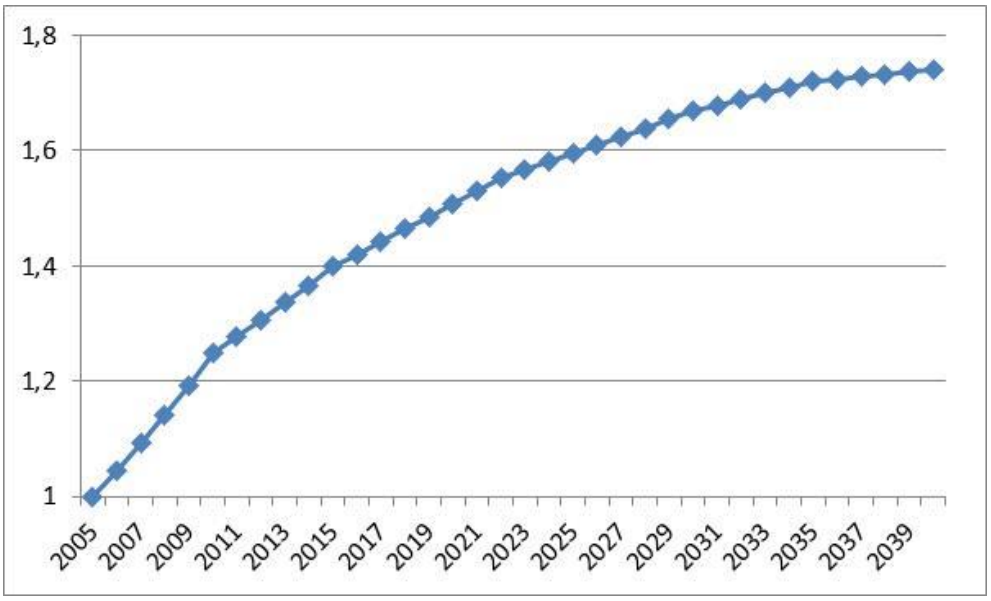
Problems drawing:



5.10 Travel demand 2030

Based on the statistical data on traffic volumes 2005 – 2015 it is anticipated, that the growth of mobility will continue with the same speed as before 2015 at first with decreasing speed. Consequently the growth from 2015 till 2030 is expected to be 19 %, till 2040 it is expected to be 24 % anticipated from the decreasing speed growth curves extrapolated from 2015 till 2040. The growth curve was used for multimodal modelling, unimodal models resulted from multimodal model runs. This is growth scenario. Conservative scenario expects no growth, this scenario we not subject of transport modelling.

Mobility growth 2005 – 2040:



The model calculation of "business as usual" situation in 2030 – if no changes will happen – showed these results:

- According to model calculations the growth of car and public transport occupancy will be comparable, so the modal splits for 2030 will be equal, more strict parking police can change modal split by 3-4 %..
- The traffic volumes on main 4 lanes roads will grow to the height 30 – 50 thousands per day. Additionally to the junction Kuzmányho x Štúrova, Hlinkova x Vodárenská, Palackého x Bajzova by bus station and SNP x Ondavská also other junctions on SNP will be congested in the peak hours
- The capacity of road system will be after 19 % growth completely utilised on Hlinkova – Watsonova – SNP and also on the junctions on Hviezdoslavova, Štúrova, Palackého and Protifašistických bojovníkov, congestions will be occurring

- Public transport lines will be more crowded in the sections, where they had already achieved the capacity on 2015, but there is always possible to decrease the headways.

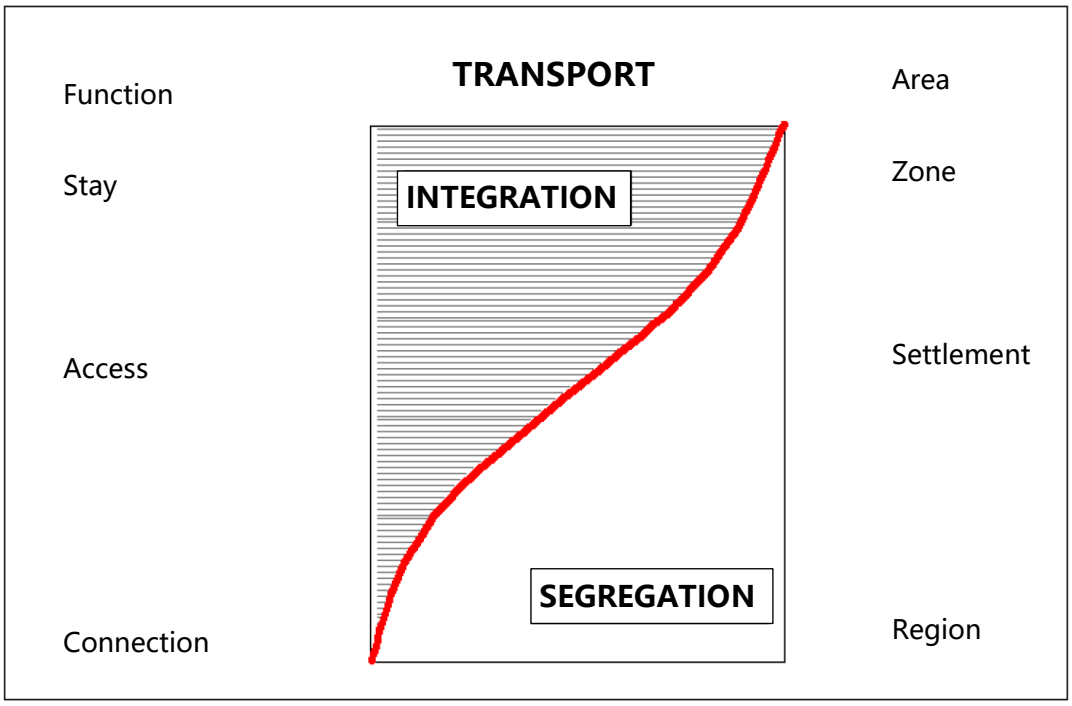
5.11 Transport sustainability

Transport system of Košice was mostly developed under the Transport master plan from 1982, which was based on these principles:

- Public transport priority
- Priority of electric power for public transport
- Segregation of transport modes
- Creation of pedestrian zones and paths connected to public transport
- Perfect connection between regional and municipal public transport
- Moving of transit traffic out of city centre
- Development of basic road network based on circle - radial system
- Optimisation of freight transport

These principals were fulfilled and most of them could be still valid, but there is one, which is completely changed. Instead of segregation integration of transport mode and its differentiation is required within the public space. The strategy was formulated on this new principal. Transport requirements were never the only driving force, but sustainability of the system was it.

Transport sustainability according to function and area (from prepared new standard STN 73 6110)



6 IDENTIFICATION OF PROBLEMS

6.1 Horizontal problems

- The city lacks administrative capacity to manage transport system
- The resources for compensations of losses of public transport are not sufficient in existing operational mode
- City budget resources do not enable proper maintenance of roads, bicycle paths and sidewalks in the city, tram and trolleybus networks, depots etc. on necessary level, there are very limited resources for investments, any development has to be financed from loans, subsides or special capital chapter of the budget.
- Due to lack of transport management there are missing arguments for future transport infrastructure decisions
- The administrative arrangement of city and regional authorities does not enable to integrate effectively regional and municipal public transport

6.2 Road transport - problems

- Košice has generally very functional and high capacity of road system, main problem is that very high capacity of roads enables to manage all journeys 2 – 2,5 times faster by car than by public transport and there is high and increasing demand to use private cars leading to congestions and environmental threats.
- Car fleet in Košice consists of more than 100 thous. vehicles , 1 vehicle per 2,4 inhabitants, of those more than 80 thous. are cars . 1 per 3 inhabitants. Average car age is 11,2 years, but most of cars are 6 years old. Car fleet is relatively modern, 30 % of cars have the engines with EURO V or EURO VI standard. Number of cars and their usage are continuously growing, what causes capacity problems in peak hours and parking problems.
- The capacity problems are occurring on the entrances to the city from PR3 and within its multi-level junctions. The capacity of major junctions on Hlinkova, Štúrova, Štefánikova, Hviezdoslavova, and SNP is exhausted in the peaks, the public transport is slowed down, barriers for pedestrians and bicycles are created and environment is worsening.
- Major roads are passing fluently through central area of the city, this causes very high transport demand with growing tendency in the very centre.
- City part of outer circle Hlinkova – Watsonova – SNP and some radial roads sections passing inhabited areas have rather high traffic volumes what has high impact to the environment - high noise levels and ambient air concentrations. They also create barriers for pedestrians and biking.

- There is no possibility to shift the transport from centre to the city part of the circle road without substantial worsening of the environment. This is caused by the fact, that all circle roads on the western side of the city pass through densely inhabited housing estates and no more outer circle is possible and necessary to be constructed.
- Express part of outer circle, road PR3-R2 Prešovská – Južné nábrežie – Nižné Kapustníky - Červený rak, is not used as bypass road for incoming or city trips due to faster roads through centre and limited connectivity with central area
- Traffic management and control centre is not functional, there is no transport management infrastructure but old camera system
- Aged traffic light control system mostly without dynamic control and public transport preference is offering simple control patterns with high capacity and green waves for the cars causing delay of public transport and pedestrians

6.3 Bicycle transport - problems

- There is limited number of bicycle paths and lanes, they do not create continuous infrastructure
- Bicycle paths are mostly in conflict with pedestrians
- Controlled junction do not solve bicycle crossings separately, pedestrian crossings are used instead
- Many roads are completely unsuitable for bicycles, biking is understood as dangerous activity
- No facilities for bicycle parking
- Bicycles in pedestrian zones in the centre in conflicts with pedestrians
- No bicycle strategies are followed inside housing estates and by working places
- Dangerous crossings with roads, some major roads cannot be safely crossed
- There is no possibility to bike along R2 from Šaca and along outer circle express section (PR3) which results in no possibility to bike to the centre from detached neighbourhoods Šaca, Poľov, Lorinčík and Pereš with 9 200 inhabitants.

6.4 Pedestrians - problems

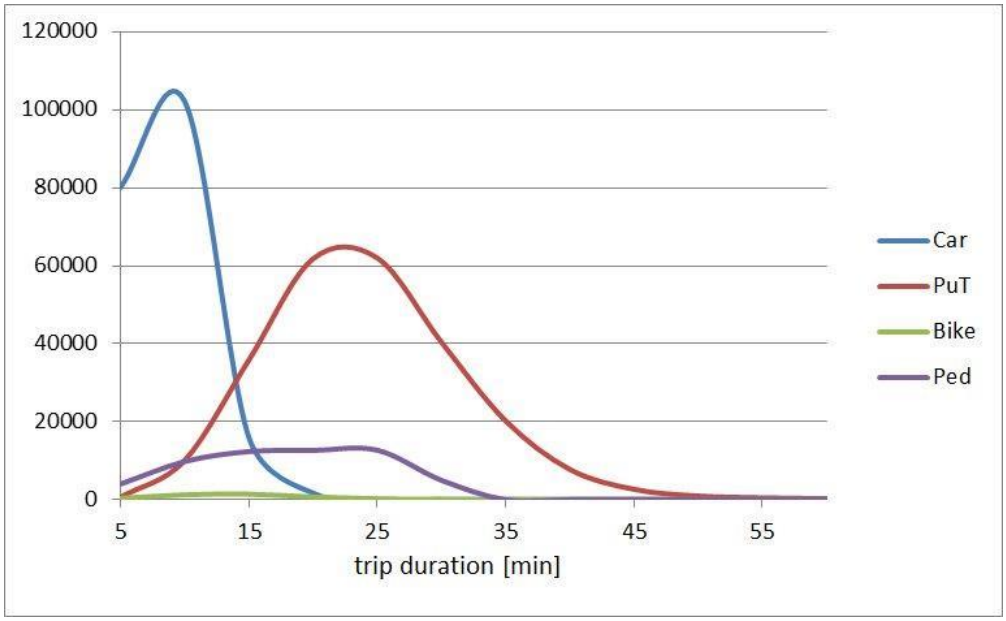
- Low quality of surface of many sidewalks mainly in the housing estates
- Many barriers, staircases, barrier effect of main roads and junctions
- Overall low priority of pedestrians
- Low quality od pedestrian paths, limited possibilities of walking from Západ to the centre
- Poor accessibility of Ťahanovce and Dargovských hrdinov without car
- Many inconvenient and dangerous uncontrolled pedestrian crossings
- Unsolved access paths to some public transport stations
- Missing pedestrian access to some neighbourhoods

- Time consuming crossing of major roads on controlled junctions
- Obstacles on both ends of Hlavná pedestrian zone
- Limited widths of sidewalks by bicycle lanes (e.g. Komenského)

6.5 Public transport - problems

- Although municipal public transport is operated according to Public service contract and its annexes prepared by public transport company and approved by the city including detailed time schedule, the city representation is not acting as the manager of public transport system and the Public transport company DPMK
- Complex system of lines designed to maximise the number of direct connections to any significant destination leads to longer headways and system suitable more for its existing passengers than for any to new clients
- Long waiting times even for most of trunk public transport lines
- Many direct lines, but any needed interchange leads to long delays
- Bad accessibility of historic city centre along Hlavná street by public transport (stops are on both ends of 1,2 km long Hlavná street with other possible access from parallel recessed Štefánikova street in the distance 300 - 400 m from Hlavná).
- Public transport fleet was far from good conditions in the beginning of 2014, tram fleet was very old, trolleybus fleet aging, there were 96 low floor buses, but some of them 14 year old and many old barrier buses were still in operation. After renewal of bus fleet by purchase of 122 buses and 5 electrobuses in 2014 it is 100 % low floor and very modern, after delivery of 33 new trams it will be created mostly by low floor vehicles too, trolleybus fleet was not renewed, trolleybuses are out of service from 30.1.2015 when the operation was suspended due to tram tracks reconstruction.
- There are 34 new trams (22 m long) and 2 reconstructed bidirectional KT 8 to low floor (30 m long) in Košice, but there is still the need to add approx. 13 new vehicles and later reconstruct more bidirectional vehicles for the usage in peak demand conditions and during reconstruction works.
- Trolleybus system is obsolete (both rolling stock – average age above20 years - and infrastructure) and cannot be operated without substantial investment.
- Tram tracks are being reconstructed, but there are still old sections with poor quality and need of reconstruction (Alejová, Slanecká, Južná trieda, south of Verejný cintorín and track to U.S.Steel).

- Slow service of public transport without preference, long riding times in comparison with cars (2,5 x longer), division of trips by duration according to transport model shows low speed of public transport:



- Ambitions of public transport are higher than resources available
- The revenue from fare is low and decreasing, number of pre-paid tickets is not high enough,
- Trams are slow and do not serve as trunk lines in spite of higher capacity and preference potential, most heavily used system is bus network
- Due to high investment to new bus fleet the depreciation is very high and leads to lack of resources for operation
- Missing transport control on U.S.Steel high speed line, missing interchange terminals for bus connections to trams
- Missing public transport integration leads to operation of parallel systems which leads to low economy efficiency and lower usage for suburban trip
- Dargovských hrdinov western and eastern limits have limited accessibility to public Transport
- Public transport from Ťahanovce face congestions slowing down buses heading to Hlinkova and centre during morning peak hours

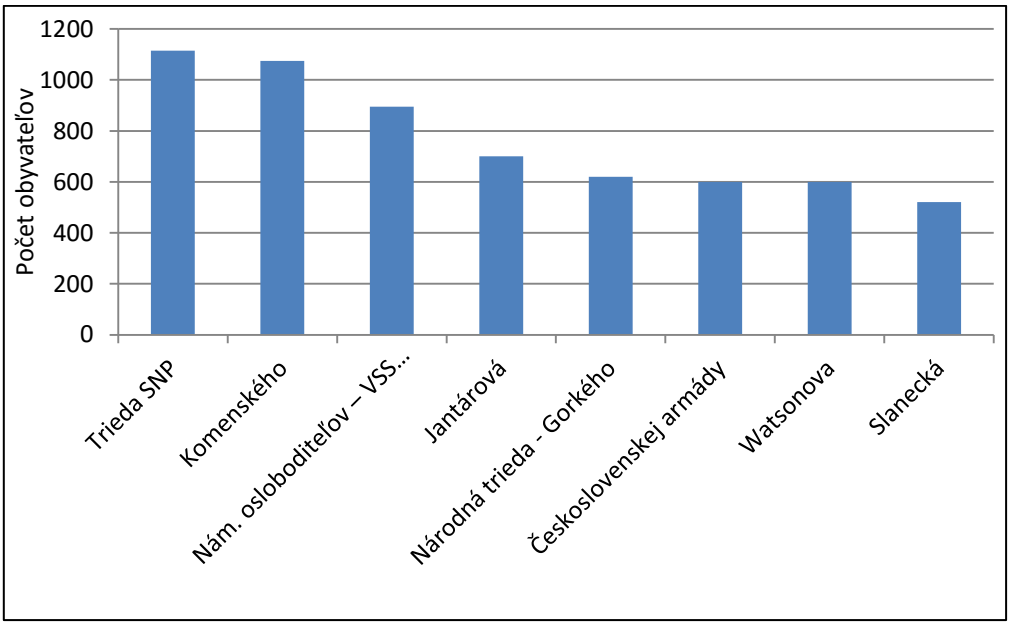
6.6 Parking - problems

- The regulation in the centre works on limited space along main roads, the level of enforcement is low in minor roads, prices are not supporting short term parking only, too many parking places are reserved for single users for too low prices, residents have difficulties to park even if they paid, many private parking spaces are available in the central area

- Paid parkings around the centre are not utilised, drivers avoid any paid facilities if possible
- No regulation in the vicinity of the centre leads to long term parking close to the centre and overuse of public space; this free option encourages car usage to the centre,
- Housing estates lack enough capacity of parking at nights in different extent, Ťahanovce is the worst case, Dargovských hrdinov and Nad jazerom face significant deficit too
- Many old garages block modern solution of parking in housing estates
- No good possibility to leave the cars by public transport terminals or railway station outside of Košice exists.

6.7 Environment - problems

- There are high noise levels achieved and the emission limits exceeded along major city roads
- According to noise calculations - numbers of inhabitants with daily noise level above the limit were calculated (together 8515 were recognised):



- Most people are living in the places with exceeded noise limits in these streets: SNP, Komenského, Južná, Národná, Gorkého, Jantárová) noise on other roads (Hlinkova, Kuzmányho, Štúrova) exceeds hygienic limits too
- There is approx. 400 t of gas emissions emitted for each km of road annually (at first CO_2) with growing trend, any limitation of traffic volumes in the centre is desirable

Development of gas emissions from road transport from 2015 to 2030

Year	CO2 (t/km)	Nox (t/km)	CO (t/km)	SO2 (t/km)	HC (t/km)	Total
2015	388,8449	10,1518	11,6805	0,0126	6,9667	417,6565
2030	472,18	12,3546	14,2376	0,0154	8,5269	507,3145

7 STRATEGY FORMULATION

7.1 Vision

Košice shall orient its development to the support of lively utilisation of urban space for meeting of other people, cultural or commercial events leaving enough space for high quality transport system too. Sustainable transport system will enable comfortable mobility for pedestrian and cyclists, it will offer fair public transport system well integrated with regional transport and preserve the qualities of excellent road infrastructure as much as possible with necessary upgrades. City management will promote transport system fitting to people needs and preserving city environment so that transport will not create any problems for city inhabitants and visitors.

7.2 Objectives

Objectives are defined to support sustainability of city transport, higher modal split for public transport and more public space for pedestrians and bicycles with preservation of sufficient capacity for car traffic with more limited public parking in the centre and its vicinity. The aim is also to define financially sustainable system of operation and maintenance of city transport system. There is defined 9 objectives, for each objective is ultimately defined the measures to achieve them and the timeframe for their implementation.

7.2.1 Responsibility of city government for the transport system

The management of municipal transport system development, maintenance and operations, including the management of DPMK activities will be dedicated to municipal authority.

7.2.2 Better financial sustainability of the transport system

Insufficient financing of public transport will be improved both by increase of the resources from city budget and from other sources focused to sustainability The financial stability of public transport financing will be achieved.

7.2.3 Better walkability of the city

Implementation of the priority of pedestrians into infrastructure planning process, traffic light control management and pedestrian crossing design.

7.2.4 Development towards cycling city

Alternation of road infrastructure towards easier usage by bike and implementation of new bicycle lanes and paths.

7.2.5 Limited parking in the centre, facilitated parking at home

Implementation of strict rules in the centre and surrounding against car commuting to the historic centre, tailored solutions for housing estates, park and rides development.

7.2.6 Higher efficiency and sustainability of public transport

Public transport operations of optimised lines on the infrastructure with preferences on junctions and reserved bus lanes managed by municipal transport authority will lead to the achievement of higher operational efficiency enabling better financial stability; higher attractiveness will attract new customers. Public transport offering fluent journeys and short waiting times will make public transport usage the natural part of transport behaviour and city living style.

7.2.7 Environmentally more friendly city transport

Reduction of the environmental impact , especially emissions from the transport caused by growing usage of car transport on the infrastructure in living areas enabling high travel speed and easy access to city centre.

7.2.8 Well controlled safe road infrastructure with limited extent of bottlenecks

Improvement of transport safety and reduction the bottlenecks keeping preference for PT and soft modes by smart utilisation of existing infrastructure with sharing of space with public transport and bicycles.

7.3 Measures implemented regardless the Strategy

Some of the measures and projects are currently in the implementation or in preparation in Košice, their implementation was conceived as a part of an existing reality and their impacts were modelled:

- The construction of the eastern bypass road R2-D1 (D1 sections Budimír - Bidovce and Šaca - Košické Oľšany) and feeder R2 (section Ludvíkov Dvor – Červený rak) with parallel road for the service of Poľov with bicycle lanes (only till Pereš) will be financed by NDS with provision of grant from EU funds
- Modernization of tram tracks MEÚ 1 (also MUzMET - Nám. Osloboditeľov, Bardejovská, Amfiteáter, Čsl. armády, TIPTOP junction, terminal Havlíčkova) the provision of grant from EU funds
- Modernization of tram tracks MEÚ 2 (VSS junction, roundabout Moldavská – SNP, Boženy Němcovej, terminal Botanická garden) with provision of grant from EU funds
- Modernisation of the tram fleet - option to buy 13 trams (increase from 33 to 46 pieces) with provision of grant from EU funds
- Reconstruction of tram depot in Bardejovská street
- Bicycle path Hornád - Eurovelo 11 (Palackého - Rampová - Ťahanovce) financed by Slovak Water Management Company with provision of grant from EU funds

7.4 Measures

7.4.1 Responsibility of city government for the transport system.

- Develop a specific study for the creation of a municipal authority in charge of transport including integration of public transport with regional system.
- Implement the system of roads, bridges, tram tracks, pedestrian and bicycle paths inspection and create maintenance plans
- Manage the organisation of transport and public transport operations according to collected transport engineering data
- Change the legislative/regulatory framework to ensure that quality public transport is ensured for all future new settlements and new parking places by business developments in the centre will be limited.

7.4.2 Better financial sustainability of the transport system

- Allocate sufficient budget resources for necessary maintenance of urban roads and bridges tram network, depots etc. on necessary level providing that all works will be procured to get good quality for reasonable price
- Allocate the resources for public transport compensations to cover all costs and part of current accountancy loss of DPMK (at least 17 mil. € for 2016) providing responsible management of public transport operations targeted to economy efficiency (effective use of lower number of modern rolling stock on faster lines to decrease fixed costs, attracting new and also less frequent users by short headways and integration, responsible investment)
- Promote pre-paid tickets for one year (half year), integrate municipal and regional ticketing, combine parking cards with bonus parking, bike sharing, and car sharing (if implemented) - offer and advantaged for long term annual passes holders
- Find new financial resources for public transport, combine tariffs for public transport with parking tariffs (offer off-peak parking in the centre for pre-paid card owners and enable parking with pre-paid cards for entire central parking zone only for the owners of annual public transport ticket using Košice city cards)
- Utilise the capacity of direct regional lines to the centre preserved in peak hours for city journeys to decrease operational costs of municipal public transport.
- Increase of available resources for transport investments connected with responsible investments based on economy efficiency, utilise European funds, state subsidies, loans for responsible investments to city transport structures, define important investments and get support from state/EU/banks.

7.4.3 Better walkability of the city

- Elaborate maintenance plan of sidewalks and maintain their surfaces to keep them walkable
- Dismiss the physical barriers on main paths and on the accesses to the public transport stops
- Implement the program of pedestrian crossings, add new necessary crossings, improve the safety of dangerous and long crossings, aim to shorter waiting times on controlled crossing and to the crossings od dual carriageways on one green light
- Build new pedestrian paths to connect the city neighbourhoods to the centre
- Improve housing estates pedestrian axes
- Improve the function of pedestrian zone in the centre by decreasing potential conflicts with car and bicycle traffic

7.4.4 Development towards cycling city

- Develop on the basis of the conclusions of this strategy non-motorized transport master plan containing detailed solutions of bicycle paths and lanes
- Develop bicycle backbones along Hornád (Eurovelo 11), Komenského – Južná and Trieda SNP to enable easy connection of neighbourhoods in flat part of the city
- Add west – east routes to enable access from eastern and western suburbs
- Separate bicycle traffic from pedestrians if pedestrian traffic on common path is high
- Develop secondary and local bicycle tracks
- Implement the bicycle paths and lanes to the controlled junctions to enable smooth use of bicycle
- Redevelop housing estate transport schemes to enable logical and safe move of bicycle, parking and service traffic
- New arrangement of bicycle lanes on Hlavná street on next reconstruction (common lane for service transport and bicycles with similar or worse surface as walking area – not attracting pedestrians)
- Provide bicycle parking by important destinations
- Implement bicycle sharing system with benefits for public transport pre-paid card holders

7.4.5 Limited parking in the centre, facilitated parking at home

- Implementation of Parking concept of Košice city in the centre and surroundings with the deployment of residential parking zone as the shield around centre as the first step of the reform
- As the residential shield around city centre according to Parking concept of Košice city will shift commuting parking to further streets it will be needed to enlarge the zone of paid parking to Hlinkova – Watsonova and to Idanská – Dunajská – Pri nemocnici –

Rastislavova – Panelová – Staničná lines in second phase, reform the paid zone according to operational experiences towards limited possibilities of pre-paid and reserved parking for commuters and more parking options for residents, entrepreneurs, owners of real estates and owners of companies residing in the centre

- Implement systematic enforcement within paid parking zone to ensure its function
- Connect parking system to pre-paid public transport tickets – e.g. give advantage in parking for frequent public transport users in off peak hours or connect pre-paid parking card for entire centre with compulsory purchase of annual public transport ticket
- Add more parking places by new parking facilities to the housing estates Sídlisko Ťahanovce, Dargovských hrdinov and Nad jazerom and to implement paid parking zone to support its usage, parking zone has to enable easy visitors' parking
- Enable parking on overcapacity main roads as Trieda KVP and Americká by changing of right lanes to parking and bicycle lanes
- Reorganise the transport schemes inside other housing estates to balance well parking, bicycle axes, pedestrian paths and conservation of green areas and calmed zones
- Build park and ride parking facilities at the transfer terminals to backbone PT lines Važecká, Nižné Kapustníky, Pereš, Moskovská, Sever
- Provision of K+R facilities and short term paid parking by main station and by new PT terminals

7.4.6 Higher efficiency and sustainability of public transport

- Increase attractiveness by shorter headways, simple lines layout, higher operational speed ensured by preference on junctions and by reserved bus lanes
- Implement new line system with shorter headlines on major trunk lines operated preferably by trams or environmentally friendly buses with other feeder buses to convenient transfer nodes (Mier, Krajský úrad, Amfiteáter, Nová nemocnica, Magistrát, Poliklinika KVP, SOŠ automobilové, Železníky-križovatka, Dneperská, Važecká)
- Organise direct bus connections to and from the schools from neighbourhoods Šaca, Poľov, Lorinčík and Pereš additionally to feeder bus lines to the tram line
- Suspend the operation of existing trolleybus network, commence the preparation of new concept of environmentally friendly buses (duobus/electrobus/trolleybus) to operate instead of trolleybuses soon after 2020
- Develop till 2020 a specific study to assess the possibility of the use of environmentally friendly buses on additional backbone bus lines after 2030
- Complement the municipal rail infrastructure by new tram track Hlinkova - Džungľa – Sídlisko Ťahanovce after 2030
- Control public transport in the framework of new transport management centre of the city

- Public transport stops programme – improve the quality and accessibility of stops
- Improve accessibility of Dargovských hrdinov housing estate from bus stops
- Integrate regional and municipal public transport services, operate main regional lines directly to central bus terminal providing also municipal services in peak hours, terminate other and off peak regional lines in regional transport terminals by the terminals near tram lines (Važecká, Nižné Kapustníky, Válcovne VSS, Perešská) and operate only regional lines to some destinations with limited demand (e.g. Jahodná and Kokšov-Bakša)
- Modernise remaining trams tracks with exhausted lifetime Alejová, Slanecká, Južná trieda south of Verejný cintorín and track to U.S.Steel for fast backbone lines operation
- After planned procurement of 13 more tram vehicles keep 10 bidirectional KT8 vehicles and gradually let them modernise to low floor
- Modernise tram track Košice – U. S. Steel to high speed tram including traffic control to be utilised as the main connection from southwestern part of Košice and integrate urban and suburban lines.
- Design and develop new layout of central public transport terminal at bus station for better integration and more fluent bus transport in the centre
- Improve the service of public transport to Sídlisko Ťahanovce by high capacity service with unconditional preference till 2040
- The tram tracks Masarykova – Station square and Popradská – Pri prachárni contained in existing land used plans have no substantiation for existing and planned land use, if new land use plan intensifies the usage of its neighbourhood it should be kept as the land reserve, otherwise it should be erased (unnecessary prolongation of tram to Krásna should be excluded from land use plan)

7.4.7 Environmentally more friendly city transport

- Maximise usage of tram operations, prepare new operation of electric buses according to their technology development based on a specific study results
- Support individual electromobility
- Decrease speed of traffic on main express road PR3 – R2 with current limits 90 km/h or 130 km/h and define zones with 30 km/h in selected living districts
- Establish low emission zone in the centre of the city and Západ neighbourhoods
- Support higher share of public transport in modal split by restrictive policy against long term parking in central zone what will distract commuters from car usage
- Allocate new development of housing and commercial zones to the vicinity of public transport lines, at first tram backbones and high capacity bus lines (10, 71, 72).

7.4.8 Well controlled safe road infrastructure with limited extent of bottlenecks

- Well utilise existing infrastructure with smart sharing of space with public transport, bicycles and pedestrians
- Solve bottlenecks and dangerous spots
- Bypasses included in land use plan and proposed to be constructed till 2030 will contribute the healthier environment in detached neighbourhoods Kavečany, Krásna and Košická Nová Ves by which will two parallel roads connect from D1 and R2 to Prešovská street.
- New connections will enable better access to living areas at Sídlisko Ťahanovce (from direction Prešov), at Kopa, at location K lesu in Krásna, from Pereš to Lorinčík, from Krásna to Barca and to the airport
- The functionality of PR3 bypass will by promoted by higher its capacity (upgrade of junctions) and better accessibility (new multilevel junctions Pri prachárni and Masarykova)
- New road connection Prešovská – Masarykova will decrease congestions on Hlinkova and Palackého, consequent elimination of the movement from PR3 road coming from D1 to Hlinkova can help Hlinkova even more
- Change of the organisation of traffic in the centre enabling only one way (counterclokwise) direction of traffic on the south and north of inner circle will decrease the congestions in the centre and leave more space for public transport, cyclists and pedestrians
- Change of the layout of Trieda KVP, Južná (northern part), Komenského a Americkej to two lanes with parking and bicycle lanes will make them to fit better to lower traffic volumes
- Junctions modernisation and capacity upgrade is planned, where the traffic model indicates capacity problems (SNP x Ondavská, Popradská x SNP, Palackého by bus station, Festivalové námestie, Popradská x Ipeľská, junctions on Slanecká, Kostolianksa cesta x Národná trieda)
- Preserve the connection via Rampová after railway modernisation will protect Hlinkova street from additional traffic
- A specific study should be made to identify if there is a real potential for car sharing in Košice
- Assess in details the necessity and feasibility of new road connections recommended to be realised after 2030 according to the results of traffic modelling (Ťahanovce – Anička, Jantárová – Južné nábrežie, Slovenská – Hlinkova)

- Develop new traffic control centre, reconstruct all obsolete elements of traffic lights, implement dynamic control of junctions with traffic lights, build new controlled junctions

7.5 Framework timetable of implementation of proposed measures

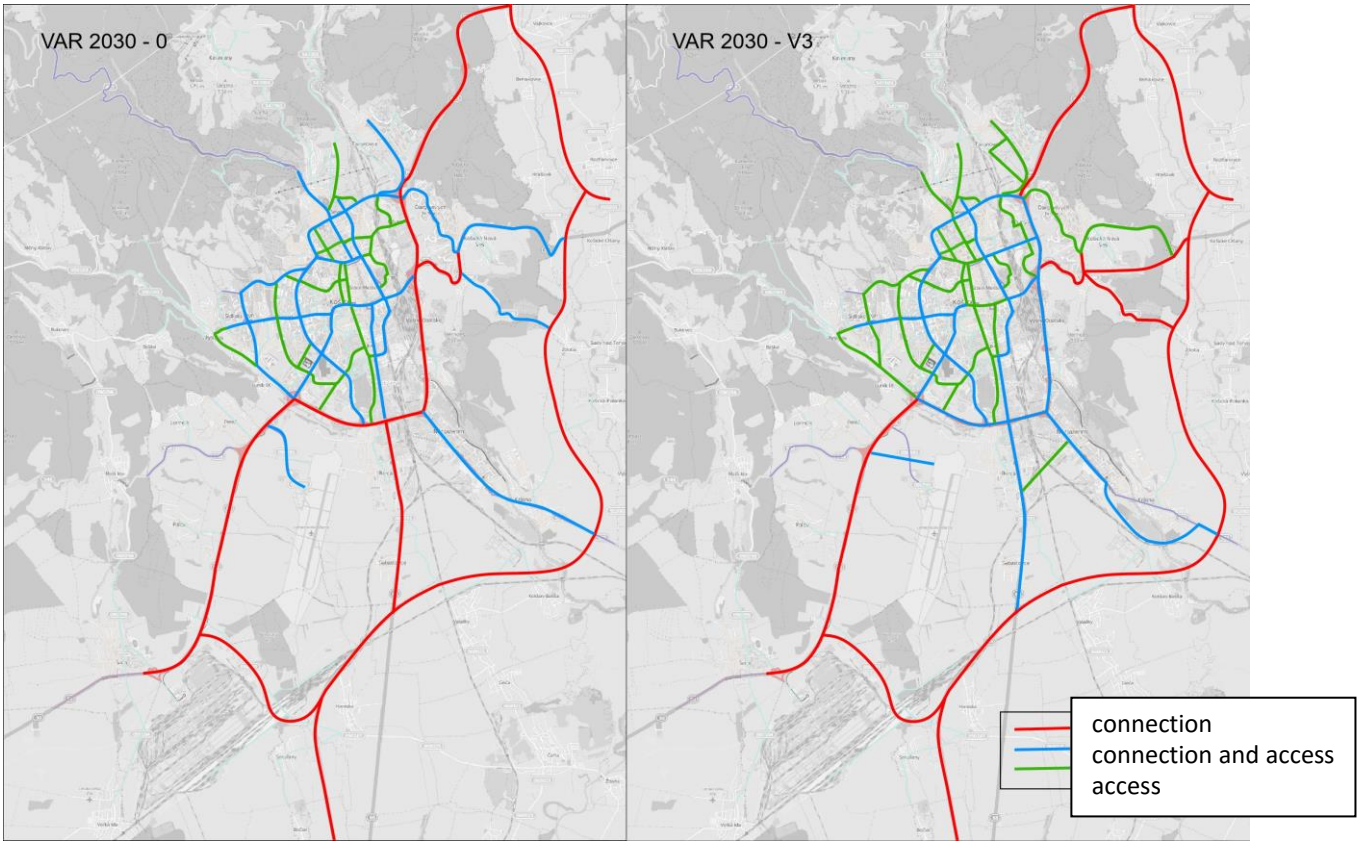
The measures described in sections 7.4.1 to 7.4.8 are designed to achieve the objectives horizons 2020, 2030 and 2040, which represents the view, therefore possibly later period. Deadlines for implementation of individual measures depend on their necessity and financial, administrative or technical complexity. With the implementation of certain measures can be initiated immediately and their nature is such that they can be introduced gradually.

- Responsibility of city government for the transport system
  - The implementation of measures can be initiated immediately and they can be introduced gradually, preferably with a term until 2020
- Better financial sustainability of the transport system
  - The implementation of measures can be commenced immediately and measure can be implemented sequentially, preferably to solve the situation till 2020
- Better walkability of the city
  - The plan for the maintenance of sidewalks may be made following the provisions of the Transport Authority
  - Measures to improve the central pedestrian zone is appropriate to implement till 2020
  - Other construction measures should be implemented gradually with the deadlines to bring sidewalks to acceptable condition till 2030
- Development towards cycling city
  - Master plan of non-motorized transport can be elaborated without waiting
  - Construction measures can be implemented by the year 2030
- Limited parking in the centre, facilitated parking at home
  - The implementation of measures can be commenced immediately and measure can be implemented sequentially
  - The first phase of the reform of paid zone in the centre will be introduced till 2016
  - The second stage of the reform of the parking area at the centre put in place till 2030
  - The implementation of new capacities along with the introduction of paid parking in housing estates Ťahanovce and Dargovských hrdinov will be introduced no later than 2030

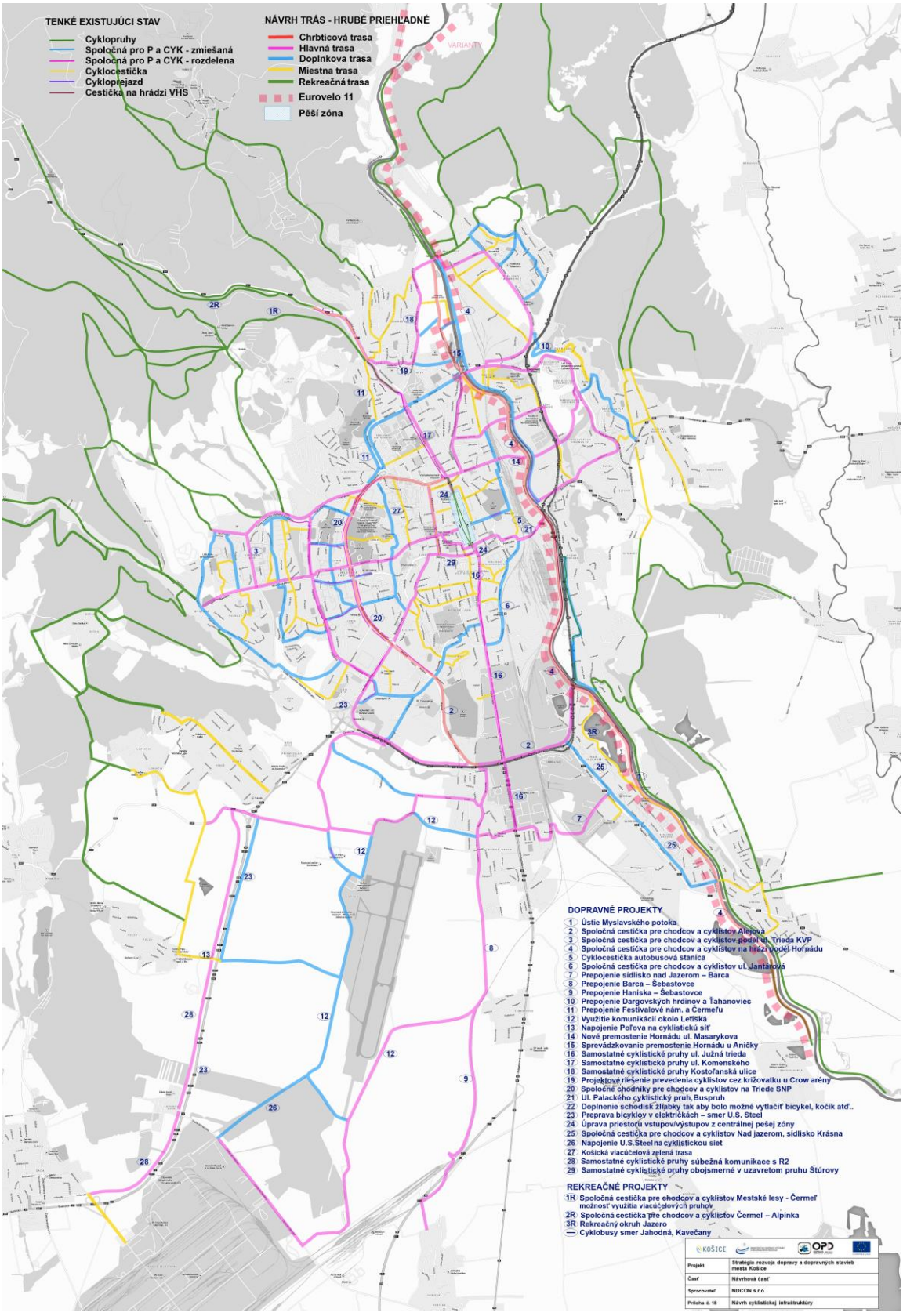
- Economy effective public transport operation with responsible investments and compensations
    - The implementation of measures such as the program of stops, traffic management and information system can be commenced immediately and measures can be implemented sequentially
    - The introduction of a new PT lines according to alternative B till 2020
    - Streamlining of operations - together with new lines layout till 2020
    - The project duobus / electrobus / trolleybus after 2020
    - Construction of terminals and integration with regional transport, realise without delays to finish in 2020-2030 period
    - To develop a new high capacity direct public transport solutions to housing estate Ťahanovce (tram or separate communication for buses) and consequent lines management till 2040
- Environmentally more friendly city transport
    - The implementation of measures can commenced immediately and they can be implemented sequentially
    - The Low Emission Zone in 2020
- Well controlled safe road infrastructure with limited extent of bottlenecks
    - Change the organization of traffic in the city (closing of Bačíková Fejova, one-way in Kuzmányho and Štúrova) 2020
    - New central traffic management in Košice in 2020, reconstruction and construction of new traffic lights till 2030
    - Construction of bypasses needed and missing links till 2030
    - New connections to bypass PR 3 - R2 and reconstruction of the junction Nižné Kapustníky till 2030
    - Construction of the extension of the Masarykova including railway and Hornád bridge till 2030
    - Modernization and reconstruction of junctions till 2030 with continuation till 2040
    - Construction of new connections assessed in outlook till 2040

8 PRESENTATION OF MAIN MEASURES

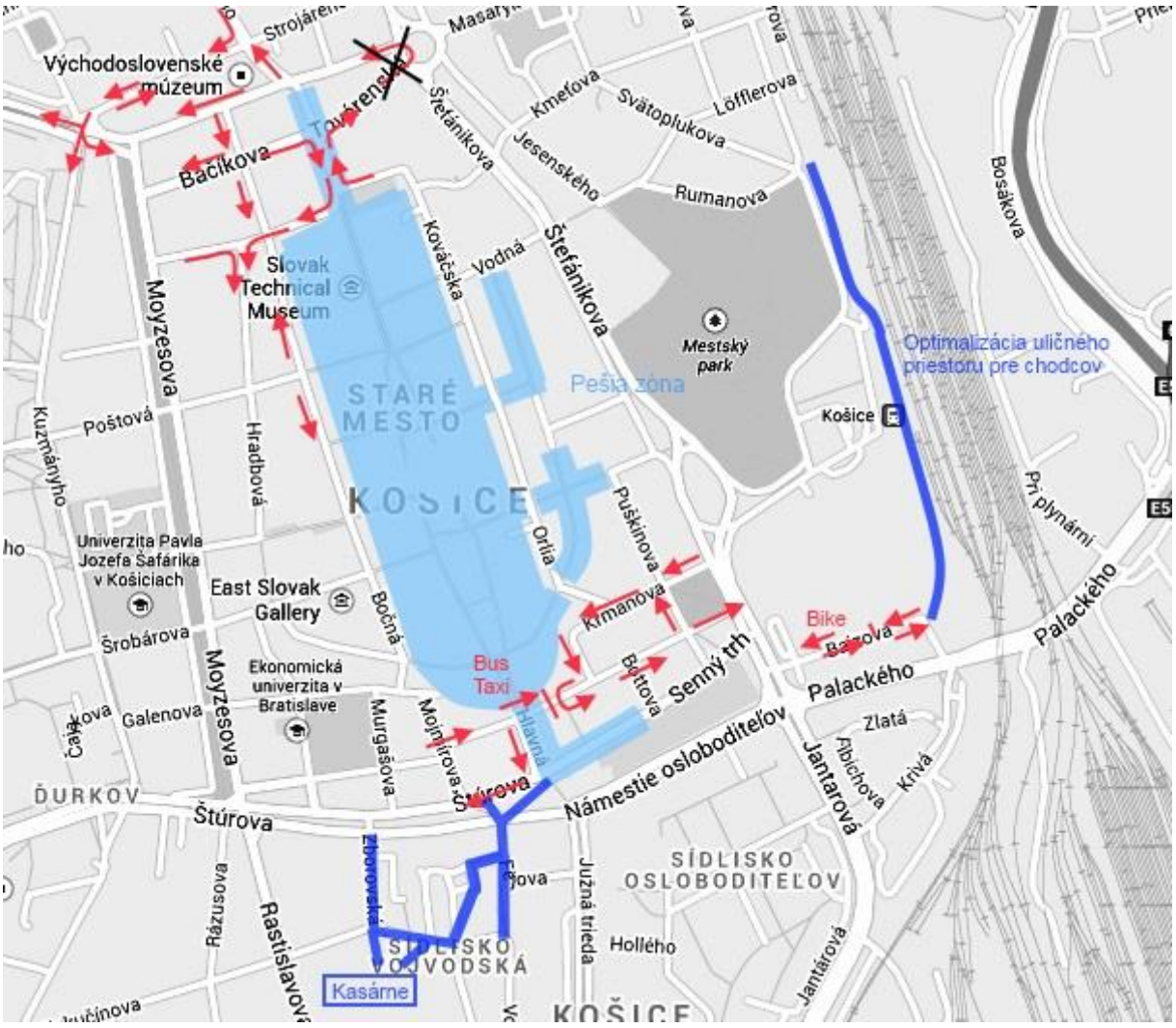
Utilisation of public space by major road infrastructure – prevailing functions



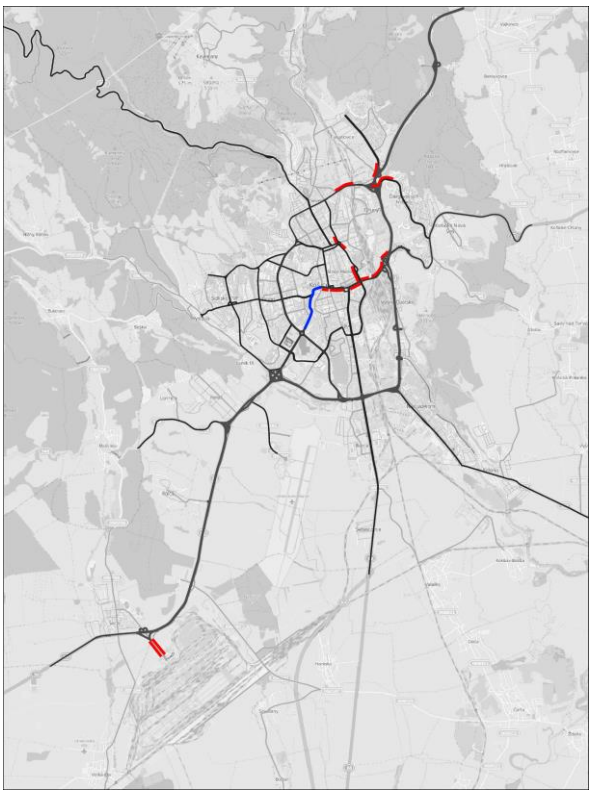
Bicycle routes (red = backbone + main, blue = secondary, yellow = local, green = recreational)



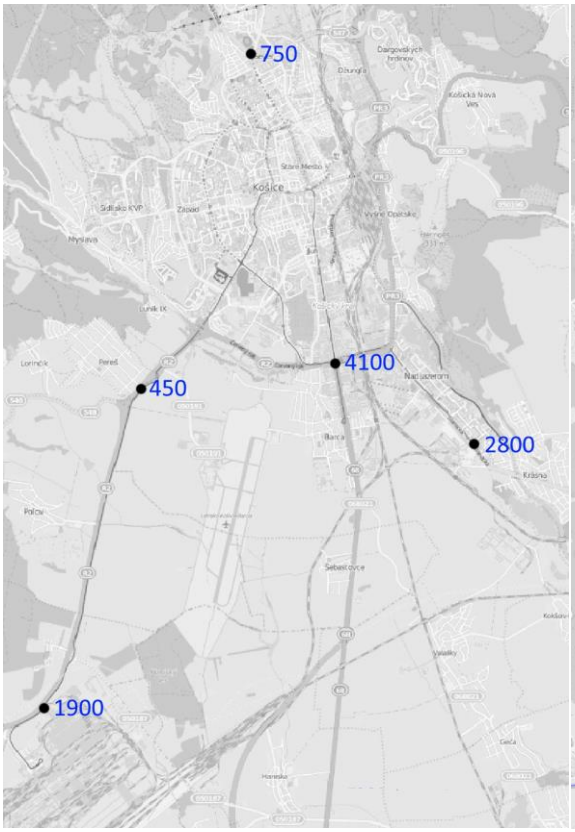
Pedestrian infrastructure improvement and public transport support in the centre by new transport organisation:



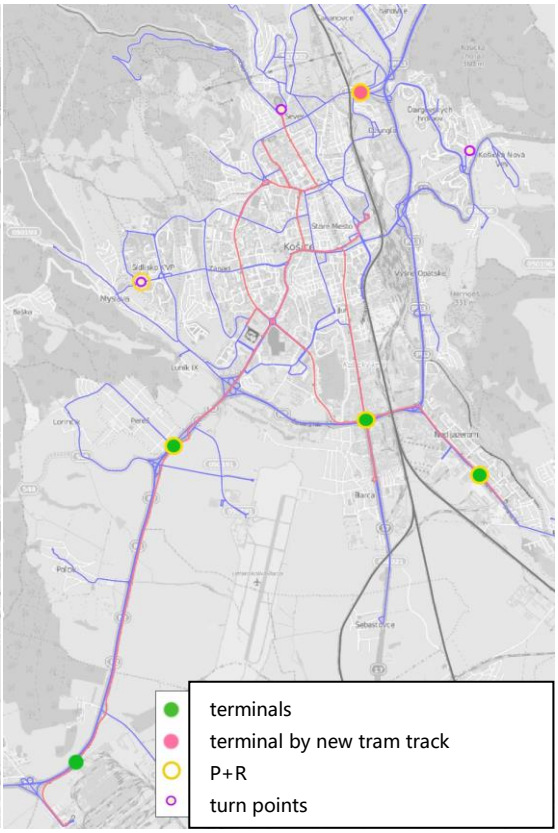
Bus lanes (red) and buses on tram track (blue)



Regional bus terminals turn points, P+R

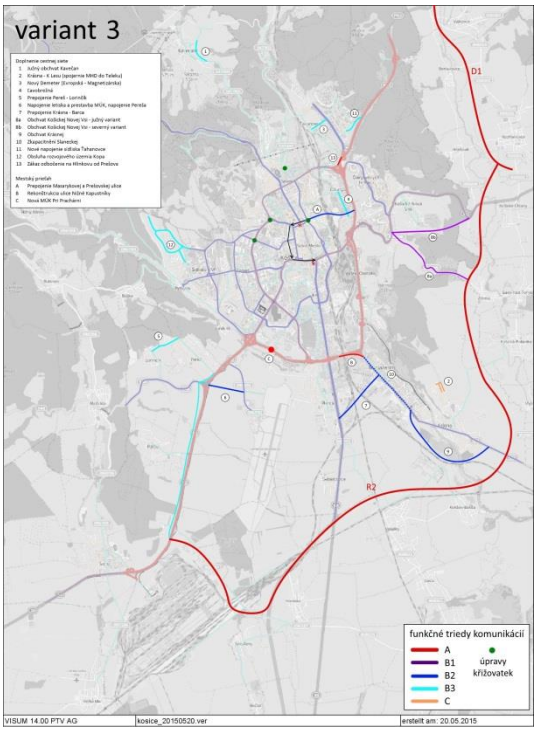


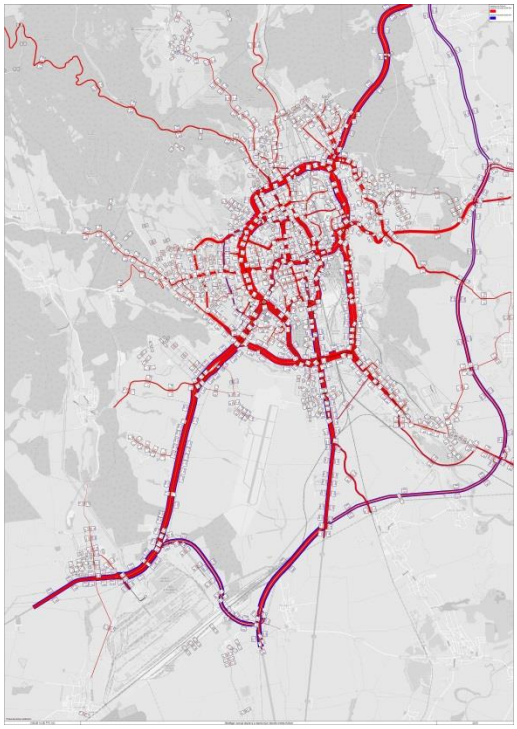
Number of expected daily transfers in terminals 2030



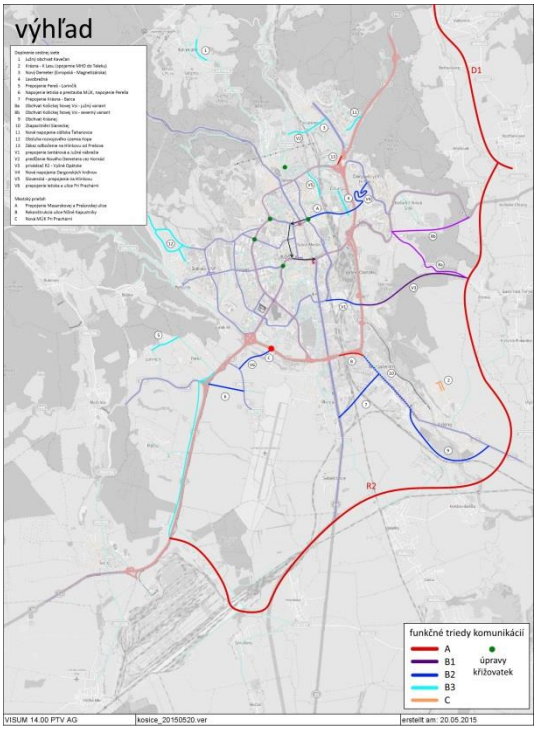
Roads (situation of measures and traffic volume)

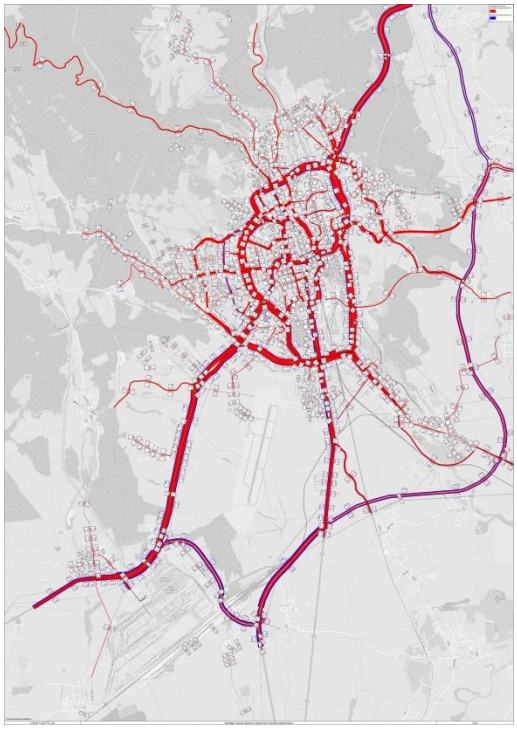
2030





2040

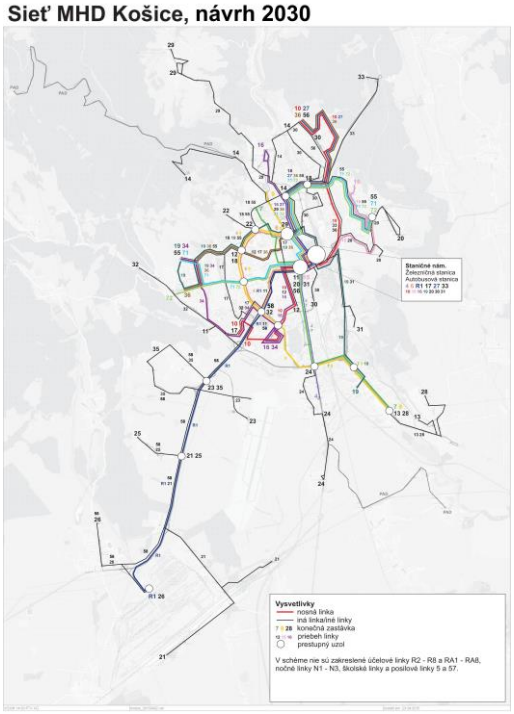


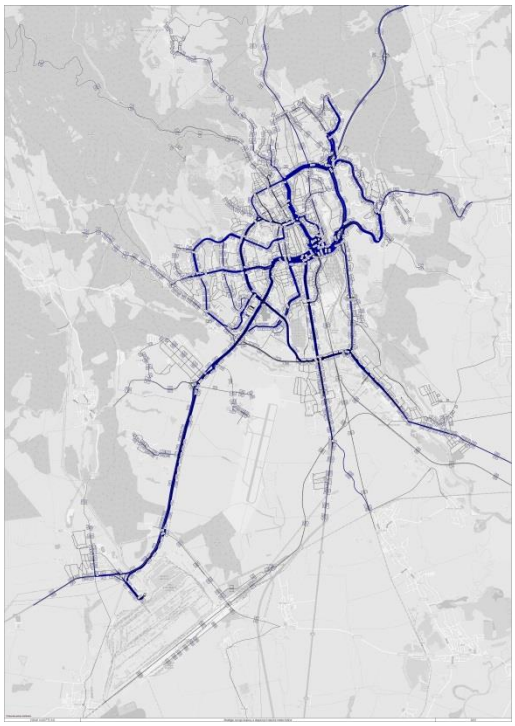


Public transport (scheme of new line routes and traffic volume)

2030

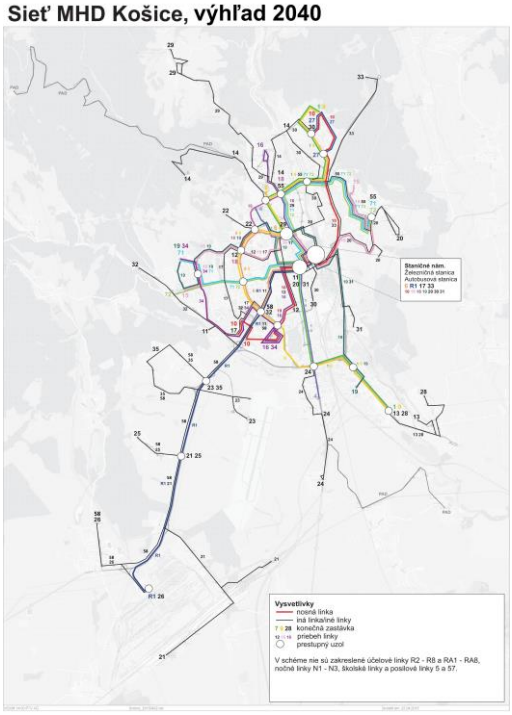
Sieť MHD Košice, návrh 2030

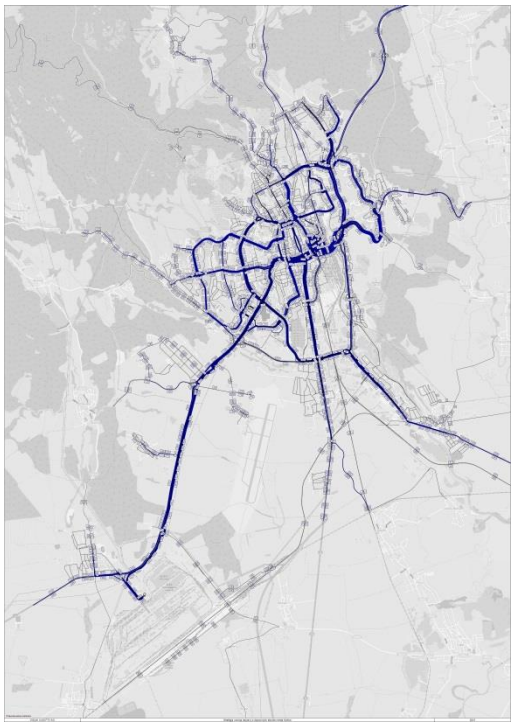




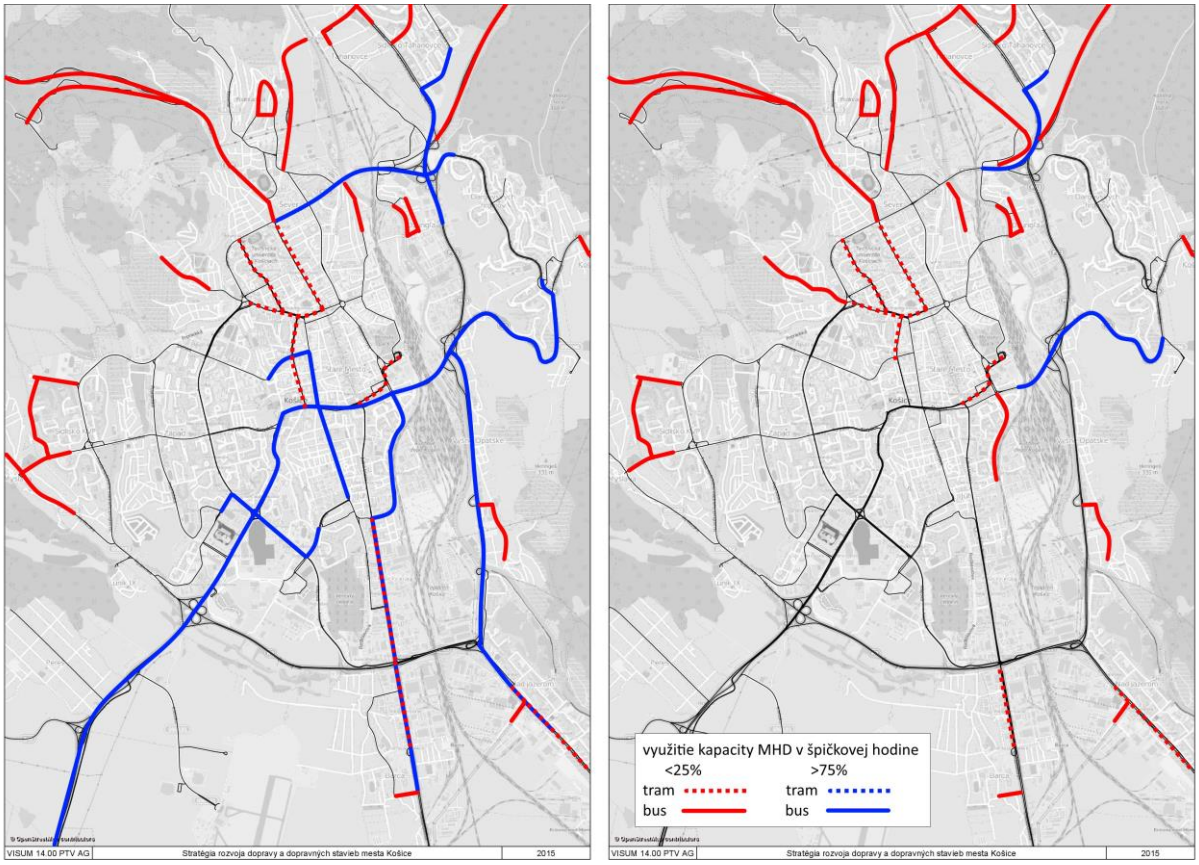
2040

Sieť MHD Košice, výhľad 2040



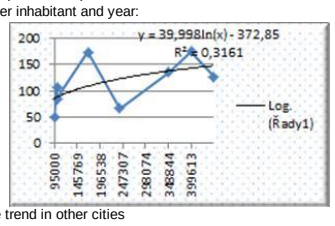
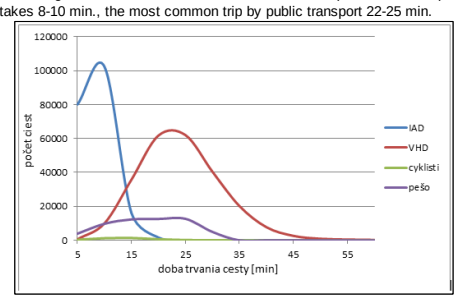


Capacity usage of PT lines in peak hour 2030 (existing and new PT line routes)
red= below 23 %, blue = above 75 %

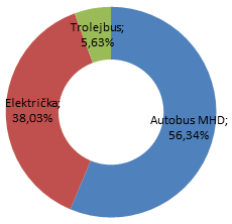


9 BINDING MEASURES PROPOSED TO PROBLEMS

The following table clearly shows the problems defined in the analysis, identifying their quantification on the basis of completed surveys and transport model and shows the linkage between the problems and the proposed objectives and measures.

Problems	Quantification	SWOT - weaknesses and threat	SWOT - objectives	Objectives	Measures
Horizontal					
The city lacks the administrative capacity to manage the transport system.	Administration of Municipality of Košice in the field of transport consists of the following departments: Construction department, investment, construction and environment office, department Chief Architect: design and development of transport in the city, Construction department, investment, construction and environment office, transport department: transferred state administration, management, maintenance and development of infrastructure agenda integrated transport system Is not addressed: the organization and management of traffic, surfacing solutions, the formulation of the order of public transport	The lack of capacity of management and organization of transport at Košice City hall	Stochastic analysis of acceptability: Strategy: High quality control team - Transport for Kosice subordinated to the Mayor	1	Develop a specific study for the creation of a municipal authority in charge of transport including integration of public transport with regional system
Means for compensating the losses of public transport are not in the existing mode of operation sufficient.	Compensation of public transport in 2015: Compensation per inhabitant and year: Brno 175 € Plzeň 174 € Ostrava 136 € Bratislava 128 € Liberec 107 € Olomouc 85 € Košice 67 € Prešov 49 €  According to the trend in other cities in the Czech Republic and Slovakia Košice should compensate Košice: 122 € / person. (Poland Rzeszow compensates € 85 / person.) The transport performance per capita in Kosice was 65 vehicle-km. Trend by as for the other cities should be 85 vehkm.	The lack of competitiveness of public transport, because of its underfinancing undersized and lack of organization from a city level.	Strategy Weakness - Threat: to avoid that better organization of transport is disallowed by a lack of funds	2	Find new financial resources for public transport, combine tariffs for public transport with parking tariffs (offer off-peak parking in the centre for pre-paid card owners and enable parking with pre-paid cards for entire central parking zone only for the owners of annual public transport ticket using Košice city cards)
Municipal budget sources do not allow proper maintenance of roads, bicycle paths and sidewalks in the city, tram and trolleybus network, depots etc., at the necessary level, there are very limited resources to invest, any development must be financed by loans, subsidies or special budget chapter .	Municipal budget expenditures in 2015 amounted to 126.1 mil. €, transport got 22.7 million €, i.e.. 18% = € 95 / person., Of which 6.1 million. € for maintenance 0.35 million € maintenance of traffic lights only, 0.1 mil. € for investment and 16.02 million. € to compensate the loss of public transportation. Total expenditure of the budget in Košice reach € 525 per capita in the Czech Pilsen € 1,365 per capita, 23.9% = € 326 / person. was used for transport, in Polish Rzeszow € 1,780 per capita, 12% = € 214 / person. for transport - total expenditure in Košice is very low. Košice consume 55% of the expenditure for transport to compensate for public transport (Plzeň 43%, Rzeszów 38%). This combined has negative impact on the amount of maintenance and Košice have no own investment funds.	Lack of financial resources from the city budget for the maintenance and development of transport infrastructure.		1, 2	- Implement the system of roads, bridges, tram tracks, pedestrian and bicycle paths inspection and create maintenance plans, - Allocate sufficient budget resources for necessary maintenance of urban roads and bridges tram network, depots etc. on necessary level providing that all works will be procured to get good quality for reasonable price, - Increase of available resources for transport investments connected with responsible investments based on economy efficiency, utilise European funds, state subsidies, loans for responsible investments to city transport structures, define important investments and get support from state/EU/banks.
Due to lack of traffic management lacks arguments for future decision-making in the field of transport infrastructure	In Košice from Kosice abolition of Transport Engineering Institute ÚDI do not care about the collection and assessment of transport engineering data nor are data on the usage of public transport. Decisions on further development of urban infrastructure can therefore not be done responsibly and with a focus on efficiency.	Unsystematic management and unpreparedness of the projects, the lengthy preparation process. Out of date implemented measures due to the length of the decision process and lack of conceptual preparation in the past.	Strategy weakness - Opportunity: higher capacity of urban governance.	1,7	- Change the legislative/regulatory framework to ensure that quality public transport is ensured for all future new settlements and new parking places by business developments in the centre will be limited, - Allocate new development of housing and commercial zones to the vicinity of public transport lines, at first tram backbones and high capacity bus lines (10, 71, 72).
Administrative organisation of Municipality of Košice and the Regional Office do not allow to integrate effectively regional and urban public transport.	Transport Department of the Regional Office directly formulates and orders transport activities. At the Municipality of Košice the order of public transport is not formulated, organization of public transport ensures DPMK			2	Utilise the capacity of direct regional lines to the centre preserved in peak hours for city journeys to decrease operational costs of municipal public transport.
Road transport					
High capacity road that allows you to travel from 2 to 2.5 times faster by car than by public transport	According to the model distribution curve the most frequent road car trip takes 8-10 min., the most common trip by public transport 22-25 min. 	The continued growth of the volumes of car traffic without increasing of the attractiveness of bicycle and public transport.		5,8	- Enable parking on overcapacity main roads as KVP avenue and Americká by changing of right lanes to parking and bicycle lanes, - Change of the layout of KVP avenue, Južná (northern part), Komenského a Americká to two lanes with parking and bicycle lanes will make them to fit better to lower traffic volumes
The quantity of cars and their use is gradually increasing	The growth of transport operations by care transport according to transport model showed an increase of 30% over 25 years: Variant 0 - 2015: OA [vozkm] 1 902 294; NA [vozkm] 246 924 Variant 0 - 2030: OA [vozkm] 2 330 517; NA [vozkm] 292 971 Variant 0 - 2040: OA [vozkm] 2 468 831; NA [vozkm] 305 967	Growth of motorized traffic causes its slowing down and increasing the number of accidents, environmental degradation.		7,8	- Support individual electromobility, - Well utilise existing infrastructure with smart sharing of space with public transport, bicycles and pedestrians, - New connections will enable better access to living areas at Sídlisko Ťahanovce (from direction Prešov), at Kopa, at location K lesu in Krásna, from Pereš to Lorinčík, from Krásna to Barca and to the airport, - A specific study should be made to identify if there is a real potential for car sharing in Košice,
Capacity problems at the entrances to the city, multi level junction and street intersection of Hlinkova, Štúrova, Štefánikova, Hviezdoslavova and SNP streets.	**Junction with limited capacity at entrance - the ratio intensity / capacity:** Štúrova - Kuzmányho west 1,322 Hlinkova - Vodárenská Ťahanovce) 1,308 Protifašistických bojovníkov - Rooseveltova from Štefánikova 1,065 Trieda SNP - 1,050 Ondavská from south Palackého - bus station from the east 0,999 Hlinkova - Němcovej from 0,956 Ťahanovce Palackého - Jantárová from Jantárová 0,915 **Congested sections (LoS D-F):** Nižné Kapustníky from the east - short weaving between Slanecká and Alejová + 1 lane from Slanecká (both directions) Prešovská cesta from the north and from Palackého at multilevel junction Prešovská - Sečovská - narrowing to one lane Trieda SNP from ČSA to Popradská			8	- Solve bottlenecks and dangerous spots, - Junctions modernisation and capacity upgrade is planned, where the traffic model indicates capacity problems (SNP x Ondavská, Popradská x SNP, Palackého by bus station, Festivalové square, Popradská x Ipeľská, junctions on Slanecká, Kostolianska cesta x Národná avenue), - Preserve the connection via Rampová after railway modernisation will protect Hlinkova street from additional traffic, - Assess in details the necessity and feasibility of new road connections recommended to be realised after 2030 according to the results of traffic modelling (Ťahanovce – Anička, Jantárová – Južné embankment, Slovenská – Hlinkova).
The main road passes smoothly through the city centre, causing high traffic in the city	**Volumes of passenger car / freight vehicles - 24 hours:** Štúrova 25830/1412 Jantárová 22092/1546 Protifašistických bojovníkov 20075/1583 Československej armády 10979/1371 Moyzesova 12561/1099	Indifference of state investors in the needs of the city.		8	-New road connection Prešovská – Masarykova will decrease congestions on Hlinkova and Palackého, consequent elimination of the movement from PR3 road coming from D1 to Hlinkova can help Hlinkova even more, - Change of the organisation of traffic in the centre enabling only one way (counterclokwise) direction of traffic on the south and north of inner circle will decrease the congestions in the centre and leave more space for public transport, cyclists and pedestrians,
The outer radial circuit and some road sections pass through populated areas and have high traffic volume, which has a major impact on the environment	**Volumes of passenger car / freight vehicles - 24 hours:** Slanecká 26586/1548 Južná 16752/2988 Moldavská 22773/1246 Trieda SNP 34233/552 Hlinkova 28803/2851 Nižné Kapustníky 27060/5441			7,8	- Support individual electromobility, - Bypasses included in land use plan and proposed to be constructed till 2030 will contribute the healthier environment in detached neighbourhoods Kavečany, Krásna and Košická Nová Ves by which will two parallel roads connect from D1 and R2 to Prešovská street.
Tangential trips on the west side of the city are going through densely populated housing estates and any additional tangential road is neither possible nor necessary to build.	**Volumes of passenger car / freight vehicles - 24 hours:** at SNP street: 34233/552			7	Support individual electromobility,
The road PR3 Prešovská – Južné nábrežie – Nižné Kapustníky – Červený rak is not being used as bypass for destination or intra city trips.	With regard to road capacity within the city, drivers do not need to use circle road for inner urban roads. On the contrary, there may be delays on radial roads that connect the circle to the city circle (Hlinkova, Palackého).			8	The functionality of PR3 bypass will by promoted by higher its capacity (upgrade of junctions) and better accessibility (new multilevel junctions Pri prachárni and Masarykova)
There is no functional central traffic management	Traffic control centre in the Municipality of Kosice is outdated and dysfunctional, using only a camera system.		The modern method of controlling traffic by traffic lights	8	Develop new traffic control centre, reconstruct all obsolete elements of traffic lights, implement dynamic control of junctions with traffic lights, build new controlled junctions
Outdated signalling devices, typically without dynamic control and preference of public transport causes delays of public transport and pedestrians	In Košice there are operated 60 road traffic lights at intersections and crossings. Only one third of them have dynamic control and only a few of them (including those built during the reconstruction of tramways) has a preference for public transport. Most traffic lights is outdated, the control includes good coordination (green wave), but limits pedestrian and bicycle traffic a lot and does not address the majority of preference or public transport.			8	Develop new traffic control centre, reconstruct all obsolete elements of traffic lights, implement dynamic control of junctions with traffic lights, build new controlled junctions

Bicycle transport					
A limited number of bicycle paths and roads form the continuous infrastructure	In the city of Košice there is about 30 km of trails open to cyclists including the central pedestrian zone. From them 4 km falls on separate paths for cyclists. The remaining 26 km are paths with mixed traffic, pedestrians and cyclists. Example: Západ housing estate at first glance offers quite a comprehensive network for cyclists, but it is not so, because the cyclist would be at each crossing of urban roads to get off the bike and push it to the other side.	- Lack of bicycle paths and lanes and missing interconnections of them, - Unreconciled ownership to the land.		4	- Develop on the basis of the conclusions of this strategy non-motorized transport master plan containing detailed solutions of bicycle paths and lanes, - Develop bicycle backbones along Hornád (Eurovelo 11), Komenského – Južná and Trieda SNP to enable easy connection of neighbourhoods in flat part of the city , - Add west – east routes to enable access from eastern and western suburbs, - Develop secondary and local bicycle tracks.
Cycle paths are mostly collision with pedestrian streets	Hlavná street Komenského Južná trieda Watsonova street Čermeľská cesta Ludvíka Svobodu Popradská Šafárikova avenue Festivalové square.			4	Separate bicycle traffic from pedestrians if pedestrian traffic on common path is high,
At controlled intersections are not separated crossings for cyclists who therefore must use pedestrian crossings	By nearly 100% of controlled intersections there is ask of crossings for cyclists. (Bicycle crossing is realized only at the Komenského x Watsonova)			4	Implement the bicycle paths and lanes to the controlled junctions to enable smooth use of bicycle.
Many roads are not suitable for cycling	narrow underpass at Palackého street Južná avenue Watsonova street Čermeľská cesta Ludvíka Svobodu Hlinkova street Štúrova	Discouragement from walking and cycling routes through the city of quality infrastructure.		4	- Develop on the basis of the conclusions of this strategy non-motorized transport master plan containing detailed solutions of bicycle paths and lanes, - Add west – east routes to enable access from eastern and western suburbs, - Separate bicycle traffic from pedestrians if pedestrian traffic on common path is high.
No facilities for storing bicycles	95% of stands does not allow for a safe secure bicycle. Throughout Kosice there is virtually no stand for secure bike lock. Typically it is a front wheel stands, which make it impossible to ensure the wheel safely. The city of Košice also does not have any central facility for bikes.			4	- Provide bicycle parking by important destinations, - Implement bicycle sharing system with benefits for public transport pre-paid card holders.
Cyclists are pedestrian zones in conflict with pedestrians	The central pedestrian zone - The main part of the street Hlavná, Mlynská, Alžbetina, Poštová, Univerzitná, Biela, Františkánska			4	• New arrangement of bicycle lanes on Hlavná street on next reconstruction (common lane for service transport and bicycles with similar or worse surface as walking area – not attracting pedestrians).
Absence of cycling strategy within housing estates and commercial zones	Not existing logical and safe cycling traffic, parking and traffic handler.			4	- Develop on the basis of the conclusions of this strategy non-motorized transport master plan containing detailed solutions of bicycle paths and lanes, - Redevelop housing estate transport schemes to enable logical and safe move of bicycle, parking and service traffic
In the city there are dangerous intersections	Festivalové square OK Gorkého x Masarykova x Hviezdoslavova x Bačíkova Popradská x Trieda SNP Hlavná x Rooseveltova (exit from the central pedestrian zone) Mlynská x Kováčska Masarykova x Alvinczyho			8	- Junctions modernisation and capacity upgrade is planned, where the traffic model indicates capacity problems, - Develop new traffic control centre, reconstruct all obsolete elements of traffic lights, implement dynamic control of junctions with traffic lights, build new controlled junctions
No possibility of cycling along R2 road from Šaca and along expressways sections of the external circuit (PR3)	Expressways are not legally permitted to be entered by cyclists and therefore there is no satisfactory connection between Šaca and the rest of Košice.			4	Develop secondary and local bicycle tracks.
Pedestrian transport					
Low quality surface of many paths, especially in housing estates.	According to field surveys and estimation of designer it is up to 65% of the trails in unsatisfactory condition. This is a clear example .. after the rain, but also during the normal walking is felt discomfort compared to reconstruct the pavement.			3	Elaborate maintenance plan of sidewalks and maintain their surfaces to keep them walkable
Low quality surface of many paths, especially in housing estates. Many obstacles, stairs, barrier effect of major roads and intersections.	Stairs : Austrálska avenue - Viedenská, Ondavská - school college, area Nová Terasa, Skalná - Užhorodská Barrier: Prešovská cesta all 4 lane roads	The barrier effect of the city's main roads for pedestrian intersections, causing uncomfortable or unsafe passing the main streets.		3	Dismiss the physical barriers on main paths and on the accesses to the public transport stops.
The overall low priority for pedestrians.	The situation at crossings Long waiting times for traffic lights Pooling of cyclists and pedestrians on shared paths	Discouragement from walking and cycling routes through the city of quality infrastructure.		3,6	- Implement the program of pedestrian crossings, add new necessary crossings, improve the safety of dangerous and long crossings, aim to shorter waiting times on controlled crossing and to the crossings od dual carriageways on one green light, - Public transport stops programme – improve the quality and accessibility of stops.
Low quality pf footpaths, limited possibility to walk from the city centre of the West to the city.	According to field surveys and estimation of designer it is up to 65% of the trails in unsatisfactory condition. This is apparent e.g. after the rain, but also during the normal walking is felt discomfort compared to reconstruct the pavement. Barriers in the form of multi-lane roads. Long uncontrolled crossings.	Poor quality of sidewalks' surface trails and local communications.		3	Elaborate maintenance plan of sidewalks and maintain their surfaces to keep them walkable
Poor accessibility of Ťahanovce and Dargovských hrdinov housing estates without a car.	Barriers in the form of multi-lane roads. Long uncontrolled crossings. Absence of sidewalks - Kostolianska st. Magnezitárska st.	Location Sídlisko Ťahanovce and Dargovských hrdinov estates outside the compact city.		3	Build new pedestrian paths to connect the city neighbourhoods to the centre
Many uncomfortable, dangerous and uncontrolled pedestrian crossings.	All passages through the 4 lane road: Komenského Južná avenue Watsonova street Čermeľská cesta Ludvíka Svobodu Furthermore, the crossing of Bačíkova, Zbrojničná, Rooseveltova, Senný trh, Mlynská x Kováčska the central pedestrian zone	The increasing rate of accidents at crossings with the gradual enforcement of priority, to which the crossings are not prepared.		3	Implement the program of pedestrian crossings, add new necessary crossings, improve the safety of dangerous and long crossings, aim to shorter waiting times on controlled ,
Unresolved access to some public transportation stops	stop Pereš, water tank station Košice, Barca bus stops along Slanecká road			3	Dismiss the physical barriers on main paths and on the accesses to the public transport stops.
Lack of access paths to some parts of the city..	To improve the quality of the main pedestrian axes in housing estates it will be necessary in particular: - Pedestrian axis of estate Západ – Katkin park – Gudernova, Zuzkin park – Katkin park with a new passage through Avenue SNP, - The main pedestrian axis of Sídlisko KVP estate including barrier free solutions and creation of axis Wuppertálska – Farský church – Billa, which does not have adequate sidewalks and - Pedestrian axis of Sídlisko Ťahanovce: Bukurešťská – Budapeštianska. To improve accessibility for pedestrians neighbourhoods no pleasant way is currently available, it is necessary to rehabilitate it, - Pedestrian connection Husárska - Floriánska from Západ housing estate - Pedestrian connection Belocerkevská/Bašťovanského - Vo Výmoli a Bašťovanského – Rampová along with unblocking of the paths to Dargovských hrdinov housing estate.	Limited opportunities for walking and cycling access to large settlements.		3	- Build new pedestrian paths to connect the city neighbourhoods to the centre, - Improve housing estates pedestrian axes.
Time-consuming crossings through controlled junctions of main roads.	VSS junction Popradská x Moldavská cesta Osloboditeľov square Senný market Palackého x Jantárová Komenského x Hlinkova junctions with traffic lights on SNP avenue			8	Develop new traffic control centre, reconstruct all obsolete elements of traffic lights, implement dynamic control of junctions with traffic lights, build new controlled junctions
Obstacles in the northern and southern edge of Hlavná street pedestrian zone	Pedestrian zone in the north and south ends nearly inside adjoined junctions, lacking continuity to further continuation as for pedestrians as well as cyclists.			3	Improve the function of pedestrian zone in the centre by decreasing potential conflicts with car and bicycle traffic.
The limited width of footpaths by bicycle lanes routes (e.g.. Komenského).	Hlavná street Komenského street Južná avenue Watsonova street Čermeľská cesta road Ludvíka Svobodu Popradská street Šafárikova avenue Festivalové street.			4	Separate bicycle traffic from pedestrians if pedestrian traffic on common path is high.
Public transport					
The city does not act as principal of municipal public transport and does not govern DPMK	The city has the contract with DPMK for the provision of public services, which is a very high-quality base the operation of the operator. Annex of the contract does not include the definition of DPMK performance defined by the city, but there is he result of planning activities of the operator, which has no accountability to the electorate and must take into account not only the needs of passengers, but also its operational priorities.	No addressing the lack of capacity of Košice City hall in the organization of public transport and transport infrastructure development.	- Setting of Public Transport Organiser, - Strategy Strengths - Threat: Well managed and functional public transport system	1, 2	- Manage the organisation of transport and public transport operations according to collected transport engineering data , - Allocate the resources for public transport compensations to cover all costs and part of current accountancy loss of DPMK (at least 17 mil. € for 2016) providing responsible management of public transport operations targeted to economy efficiency (effective use of lower number of modern rolling stock on faster lines to decrease fixed costs, attracting new and also less frequent users by short headways and integration, responsible investment) ,
A complex system of lines leads to long intervals between connections and the system more suited to existing passenger	Line management in Kosice is for many years stabilised, it offers the opportunities for the maximum amount of direct connection and is permanently maintained in accordance with the requirements of the traveling public. But it does not offer an attractive option for new passengers. Rail transport does not constitute in Košice backbone system since the peak intervals are ranging from 10 to 15 minutes, as well as intervals of backbone bus lines and the system is not suitable for transfers. This leads to low usage of trans and overload of direct buses at peak times and the lack of interest in switching to public transport by the users of cars.	Political and improper interference with the process of preparation of line management and service schedules.	Increase of public transport attractiveness	6	Increase attractiveness by shorter headways, simple lines layout, higher operational speed ensured by preference on junctions and by reserved bus lanes.
Long waiting times for public transport and on most lines of supporting public transport			Public Transport information systems	6	Implement new line system with shorter headlines on major trunk lines operated preferably by trams or environmentally friendly buses with other feeder buses to convenient transfer nodes (Mier, Krajský úrad, Amfiteáter, Nová nemocnica, Magistrát, Poliklinika KVP, SOŠ car, Železníky-križovatka, Dneperská, Važecká)
Any necessary approach leads to long delays				6	Organise direct bus connections to and from the schools from neighbourhoods Šaca, Poľov, Lorinčík and Pereš additionally to feeder bus lines to the tram line
Poor accessibility of the historic center along the main street public transport	1.2 km long Main Street is not served by public transport, a tram track at 600 m distant Kuzmányho street is too far, buses (trolley) on 300 m distant Štefánikova Street replaced the service on the main street. There is however no barrier free access and improved quality of stops and access to the city is desirable.			6	Design and develop new layout of central public transport terminal at bus station for better integration and more fluent bus transport in the centre

Extensive fleet and the corresponding needs of the city	DPMK operated at the end of 2015 79 trams of type T3, T6 x 30, 19 x 34 and KT8 Vario LF, 158 diesel and 19 CNG buses (146 buses were withdrawn in the past three years) and owned 14 trolleybuses and 5 electric buses. The expedition during peak hour is just about 50 trams and 80 buses, it is not advantageous to operate several types of drives diesel / gas / electricity).			6	- Suspend the operation of existing trolleybus network, commence the preparation of new concept of environmentally friendly buses (duobus/electrobus/trolleybus) to operate instead of trolleybuses soon after 2020, - After planned procurement of 13 more tram vehicles keep 10 bidirectional KT8 vehicles and gradually let them modernise to low floor.
Still, it is necessary to restore about 12 trams from the long part of the park older than 25 years.	DPMK operated at the end of 2015 79 trams of type T3, T6 x 30, 19 x KT8, but only 34 modern Vario LF, with a length of 22m, it is not sufficient for the expedition after the elimination of obsolete vehicles.			6	After planned procurement of 13 more tram vehicles keep 10 bidirectional KT8 vehicles and gradually let them modernise to low floor
Neglected trolleybus system	DPMK is capable to operate only 14 trolleybuses, trolleybus transportation infrastructure has not been properly maintained and needs the renewal. Due to lack of funds for investment and maintenance costs and excess of purchased buses it is not economically feasible to continue in the short term in-service of trolleybuses.			6	- Suspend the operation of existing trolleybus network, commence the preparation of new concept of environmentally friendly buses (duobus/electrobus/trolleybus) to operate instead of trolleybuses soon after 2020, - Develop till 2020 a specific study to assess the possibility of the use of environmentally friendly buses on additional backbone bus lines after 2030.
Sections of tram tracks with poor quality and in need of renovation (Alejová, Slanecká, Južná avenue south of Public cemetery track to U.S.Steel).	These tramways tracks were upgraded last time more than 20 years ago.			6	- Modernise remaining trams tracks with exhausted lifetime Alejová, Slanecká, Južná avenue south of Verejný cintorín and track to U.S.Steel for fast backbone lines operation, - Modernise tram track Košice – U. S. Steel to high speed tram including traffic control to be utilised as the main connection from southwestern part of Košice and integrate urban and suburban lines.
Public transport is slow without a preference, compared with cars have a long driving times	Traffic of public transport s 2 to 2.5 x slower than the traffic of cars, except for the natural causes it is deteriorated by very limited range of preferences at intersections and a small range of preferential lanes reserved.			6	- Control public transport in the framework of new transport management centre of the city, - Bus preference lanes (also for cyclist and taxi) preferably establish in the streets Hlinkova, Tr arm. gen. L. Svobodu, Americká trieda, Prešovská, Sečovská, Palackého, Štúrova and Buzinská according to the results of traffic modelling and capacity calculation, Senný trh – Štúrova and Bačíkova – Továrenská will be dedicated to buses, cyclist and taxi only,
Public transport ambitions are higher than available resources.	Amount of compensation for loss of mass transit in the amount of 16 million. € per year and insufficient pressure to the efficient causes that DPMK does not have enough operating funds to travel extensive network of direct lines connecting the edge of the city centre through each other without having to transfer.			6	The tram tracks Masarykova – Station square and Popradská – Pri prachárni contained in existing land used plans have no substantiation for existing and planned land use, if new land use plan intensifies the usage of its neighbourhood it should be kept as the land reserve, otherwise it should be erased (unnecessary prolongation of tram to Krásna should be excluded from land use plan) .
Revenue from fares are low and declining, the number of prepaid tickets is not sufficient.	DPMK has income from fare of € 12.9 million. € (2014), revenues and number of passengers are falling annually by 3-4%, only 43% of revenue is from the time of pre-paid tickets.	Reducing the share of public transport on modal split in the absence of funds for investment and operation.		2, 5, 7	- Promote pre-paid tickets for one year (half year), integrate municipal and regional ticketing, combine parking cards with bonus parking, bike sharing, and car sharing (if implemented) - offer and advantaged for long term annual passes holders, - Connect parking system to pre-paid public transport tickets – e.g. give advantage in parking for frequent public transport users in off peak hours or connect pre-paid parking card for entire centre with compulsory purchase of annual public transport ticket, - Support higher share of public transport in modal split by restrictive policy against long term parking in central zone what will distract commuters from car usage.
Trams have low operational speed and do not serve as the backbone, the most common mean of regular public passenger transport is bus service.	The current transport speed of tram is an average of 21.7 km / h. Percentage share of basic types of public transport vehicles on the way to employment 			7	Maximise usage of tram operations, prepare new operation of electric buses according to their technology development based on a specific study results.
Due to the high investments in a new bus fleet depreciation they are very high and leads to a lack of resources to operate.	In 2014, there were purchased 137 new buses, depreciation amounted to 3.45 million in 2014. €., ie.. annually.				
Missing traffic management on the high speed line in U. S. Steel, missing transfer terminals of bus connections to the tram.	Out of city landscape leading line layout to U.S.Steel could run faster if it was introduced traffic management on upgraded lines and it served for its surroundings, if transfer terminals would be available.			6	Modernise remaining trams tracks with exhausted lifetime Alejová, Slanecká, Južná trieda south of Verejný cintorín and track to U.S.Steel for fast backbone lines operation.
Lack of integration of public transport leading to the operation of parallel systems, resulting in low efficiency and falling use of public transport for suburban goals.	Strong lines of buses leaving from Slanec, Valalíky, Seňa, Moldava nad Bodvou, Jasov and Hýľov (9000 passengers per day according to the traffic model) go through the whole city parallel to the lines of public transport.			6	Integrate regional and municipal public transport services, operate main regional lines directly to central bus terminal providing also municipal services in peak hours, terminate other and off peak regional lines in regional transport terminals by the terminals near tram lines (Važecká, Nižné Kapustníky, Válcovne VSS, Perešská) and operate only regional lines to some destinations with limited demand (e.g. Jahodná and Kokšov-Bakša)
Western and eastern edge of the Dargovských hrdinov housing estate has limited accessibility to public transport.	Street kpt. Jaroša and Belocerkevská in the west and Ovručská and Lupkovská in the east and Lupkovská have poor accessibility to bus stop., more than 400 m.			6	Improve accessibility of Dargovských hrdinov housing estate from bus stops
Public transport from Sídlisko Ťahanovce facing congestion endurance buses going to Hlinkova and the city during the morning peak hours.	A delay of 20 minutes. arise in the intersection of Americká and Hlinkova and at level crossings Vodárenská x Hlinkova due to overlapping of transport from Prešov, Dargovských hrdinov and Sídlisko Ťahanovce during the morning peak hours.			6, 8	- Bus preference lanes (also for cyclist and taxi) preferably establish in the streets Hlinkova, Tr arm. gen. L. Svobodu, Americká trieda, Prešovská, Sečovská, Palackého, Štúrova and Buzinská according to the results of traffic modelling and capacity calculation, Senný trh – Štúrova and Bačíkova – Továrenská will be dedicated to buses, cyclist and taxi only, - Complement the municipal rail infrastructure by new tram track Hlinkova - Džungľa – Sídlisko Ťahanovce after 2030, - The functionality of PR3 bypass will by promoted by higher its capacity (upgrade of junctions) and better accessibility (new multilevel junctions Pri prachárni and Masarykova), - New road connection Prešovská – Masarykova will decrease congestions on Hlinkova and Palackého, consequent elimination of the movement from PR3 road coming from D1 to Hlinkova can help Hlinkova even more.
Parking					
Parking regulations in the city centre is effective to limit the scope zone	The city centre can be considered stable and fully regulated area, monitored streets Hradbová, Kováčska, Krmanova, Pribinova, Timonova and Tajovskeho have high daytime turnaround, mainly due to the location of parking machines. In other streets near the edge of the town centre it is vice versa low turnaround and it served often for all-day car parking.	Lack of parking spaces in residential areas and crowded parking capacity in the city and surrounding areas.		5, 7	- Implementation of Parking concept of Košice city in the centre and surroundings with the deployment of residential parking zone as the shield around centre as the first step of the reform af paid parking, - Implement systematic enforcement within paid parking zone to ensure its function, - Support higher share of public transport in modal split by restrictive policy against long term parking in central zone what will distract commuters from car usage.
Paid parking around the center is not being used	Immediate vicinity of the center has taken some of the burden of regulated area. There are also, compared to the center, free and legal spaces, a greater proportion have due to less compact development also parkings..			5	• Build park and ride parking facilities at the transfer terminals to backbone PT lines Važecká, Nižné Kapustníky, Pereš, Moskovská, Sever
Lack of control in downtown leads to long-term parking near the centre	The city center has a daytime high turnaround, mainly due to the location of parking machines. In other streets near the edge of the town center it is low and vice versa turnaround serve as an all-day car parking.	The negative economic impact of improved parking system.		5	As the residential shield around city centre according to Parking concept of Košice city will shift commuting parking to further streets it will be needed to enlarge the zone of paid parking to Hlinkova – Watsonova and to Idanská – Dunajská – Pri nemocnici – Rastislavova – Panelová – Staničná lines in second phase, reform the paid zone according to operational experiences towards limited possibilities of pre-paid and reserved parking for commuters and more parking options for residents, entrepreneurs, owners of real estates and owners of companies residing in the centre.
Settlements have sufficient capacity for parking at night	Sídlisko Ťahanovce night deficit 1 350 places Sídlisko Dargovských hrdinov (Furča) night deficit 760 places Sídlisko Nad jazerom night deficit 690 places Sídlisko KVP night deficit 440 places Sídlisko Západ night deficit 630 places	Low attractiveness of housing - if parking is not solved.		5	- Add more parking places by new parking facilities to the housing estates Sídlisko Ťahanovce, Dargovských hrdinov and Nad jazerom and to implement paid parking zone to support its usage, parking zone has to enable easy visitors' parking, - Reorganise the transport schemes inside other housing estates to balance well parking, bicycle axes, pedestrian paths and conservation of green areas and calmed zones
Many old garages blocks modern solutions	In the city it is nearly 15 thous.. garages, most in neighbourhoods Juh, Západ and Sever, an estimated half of them are not used for parking , the maintenance of driveways is not managed.	Unsettled ownership to the land.			
There is a good possibility to leave your car in the bulk shipping terminal or train station outside Kosice				5	Provision of K+R facilities and short term paid parking by main station and by new PT terminals
Environment					
High noise emissions and also exceed health limits along the main roads.	Most affected residents in the streets: SNP avenue (1 115 residents), Komenského (1 075 residents), Južná avenue – Osloboditeľov square – VSS junction (895 residents). Altogether it detected 85,151 residents in zones, where there is exceeding the daily limit noise	Transport noise on main roads: (SNP, Hlinkova, Národná, Komenského, Jantárová, Kuzmányho, Štúrova).		7	- Decrease speed of traffic on main express road PR3 – R2 with current limits 90 km/h or 130 km/h and define zones with 30 km/h in selected living districts, - Establish low emission zone in the centre of the city and Západ neighbourhoods