TRANSPORT MASTER PLAN FOR GREATER SKOPJE

FINAL VERSION

STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE,
WITH PRELIMINARY DESIGNS FOR THE FOLLOWING ROADS:
"ST.KLIMENT OHRIDSKI" BOULEVARD
AND THE UNDERGROUND ROAD FROM THE SYNODAL CHURCH TO "KOMPLEKS BANKI" BUILDING

REPUBLIC OF MACEDONIA

Skopje, April 2011

idom

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GLOSSARY OF ABBREVIATIONS

AVG	Average
EU	European Union
GUP	General Urban Plan
IDOM	Consultant in charge ("Ingenieros de Obras y Mantenimiento")
JSP	Biggest Bus Operator in Greater Skopje (Semi-state)
LRT	Light Rail System
Nº	Number
NUTS3	Nomenclature of Territorial Units for Statistics
PAX	Passengers
SIDA	Swedish International Development Cooperation Agency
SPSS	Statistical computer software
VEH	Vehicles

1. INTRODUCTION

1.1. PRESENT LOCAL CONDITIONS

Skopje, the capital city of Macedonia has a very long history as a main settlement in the Balkan region. Over the years, and influenced by many different and shifting regimes and cultures, the town has turned into a multi-facetted and vibrant city, where a mixture of ethnic and socio-economic groups gives the city a specific character.

Population increase in parity with the global urbanization trend and the simultaneous growth and shifts in the economy of the area has put a pressure on the socio-economic and environmental conditions under which the people live. Issues related to health, comfort, safety and quality of life has thereby come to the forefront in the daily life of the individuals and the communities and at the same time caused some concern about the long-term sustainability of the development of the City.

At present, urban transport and the general public traffic system throughout the city have degraded to a large extent the quality of life in the city. Jammed traffic problems and loss of time, lack of parking space, air pollution and noise, reduced traffic safety, are part of everyday lives' citizens. These traffic issues can affect to the opportunities for economic development, cultural, political development and prosperity of the city. Hence the urgent need to solve traffic problems in general and the specific problems of urban public transport operating in Skopje.

Urban public transport is particularly affected by a long period of lack of investment, which has resulted in degradation of the quality of service, very old fleet of vehicles, lack of coordination, and inability to invest and improve service.

Despite the poor conditions in public urban transport in Macedonia there is no policy or strategy to develop urban transport, and especially the sustainable development of urban transport systems. This study may be the beginning of a change in strategy, now more than ever, in order to be closer to Europe. Thus, the study has followed the definitions and recommendations of the EU.

1.2. CONTRACT SETTINGS

On 17th July 2009, the Spanish Engineering company IDOM SA was awarded by the Ministry of Transport and Communications of the Republic of Macedonia to develop a traffic study and to prepare a conceptual design for two new inner city road links. The agreement was made and signed by the following representatives:

TABLE 1, Details of Contract, Tender, Client and Consultant, Source: IDOM

Representatives:

Contracting Authority (Investor)	Ministry of Transport and Communications Represented by Mr. Mile Janakieski (Minister)
Contractor (Consultant)	IDOM Ingeniería y Consultaría, Sociedad Anónima (Registration Nº: A48-283964) Represented by Mr. Luis Claudio Rodriguez Llopis (Managing Director)

Quote from Contract:

Article 14

The Contractor, as a project-coordinator for development of the Study for the Traffic System of the City of Skopje with conceptual designs for the roads, designates the following person: Juan Lopez Redondo, civil engineer

The Contractor will engage the persons mentioned in the Statement regarding the educational and professional qualifications of the management and in particular of the persons in charge of delivering the service included in his bid.

The Contractor will not make changes in the composition of the key team members. If, due to the any reason which is beyond the reasonable control of the Contractor it is necessary to replace any of the key members, the Contractor will provide, as replacement, a person that has equal or better qualifications. If there is such replacement, it will be subject to previous written endorsement from the Contracting Authority.

Objectives according to Tender:

Objectives of the study

The key objective of the study is to provide long-term guidelines and define project proposals on middle-term for improvement of urban mobility of the citizens and the transport of goods in the cities, by providing solutions which will not focus only on provision of sufficient quantity of road infrastructure but will be also oriented towards the strategic concept for sustainable development of the city.

The traffic study needs to provide long-term vision for development of the transport system of the City of Skopje and also propose specific middle-term projects for realization.

Establishment of the transport system which will provide high level of coordination and integration between different types of traffic.

Improvement of the safety in the traffic, both for the motorized and non-motorized traffic.

The contract was divided in three sections:

- SECTION 1 – Study for the traffic system of the City of Skopje
- SECTION 2 – Technical Part for conceptual design for the Boulevard Kliment Ohridski
- SECTION 3 – Technical Part for conceptual design for the new underground Road Synodal Church – Kompleks Banki

Subject of this present Report are the results and conclusions of the first section, i.e. the Traffic Study, which analyses the current traffic system and comes up with solutions to improve it in the future. The team of consultants complied with the Project program, submitted at the inauguration of the Project which predicted a total of 15 months for this first section. The following phases have been passed during the course of the Traffic Study:

GRAPHIC 1, PROJECT PROGRAM, SOURCE: IDOM

	Project Program - Section One "Traffic Study"	**2009**		**2010**				**2011**
Phase		3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q
01.	Review of previous studies, plans, etc.							
02.	Strategy for traffic in the city (long-term)							
03.	Methodology. Implementation of surveys							
04.	Existing demand for mobility and transport							
05.	Prognosis							
06.	Transport Model for forecasting							
07.	Projects/Measures. Priorization of projects							
08.	Final Traffic Report "Transport Masterplan"							

The "Contract for Development of the Study with Conceptual Design" between IDOM (Consultant) and the Ministry of Transport and Communication (Client) sets out in page 1 Article 1 that the Subject is:

- A Study for the traffic system of the City
- A Conceptual design for two new roads.

The corridors for which a preliminary designs needs to be prepared are via St. Kliment Ohridski Boulevard and secondly via an underground alignment going from the Synodal Church to "Kompleks Banki" building".

Three milestones have been set:

1. Analysis of the current transport system of Greater Skopje, based on a household survey
2. Model the system for some future scenarios
3. Identify the prelim design for these two new city links using demand data of previous step.

The study has been prepared for the Ministry of Transport in close corporation of all key stakeholders concerning regional transportation, using their latest studies and approved guidelines as well as best international practice recognised by the Client. As the study covers all aspects of mobility and gives concrete recommendations for the new General Plan, this report can be seen as a **Transport Master Plan for Greater Skopje**.

1.3. PROJECT TEAM

The overall supervision and management of the Study was ensured by the Managing Director, who forms part of IDOM's management board and who signed the Contract with the Ministry.

However, due to the complexity of development of the Study and its three very specific and different sections, it was necessary to engage qualified experts and other professionals that have been capable to respond to all tasks foreseen in the Terms of References. This applies especially to the 1st sections, i.e. the Traffic Study of the City of Skopje. The Team for the development of this first section has been specialized in the following fields:

- planning and designing in the area of traffic;
- simulation of the traffic flows;
- development of databases in GIS;
- environment protection and designing of building construction

Names, positions and qualifications of the six most important key experts have been summarised in the table below:

TABLE 2, Working Team, Source: IDOM

Key Expert	**Position in the team**	**Qualifications**
Raúl Coleto Sierra	Team Leader of Traffic Study	o Graduated civil and traffic engineer with more than 10 years of working experience in the vocation o Head of the transport modelling department of IDOM o Graduated economist o More details in the Golden Paragraph

		below
Falko Mathews	Transportation planner with experience in planning, strategies and protection of the environment	o Graduated transport and urban planning engineer with 10 years of working experience in the vocation o More details in the Golden Paragraph below
Carlos Tarragona	Professional in Geographic Information Systems and urban planning	o Graduated urban planner o Minimum five years of working experience in the vocation.
Patricia Tobias	2 experts – construction engineers	o Graduated construction engineer for transportation infrastructure o Five years of working experience in the vocation o Internal project co-ordinator of IDOM for all three sections of the entire assignment
Raúl Perez Campos	Economist in spatial economy and financing of transport infrastructure	o Graduated economist o Eight years of working experience in the vocation o More details in the Golden Paragraph below
Nikola Spasov	Local statistical, analytical and surveying expert (sub-contracted)	o Graduated economist o Seven years of working experience in the vocation.

All named experts of IDOM have visited Skopje several times during the course of the Study. However, there were more experts and assistants involved, who will not be listed in more detail. Three Golden paragraphs of the three co-ordinating staff od IDOM Transportation, including the team leader give some more insight to their specific skills:

The team leader **Mr RAUL COLETO SIERRA** is a Civil Engineer of the Polytechnic University of Madrid and Master in Business Administration for Professionals (MBAP) of the IE (Madrid). He has 11 years of experience focused on infrastructures and traffic planning, and design of transport facilities for major urban developments, with active participation in both technical and financial feasibility studies and investment assessment relating to main transport modes.

He was responsible for the Traffic and Mobility studies in the Atocha Station. Currently, he is leading transportation studies, cost benefit analyses and economic and financial models, such as the study of Metro lines 5 and 6 in Ho Chi Min City (Vietnam). Some other projects he has carried out in the past are outlined below:

- "Simulation of the public transport in Rabat, Salé and Tamara".
- "Master Plan and Special Urban Action Plan to re-organise the transport network of Valladolid"
- "Basic Project and Complementary studies for the new multimodal complex at Atocha Railway Station".
- Financial Expert for various concessionary projects, such as Feasibility Studies in the A-55 (A Coruña – Carballo) y A-57 (Puxeiros – Valmiñor) Highways.
- Due diligence of Line 1 Saragossa Tramway.

Mr FALKO MATHEWS is a graduated Engineer of Urbanism and Regional Planning (Technical University of Berlin/ Germany) with an additional Masters of Science in Civil and Transport Engineering (Trinity College Dublin/ Ireland). He has 10 years of professional experience in Transport Planning and has lived and worked in Germany, the UK, Ireland and Spain. His focus is on demand modelling exercises (micro and macro), alignment studies of public transport infrastructure and improvement studies of accessibility on a more local level.

He has participated as a delegate in strategic planning forums, also. Some of the positions he held are listed below:

- Project manager of the Orbital Metro alignment study (Railway Procurement Agency, Dublin)
- Project Manager of the Light Rail Line F Extension – Feasibility Study (RPA, Dublin)
- Delegate in steering and planning committees of Greater Dublin (RPA, Dublin)
- Assistant of a sustainable transportation guide (Institute of Ecological Economy, Berlin)
- Project Manager of accessibility studies in San Sebastian
- Technical co-worker of the reorganisation of bus franchises in Asturias, etc.

Mr RAÚL PÉREZ CAMPOS with a BA in Economics of the University of Alcalá de Henares and Master in Business Administration (MBA) of the IEB – the Institute of Stock Exchange Studies ("Instituto de Estudios Bursátiles" in Spanish) has extensive experience in feasibility studies for public infrastructure and inter-modality projects. He joined IDOM in 2005 where he currently acts as a project manager and key expert within the Transportation Department. He has participated in various projects, some of which have been outlined below:

- "Proposed Infrastructure and Facilities Feasibility of a platform reserved for public transportation between San Sebastian de los Reyes and Algete"

- "Technical Assistance to the Directorate of Works for the bidding of concessions related with the works and operation of the tram lines Alicante and Valencia"
- "Audit of the extension of Metro Line 11 in Madrid to La Fortuna", etc.

2. AIM

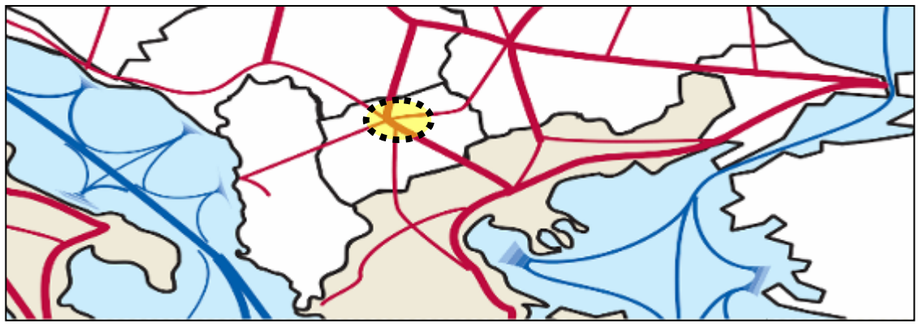
This "STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE" or in other words the new Transport Master Plan was drawn up jointly with the national and metropolitan transport departments, the public transport operator's as well statutory interest groups.

The Transport Master Plan is a long-term programme for strategic development of the City's transport infrastructure, namely its highways, railway and future light rail network. The Plan is also the concrete embodiment of Skopje's policy on a transport infrastructure geared to sustainability and will help the City Council of Skopje in the upgrading of the General Urban Plan, which is envisaged for the upcoming year.

The aim in developing Skopje's infrastructure is to provide infrastructure which facilitates the greater use of environmentally friendly modes of transport. So the aim is not just to manage existing or predicted traffic flows "passively", but "actively" to shape metropolitan and regional structures in a way which will meet the needs of Macedonia's national and regional economy.

This has prompted an appropriate degree of interoperability, particularly with the perspective of joining the EU in the near future. European funds have already been invested in Skopje, such as for the new by-pass motorway which forms part of the Pan-European Corridor VIII, and which has already removed through-traffic from the city centre and decreased the currently high air pollution in the city region.

IMAGE 1, EUROPEAN FREIGHT VOLUMES PASSING THROUGH SKOPJE, SOURCE: EU 2003



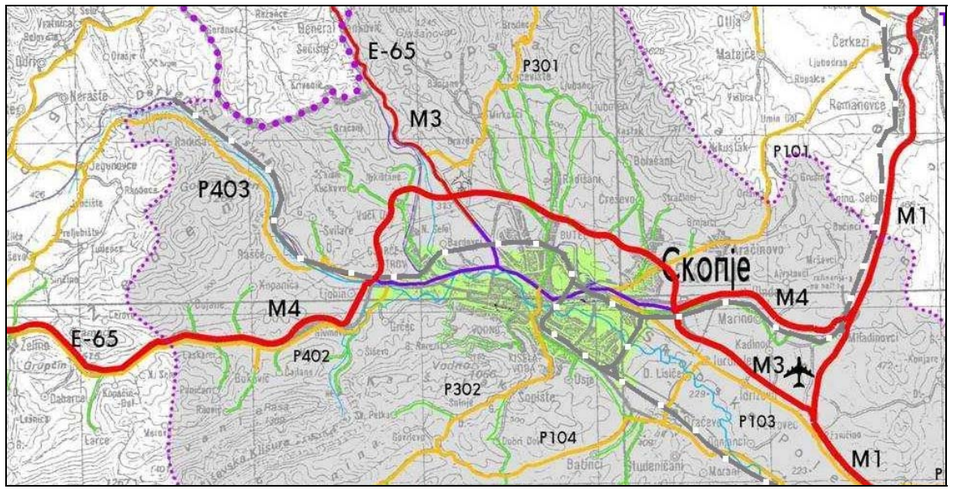
Another focus lies on local public transport which, not least because of the amount of ground to be made up, will be receiving more investment spending, concerning the foreseen concessions for the new light rail network.

The Skopje Transport Master Plan carries a mandate to review strategic progress with the aim to make cautious readjustments, without fundamentally jeopardising the security of planning which a development programme of this kind is meant to guarantee. A transportation forecast for the period to 2030 has been also completed in this document. Key objective will be that the urban transport system must be transformed from

being an increasing threat into an instrument to promote the concept of the Sustainable City. In this respect, the outcome of the STRATEGY FOR THE DEVELOPMENT OF PUBLIC TRANSPORT IN THE CITY OF SKOPJE 2008 – 2018[1], has been taken into account also. The key aspects in terms of urban environment, economics and sociology have been summarised below:

- Contribute to environmental sustainability
    - The urban transport system should minimize harmful emissions, noise and climate gases. It should also be energy efficient in broad terms.
- Contribute to economic sustainability
    - By providing mobility and access to all parts of the city, the urban transport system should make the city more efficient and thereby promote economic growth
    - Investments in traffic infrastructure should be carefully planned
    - Mechanisms should be in place to ensure that private transport pays for its costs
    - Public transport should be efficient so that subsidies – if needed – are spent in the best possible way.

IMAGE 2, CURRENT TRANSPORT NETWORK OF GREATER SKOPJE, SOURCE: UKIM 2008



- Contribute to social sustainability
    - The urban transport system should ensure that city services and employment opportunities are within reach for all citizens regardless of social strata and ethnic belonging and should contribute to an integrated city.
- Contribute to the liveable city
    - Meeting some minimum requirements of private vehicles, the urban transport system should be designed for people, not for vehicles.

[1] Written by the Technical Faculty of the University of Bitola in May 2008

3. APPROACH

3.1. CURRENT SITUATION

According to the "Project program for development of study for the traffic system of the City of Skopje", which corresponds to the first part of IDOM's commitment with the Ministry of Transport, the Consultant has developed a long-term strategy using scenarios up to 2030 and furthermore in detail an Action Plan, to give systematic guideline for development of the City's transport system (see Chapter Conclusions).

Preliminary design proposals for the positioning of tunnel and bridge ramps for new city links are given as well as predicted traffic flows over new urban highways. Proposals are also made concerning new light rail stops, such as those for Line 4 or how to improve the connectivity in the surroundings of the railway station Sever.

After various meetings and consultations with experts from the Ministry and the City Hall, the Consultant understands the need to make some amendments to some parts of the General Urban Plan and also some parts of the traffic system, especially for those foreseen infrastructures which appear to have little impact to achieve a more effective traffic system.

As mentioned earlier, the Study has been an ambitious project for two reasons:

1. LACK OF INTEGRATION: There is currently no official transport model in place, which would help to define new infrastructure. Information is quite scarce and there is a lack of institutional coordination in the Skopje area. For instance, parking matters are treated separately from the management of public transport, although these two matters are closely related.
2. URGE TO UPGRADE SYSTEM: Due to the soon incorporation in the EU, Skopje intends to force new projects which need a solid demand data base in order to be justified and well selected. This current Document will be already the basis for two key projects: the new light rail network as an external linked project to this study as well as the new city links according to the same contract as for which this Study has been prepared.

Additionally to the mentioned two concrete projects, this Study should be seen as the foundation for any future funding, which might be obtained from the European Union. Taking all these subjects into account, IDOM highlights that this Transport Master Plan could be a great opportunity to co-ordinate concerns of mobility in the future. Two new corridors for the city links for which a preliminary designs needs to be prepared are via St. Kliment Ohridski Boulevard and secondly via an underground alignment going from the Synodal Church to "Kompleks Banki" building".

3.2. PREVIOUS STUDIES

There are two approved studies, which are recognised as guidelines for this new Transport Master Plan for Greater Skopje:

- "The Sustainable City Approach" developed by SIDA
- GUP - Master Plan of the City of Skopje for 2001 – 2020

The City of Skopje has decided to carry out a Sustainability Review of the City through support by the Consultant SIDA who finished their work with a manual. The review and manual have been undertaken with an integrated approach to sustainable urban development and with an aim to identify synergies and constraints in the interrelation between environmental aspects, institutional factors and so called sub-systems in order to get a better basis for prioritised actions for improvement of the urban environment.

The General Urban Plan (GUP or NACRT), also known as the Master Plan of the City of Skopje for 2001 – 2020, was developed in 1998 and 1999 with a wide range of new data in terms of urban and transport development.

Furthermore, there is a Feasibility Study dated from 2008 which was carried out on behalf of the City Council. All these studies have been reviewed and partially included in this Transport Master Plan. All previous studies and other information sources are listed below:

1) Cartographic information of Greater Skopje, received by the Ministry of Transport
2) State Statistics Reports. Census 2002
3) Law on Spatial and Urban Planning
4) GUP - Master Plan of the City of Skopje for 2001 – 2020
5) Strategy for the Development of Public Transport in the city of Skopje 2008 - 2018
6) Sustainability Approach for the City of Skopje (SIDA)
7) Light Rail Feasibility Study, (done by Bulgarian and Italian consultants), 2007/ 2008
8) Information from Public Parking Regulation Body
9) Bus demand data from SLOBODA PREVOZ and JSP
10) JSP analysis of patronage: ELABORAT 2003
11) Random JSP bus counts, done in 2009
12) Runtimes, timetables, fleet composition, survey results, stop location graphics, etc. from JSP
13) Information obtained in various meetings
14) Local Masterplans of the Municipality "Opstina" of CENTAR

15) Traffic Count data from the City and the National Road Authority

16) Map of bus stops of urban lines in digital format (from City Council)

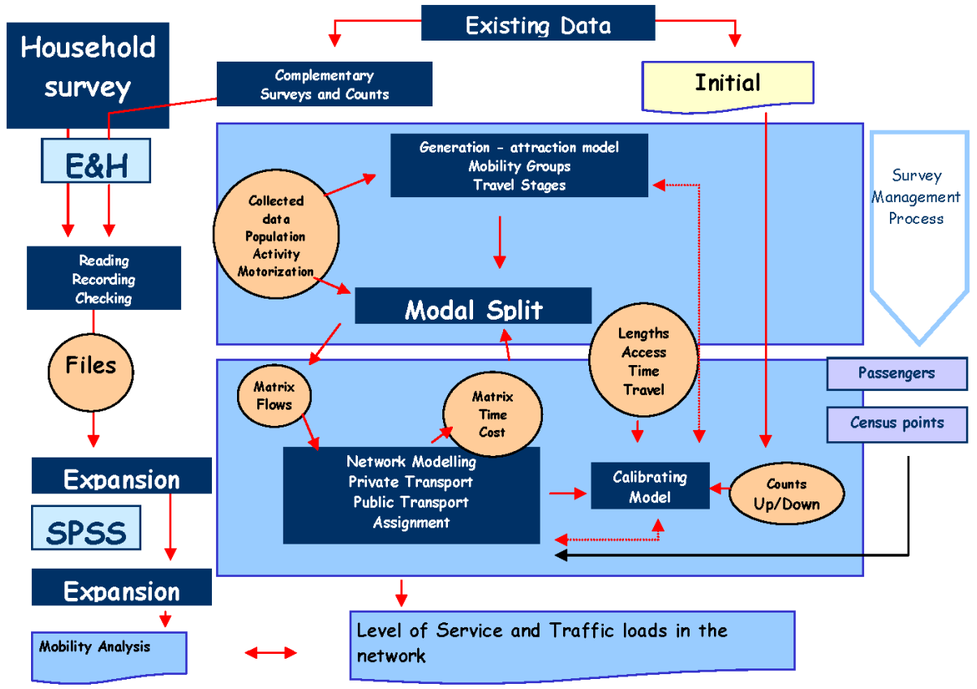
17) Information from Operator of Regional Bus Station (Ruleturs)

4. METHODOLOGY

The Study developed by IDOM is based on the knowledge of the city and its problems which gained the Consultant previously. On the basis of the Mobility Household Survey - the first ever held in Skopje -, IDOM developed a transport model, both for private and public transport, in order to analyze the current state of mobility in Skopje, and to make then projections for the future. The questionnaire of IDOM's survey can be seen in the second ANNEX.

The following scheme summarizes the different tasks in the study. It includes the reviewing of existing data, the household survey as the main issue, and the developing of the transport model.

GRAPHIC 2, METHODOLOGY – TECHNCIAL APPROACH, SOURCE: IDOM

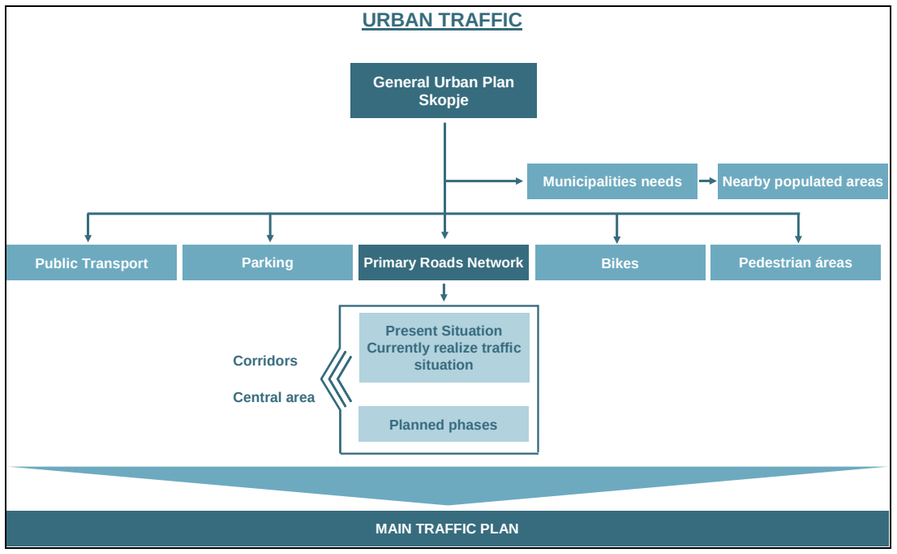


IDOM has prepared this Transport Master Plan in such a way, that it can be the basic study for the upcoming revision and reconsideration of the existing General Urban Plan for the City. Detailed recommendations for upcoming changes in the City's traffic system are explained at the end of the Traffic Study Report in Chapter 7:

- Chapter 7.4: In terms of private transport, including conclusions to the proposed underground city links

- Chapter 7.4: In terms of public transport, including proposed changes of the bus network as a required response to the implementation of the light rail
- Chapter 7.5 with some broader conclusions for a better mobility in Skopje in direct response to the terms of reference of this project

GRAPHIC 3, PROPOSED PHASING TO UPDATE GUP, SOURCE: IDOM



5. INFORMATION COLLECTION

With the support of the Ministry of Transport and Communications and various local authorities, a vast amount of data has been gathered.

Complementary, based on a household survey in Skopje, IDOM collected and analyzed demographic, social and economic data from all municipalities of the Skopje area, in order to analyze the current situation of public and private transport and taking into account all different transport modes acting within the metropolitan area.

Some of the outcome presented in this report is key social-demographics like:

- Age structure of population
- Socioeconomic assumptions
- Division into a detailed geographical context
- Mobility patterns of population.

5.1. SOCIO-DEMOGRAPHIC AND POLITICAL INFORMATION

The City of Skopje is located in the central part of the Skopje Valley, which is a large area in the upper reach of Vardar River. It is surrounded by high mountains on all sides. The Valley is oriented in a north-west to south-east direction. The area of the Valley is 2.100 km^2. The highest point of the Valley is at Jakupica (2.540m) whereas the bottom of the Skopje Valley is at an altitude of 225 to 340 m. Deep gorges and high and wide ridges enable good communication conditions to the neighbouring areas.

Comprising three geo-tectonic units, the Valley takes a very specific position and is characterized by occurrence of the strongest earthquakes in the Balkan Region most notably in 1963 when major parts of Skopje was tragically demolished.

The Skopje valley region is influenced by continental and Mediterranean climate. The lower plains of the valley have hot and dry summers and moderate cold and wet winters with appearance of extreme temperatures and low values of annual precipitations (492 mm). The valley is very sunny – the total value of sunshine duration is 2.136 hours/ year.

The hydrographical network is well developed. Vardar River is the main recipient of its tributaries, and in the valley are the inflows of Treska River, Lepenec, Markova Reka and Pcinja River. Springs of water are located mostly in the west and north part of the valley, but there are also dry parts in the valley. The most important spring for the town is the Rasche Spring, located west of Skopje (average yield of 4 m^3/ sec).

Vegetation zones are clearly distinguished such as lowest sub-Mediterranean with beech woods, oak woods, and high mountain meadows comprising numerous varieties of units and species.

The fauna mainly comprises of middle-European and Mediterranean type species, presented in a large number and variety. For lots of species, the valley is the utmost south or north border of their spreading and appearance.

Being the capital of Macedonia, the City of Skopje holds a big public sector. But also the commercial service sector is well developed as well as the secondary sector with a number of manufacturing industries. The latter includes metal industry, cement and construction materials industry, pharmaceutical and chemical industry and beer production.

In spite of the above economic activities a very high unemployment rate prevails amongst the population of Skopje, which according to the 2002 census, was 506,926. The unemployment rate in Skopje is around 28,5 %. However, the national unemployment rate is even higher, 38,1 %.

The main ethnic groups are Macedonians - 338,358, who make 66.75% of the population, followed by Albanians - 103,891 (20.5%), Roma - 23,475 (4.6%), Serbs - 14,298 (2.8%), Turks - 8,595 (1.7%), Bosniaks - 7,585 (1.5%) and Aromanians (Vlachs) - 2,557 (0.5%) and others - 8,167 (1.6%). 97.5% of the population over the age of 10 is literate.

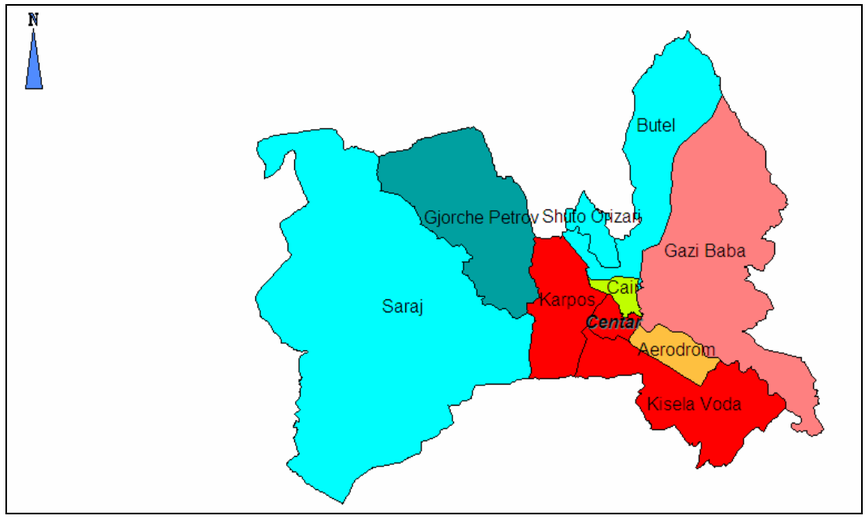
From an environmental sustainability point of view the City of Skopje and its surroundings is in a very vulnerable position considering its inland location surrounded by mountain ridges and strong seismic activities. Seasonal variations in climate and inversion phenomena reinforce the pollution from not always up to standard industrial emissions and an increasing traffic volume contributes heavily thereto. The socio-economic characteristics of the area are also typical for an urban area in transition with strong in-migration and daily commuting to jobs or for job seeking.

The City of Skopje is an administrative division within the Republic of Macedonia constituted of **10 municipalities.** The City of Skopje, as all other municipalities, has a Mayor and its own administration. When it comes to decision-making the City of Skopje relies on close interaction with the Municipalities (opstina), since many decisions reciprocally presupposes the acceptance by the municipalities involved. The organisation of Skopje, like a distinct unit of the local self-government is defined by the Law of the City of Skopje. The ten municipalities (*opstina*) are:

TABLE 3, SKOPJE INNER MUNICIPALITIES, , SOURCE: IDOM

1. Centar	6. Butel
2. Gazi Baba	7. Šuto Orizari
3. Aerodrom	8. Karpoš
4. Čair	9. Gorche Petrov
5. Kisela Voda	10. Saraj

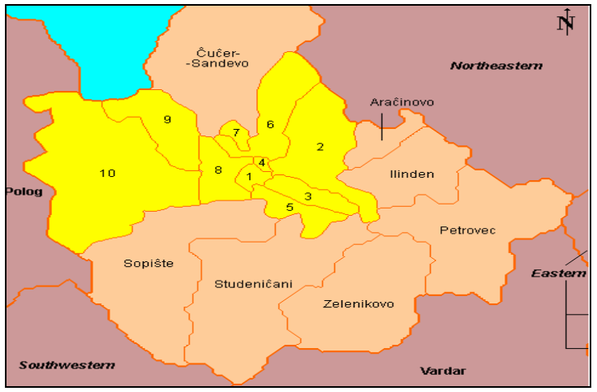
IMAGE 3, TEN MUNICIPALITIES OF SKOPJE, SOURCE: IDOM



Apart from these 10 Skopje Municipalities, there are seven municipalities outside the City boundaries, which belong also to the Metropolitan area of Skopje:

- Aračinovo
- Čučer-Sandevo
- Ilinden
- Petrovec
- Sopište
- Studeničani
- Zelenikovo

IMAGE 4, OUTER MUNICIPALITIES OF GREATER SKOPJE, SOURCE: IDOM



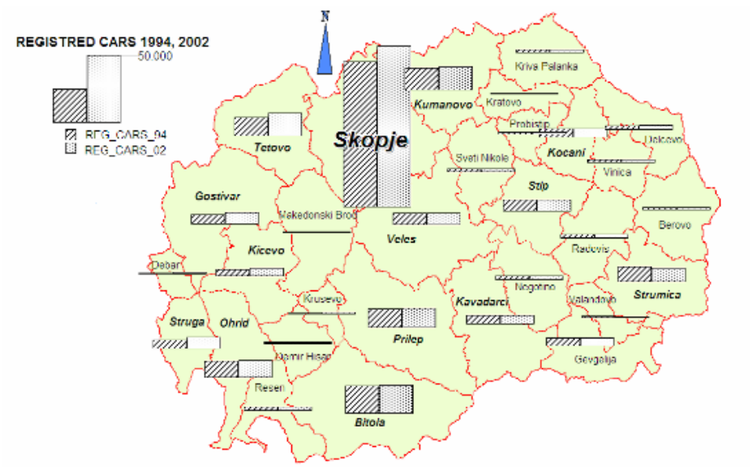
5.2. MOTORIZATION RATE

According to the study of professor Krakutovski (University of Skopje), the number of registered cars in Skopje is growing gradually. In 1994, there were 108,000 whereby this number has gone up by 11,000 to 119,000 in 2002. The average age of the car fleet in Skopje is relatively old (11.8 years).

Each household in Skopje counts with 0.79 cars, whereby 51.5% of households have only 1 vehicle. 12.5% have two or more cars and approximately a third of all households do not have any (36%). This number might decrease, as the number of driving licences per household is twice as much as that of the number of cars (1.81).

Later on, and based on the household survey, these figures will be updated.

IMAGE 5, CHANGE IN CAR REGISTRATION FROM 1994 TO 2002, SOURCE: MTC 2002



5.3. OVERVIEW OF MAIN ROAD NETWORK IN 2009

The Consultant has made a general analysis of the existing traffic network of the constructed main roads and collective roads of the base year in 2009. The main road network of the Metropolitan Region of Skopje is made up of:

- Two inner city rings (the first and second ring shares the Goce Delcev street)
- Main arteries branching off these rings
  - To the north: Krste Misirlov
  - To the east: Kuzman Josifovski-Pitu, 3-ta Makedonska Brigada
  - To the southeast: 11 October
  - To the south: Vodnjanska
  - To the west: Partizanski Odredi, Teodosij Gologanov, Ilinden
- Transit highway Alexander of Macedonia Blvd, also known as the "Magistrala"
- Suburban access motorways (M4/ M3) and the new ring road ("tranzit").

All existing main roads are shown in the following table, as well as the Municipality in which they are and the lanes per direction in 2009:

TABLE 4, MAIN URBAN HIGHWAYS IN 2009, SOURCE: IDOM

	Municipality	Lanes per direction
Boulevard Serbia	Aerodrom	2
Boulevard 3-ta Makedonska Brigada	Aerodrom	1
Boulevard Kuzman Josifovski-Pitu	Aerodrom	2
Boulevard Slovenia	Butel	2
Boulevard Krste Misirlov	Cair	2
Boulevard Nikola Karev	Cair	3
Christian Todorovski Karpos Street	Cair	3
Boulevard 11 October	Centar	2
Boulevard Koco Racin	Centar	2
Boulevard Dame Gruev	Centar	2
Boulevard Goce Delcev	Centar	2
Dimitrie Cupovski Street	Centar	2
Boulevard Vodnjanska	Centar	2
Antonio Grubsic Street	Centar	3
Mito Hadzivasilev-Jasmin	Centar	3
Belasica Street	Centar	3
Boulevard Makedonia	Centar	3
Boulevard Voivodina	Gazi Baba	2
Blagoja Stefkovski Street	Gazi Baba	1
Boulevard Alexander Macedonia	Gazi Baba	2
Boulevard Gorce Petrov	Gorce Petrov	2
Metropolit Teodosija Gologanov	Karpos	1
Skupi Street	Karpos	1
Boulevard 8 September	Karpos	2
Boulevard Partizanski Odredi	Karpos	3

Boulevard Ilinden	Karpos	1
Boulevard 11 October(1st part)	Kisela Voda	3
Boulevard 11 October/ Prvomajska	Kisela Voda	1

Note: The project which have been finished or which are about to be finished in 2010, i.e. the widening of the Boulevard Ilinden and of Boulevard Serbia, will be included in the future model scenarios.

5.4. CITY COUNCIL'S TRAFFIC COUNTS

Regarding quantities of current traffic flows in the city centre, the Consultant was analyzing 28 counts undertaken by the City across the Centar Municipality. The highway sections with the highest daily concentration of traffic, i.e. with more than 40,000 vehicles per average day (in 2009) are those around the Mavrovka Junction (marked in orange below).

However the worst road bottlenecks are the junction along and around the western inner city ring as road capacity is lower and traffic lights cause further delays (marked in red).

These figures were used in the Private Transport Model in order to calibrate it.

IMAGE 6, CONGESTED AREAS IN THE CENTRE OF SKOPJE, SOURCE: IDOM

IMAGE 7, MAIN URBAN HIGHWAYS IN 2009 AS SHOWN IN PREVIOUS TABLE, SOURCE: IDOM

IMAGE 8, NUMBER OF LANES ON MAIN URBAN HIGHWAYS - TAKEN FROM GIS, SOURCE: IDOM

IMAGE 9, 28 INTERSECTIONS WITH PEAK TRAFFIC COUNTS, WHICH WERE USED TO CALCULATE AVERAGE DAILY WORK DAY FLOWS, SOURCE: CITY COUNCIL

5.5. PARKING

According to Macedonian laws, there was a public procurement tendering for a City parking regulation scheme, in which NextSens won this project. The scheme was established by The City of Skopje. One of the City's public enterprises is in charge for this scheme which will also have the power to remove/ tow away irregular parked vehicles or those without parking ticket.

The responsible public body has made a 3-years-long contract with NextSens in order to implement the parking zones in Skopje.

There are three types of Parking covered by this scheme:

- o 15 indoor public car-parks
- o open-air public car-park
- o zonal on-street parking A,B, C.

The city parking regulation scheme divides the city centre into three different zones and several subzones. The three main zones are A, B, C (or red, yellow and green). The implementation of the project is going in phases. Firstly, the three zones A1, A2 and B1 will be implemented, after that A3, A4 and B2. A second step will define Zone C.

IMAGE 10, ZONING FOR PARKING SCHEME IN THE CENTRE OF SKOPJE, SOURCE: NEXTSENS 2009

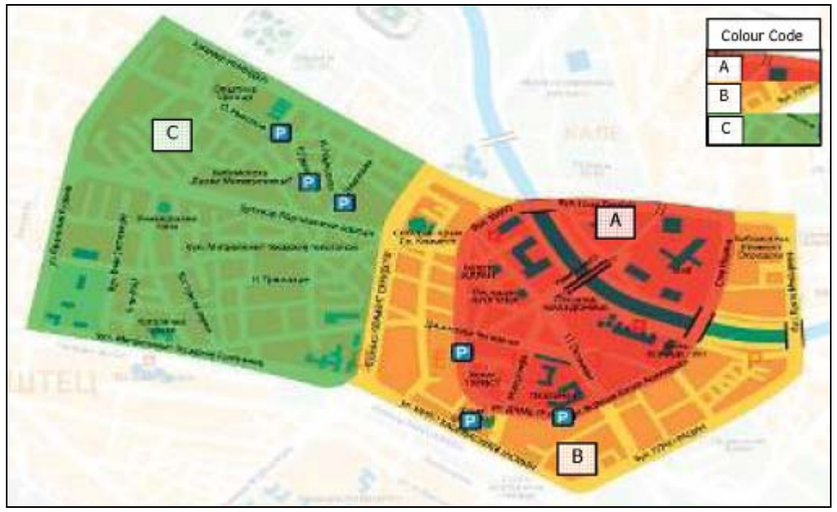


TABLE 5, PARKING TYPES, SOURCE: NEXTSENS 2009

Description	Zone A	Zone B	Zone C
Price per hour	25 denars/hour	35 denars/hour	45 denars/hour
No. Parking spaces	199	109	794
time limit	2 hours	4 hours	unlimited
Enforcement (penal ticket)	1.300 denars	1.000 denars	700 denars
Resident permits	200 denars/ month	200 denars/ month	200 denars/ month
Paid permit/month	5.000 denars	4.000 denars	3.000 denars

5.6. NEW INFORMATION

5.6.1. Household survey

5.6.1.1. Initial planning

TABLE 6, INITIAL PLANNING, SOURCE: IDOM

Average Daily trip per capita (+/-	3,0	Source: Strategy of Transport 2008-2018	
Average size family	3,5	Source: Estatistics Macedonia	
Average daily trips per househol	10,5		
95% confidence interval	1,96		
Standard deviation	2,15		
error per zone	7,5%		
Zones in Skopje	110	Household per zone:	29
Total Sample size (Households)	3.150		

The main base of the Transport Master Plan has been the already mentioned Household Survey, which was conducted at a sample of private households/ families in Skopje. Its format can be seen in the second ANNEX. Depending on the territory studied, one has defined the following parameters:

Territory: All Municipalities of the City of Skopje

Time period: 17th November – 6th December 2009

Sample: 3,228 occupied dwellings

Respondents: 11,418 adults

5.6.1.2. Design, selection and determination of sample

The procedure for sample selection was based on the principle of making regional representative sample that will define the region in accordance with its definition by the State Statistic Office of Republic of Macedonia (NUTS3 EU 16).).

The number of respondents in each region was proportionally deployed by the total population in each region, using official statistics from the national census in 2002.

Realized total sample consists of 3.228 living quarters, i.e. 11.418 respondents. Respondents or participants in the research were all the members of the living quarter aged over 5 years. The respondents (living quarters) in the survey were selected on the base of the stratified random sample.

The living quarters included in the research were randomly selected and in advance informed (by the daily newspapers and TV broadcasting) for the goals of the research and the importance of their participation in the same. The data was collected with the method – face to face interview by qualified and trained pollsters in the pre-selected living quarters. In the ethnically mixed municipalities the interview was conducted by pollsters speaking both languages, Macedonian and Albanian. In case when the selected addresses were unsettled or when their residents refused to participate in the survey for any reason, the living quarters on the next address were selected.

In the rural settlements the households were selected on both sides of the main street. Pollsters were obligated to choose every third house, counting from the living quarters that were denoted as starting point.

The interviews were conducted face to face in the homes of the respondents, using paper and pencil (PAP). Ten groups of pollsters were formed and each active in a particular municipality, and the total number of included pollsters was 49. Coordinator was appointed for each group and his task was to coordinate and supervise fieldwork through monitoring the implementation of the basic criteria, such as routes, the selection of living quarters, quality of the conducted surveys, control of the material etc.

The field work started on the 17th of November 2009 and ended on the 6th of December 2009. The percentage of living quarters that agreed to participate in this research from the total number of primarily selected living quarters is 66,3% (2140), i.e. 33,7% (1080) from the primarily selected living quarters refused to participate and were replaced with living quarters on the next address. This high percentage of refusals is a result of the unfavourable weather conditions in which the research took place, the appearance of serial killer in the city of Skopje (during the research period), expansion of the swine flu etc.

5.6.1.3. Questionnaire

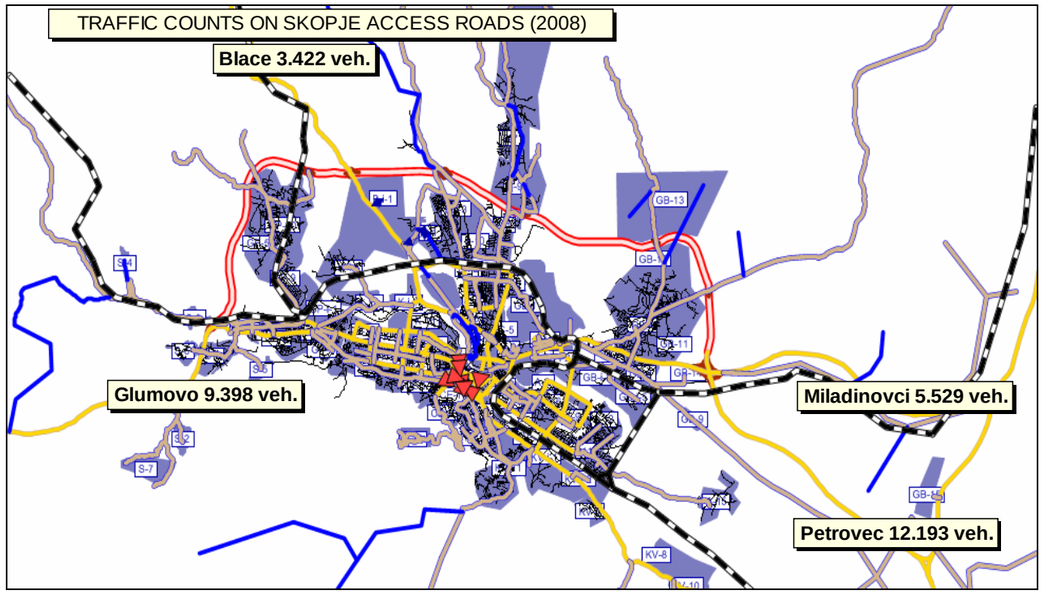
The goal of this research is to determine the mobility of the households in the city of Skopje, i.e. the number and the directions of the realized daily trips. This data were collected with questionnaire composed of three parts.

- The first part includes general data for the living quarters as: type of construction, mode of possession, number of members, numbers of vehicles owned and used by the living quarters, type of parking and amount of annual income in the living quarter.
- In the second part are placed questions for the demographic characteristics of the population, as relative relations (other relationships) in the living quarter, gender, marital status, age, driving license and availability of vehicles, execution of main activity (employment status), sector of employment, level of completed education and correct address of employment or educational institution.
- The last third part includes questions for the realized daily trips, i.e. the points of departure and arrival, time of departure, trip expenses, duration of the trip, type of transport etc.

5.6.2. Access road counting

According to the National Road Agency and some traffic counts, the Consultant undertook some countings at the city's access roads to complete the official counts. The daily traffic in the main access roads can be summarized as follows:

IMAGE 11, TRAFFIC COUNTS ON MAIN NATIONAL ARTERIES, SOURCE: IDOM



5.6.3. Commuting and Ring Road Use

The Consultant has also made some assumptions regarding commuting to the City of Skopje for residents living within the metropolitan region. They are based on a field work campaign in the main access roads.

There are basically two modes of transport which are mainly used to commute to the city: via suburban bus lines or private car. The calculation has been limited to an average working day, and can be seen as representative for the base year 2009.

There is a total of approximately 94,000 of people who commute to the City of Skopje, of whom most arrive in the peak morning hours and depart in the peak afternoon hours. This means that there are around 188,000 commuting trips across the city's road network. The table below shows also how many cars are used by commuters and the split between private and public transport.

TABLE 7, COMMUNTING TO/FROM SKOPJE, SOURCE: IDOM

Commuting to/ from Skopje within the Metropolitan Region	BOTH WAYS	IN	OUT
All Commuting Bus Passengers	77,220	38,610	38,610
All Private Car Passengers	110,843	55,422	55,422
Cars Entering/ Exiting Skopje	46,742	23,371	23,371

Note: Occupation / Car: 2.37 passengers (survey result). Without ring road traffic

The use of the new built Ring Motorway around Skopje was also analysed during the mentioned survey and traffic count campaign on the access points of the City. Its use of those trips with origin or destination outside of Skopje can be seen as fairly low as only 30% of all vehicles use the ring road, the vast majority, i.e. 70% prefers entering or exiting the City directly. This means that the Ring Road has only a modest effect for transit trips or as an alternative of by-passing the City and entering Skopje at some other point.

6. MOBILITY AND TRANSPORT SYSTEM

6.1. CURRENT TRANSPORTATION SUPPLY

6.1.1. Railways

The total length of the railway network in the City of Skopje is 88 km with a total of ten railway stations, the network is also know as "Skopje city railway hub". Railway transport does not play a major role in terms of passenger transport, due to poor conditions of the network and a lack of good connection to neighbouring countries. Numbers at the Central station have come down from approx 7.000 on an average working day in 1998 (343,114 per year) to only 1,000 passengers in 2009.

Owing to a foreseen increase in cross-border transit, the Ministry is keen to invest and modernise the Macedonian railways. The main goal of development of railway infrastructure in the Republic of Macedonia is the construction and finishing of the railway connection Corridor 8 up to Albania and Bulgaria and also the development of Corridor 10. Further details to both corridors below:

- Corridor 8:
    - Kicevo- Republic of Macedonia – border with Albania –total length 70 km.
    - For finishing of this project it is necessary to make a design of routes, to make expropriation and to construct rail for total length of Corridor 8.
    - On route Kicevo – Lin to the border with Albania.
    - Kumanovo- Beljakovce- Kriva Palanka in Macedonia up to Deve Bair – border with Bulgaria.
    - Kumanovo - Beljakovce- Kriva Palanka
    - With this project should be finished route in all positions with complete construction with signalization and electrification.
    - Kriva Palanka in Macedonia up to Deve Bair – border with Bulgaria

  It is planned to finish the main project by designing new bridges and tunnels for the route going from Kriva Palanka up to Deve Bair by elaborating expropriation and construction of the line.

- Corridor 10:

  This project intends to build a new route of Corridor 10 for speeds up to 120 km/h. Measures will be the recondition, reconstruction and maintenance of railway infrastructure of this route.

  The implementation of this project will be in 2 phases. For the first phase it is already given 2 options:

    - Option 1- reconditioning with changing of type of the rails

- Option 2 – "Small reconditioning" of the rail (distance between stations)……. and urgent maintenance of the rail.

The second phase will comprise in the construction of a new section Dracevo-Veles-Veles – Nogaevc, Demir Kapija- Miravci, Kumanovo – Deljadrovce and Bitola – Kremenica.

6.1.2. Buses

6.1.2.1. Bus Operation and Pricing

There is currently one public bus operator in the city and two more private bus associations, which dominate the local public transport operation:

1. **JSP** (public transport operator)
2. **MAK EXPRESS** and **SLOBODA PREVOZ** (association of several private operators)

About 75% of bus lines are run by JSP, and 25% of lines by private operators. There are some more private minibus operators to rural areas, which have not been included in this analysis. Operation for all lines is separated between a winter timetable and a shorter term for the three months of summer holidays with fewer services.

JSP is property of the City of Skopje. In 2007 it had 1,291 employees. JSP has a total bus fleet of 405 vehicles with an average age of 16.6 years. About 300 buses circulate every day in the Region of Skopje to serve 17 municipalities (10 in the Town and 7 in the Region of Skopje).

The number of total kilometres done by JSP buses was of 15,000,000 km in 2007. JSP operates 31 urban lines and 41 suburban lines in the region, giving a total of 72 lines.

In 2007, 69% of passengers used a single ticket, 29.6% used a monthly ticket and about 1% travelled with some sort of tariff agreement.

The bus ticket tariff system is regulated by the City Council. The price for one single trip ticket for JSP city lines is about 30 Denar (0.5 €, red image below), and about 0.9 € for single trip ticket for three zones. Pre-purchased tickets cost currently 25 Denar, the same price as for single tickets on private lines (green image below).

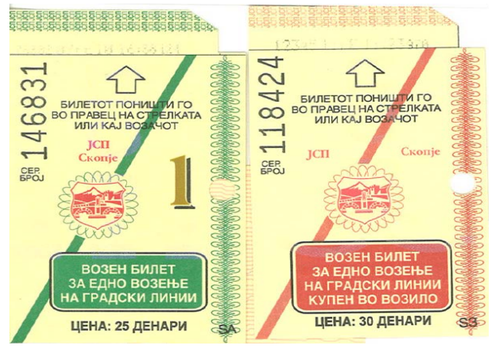


IMAGE 12, TICKETS (PREPAID – GREEN, ONBOARD – RED), SOURCE: JSP 2010

Price for monthly pre-paid passes for pupils, students and retired persons for all lines, was about 17 €. Price for monthly pre-paid passes for all other citizens for all lines was about 30 € in 2007.

Apart from the suburban and urban bus lines, Skopje is also the hub for national and regional bus lines which terminates at the bus station at **Transporten Centar**. The main regional bus operators are:

- **RULE TURS**, also the operator of the regional bus station (fleet: 12 buses)
- **GALEB AD** (16 buses)
- **JUG TURIST KUMANOVO** (13 buses)
- Some other smaller companies: Avto-atom Kocani, Strumica Ekspres Strumica, Transkop Bitola, Pelagonija Trans Prilep, Simeks Kicevo, Zas Bus Gostivar, Transbalkan Gevgelija, Polet Tetovo, Ohrid Ekspres Ohrid

According to the JSP survey, the bus frequencies within the urban area can be seen as good, although the bus fleet is fairly old and lacks comfort to its users. The lines, regardless of private or public operators, with the highest patronage are: 2, 2A, 5, 15, 22, 24, 41, 50, 57, 65B.

6.1.2.2. Metropolitan Bus Network

All regional and suburban bus lines are concentrated at **Transporten Centar**. Regional buses access the City via three routes: the national road to Skopje on the west and the two national roads to Veles and Kumanovo, connecting the City to the East. The following map shows the final destinations of the regional lines:

IMAGE 13, REGIONAL BUS LINES, SOURCE: IDOM

The total length of all urban JSP lines is 289 km and regarding suburban lines of 771 km. The average length by line is 11km (urban) and 19km (suburban). The average length a passenger is on an urban bus of 5km and in the region of 9km. The average numbers of the whole network are:

- 15,6 km for all suburban and urban JSP lines
- 48,6 min of travel time for all suburban and JSP urban lines.

IMAGE 14, JSP SUBURBAN BUS & RAILWAY LINES, SOURCE: JSP 2009

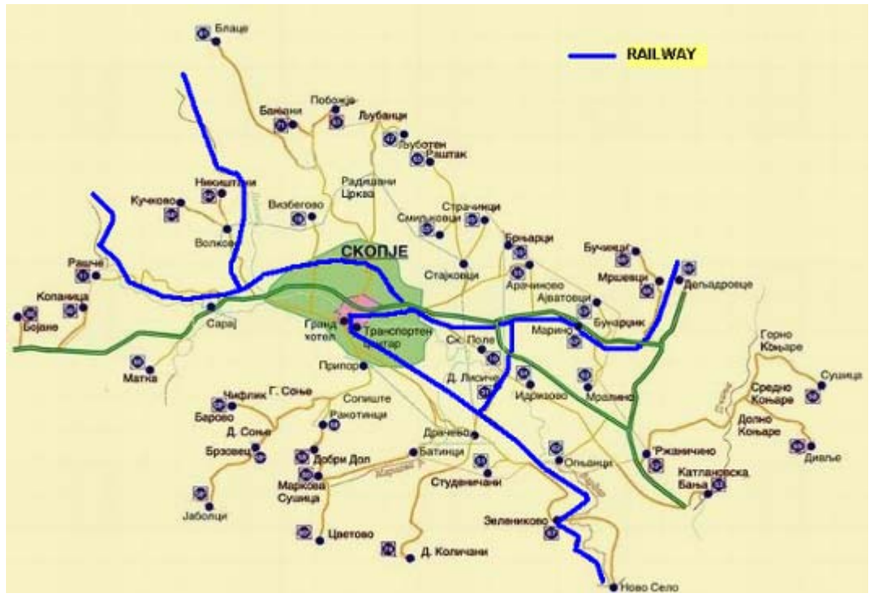


IMAGE 15, JSP URBAN BUS LINES, SOURCE: JSP 2009

The average run times for both types of service per direction can be seen below:

GRAPHIC 4, AVERAGE RUNTIME PER DIRECTION, SOURCE: IDOM

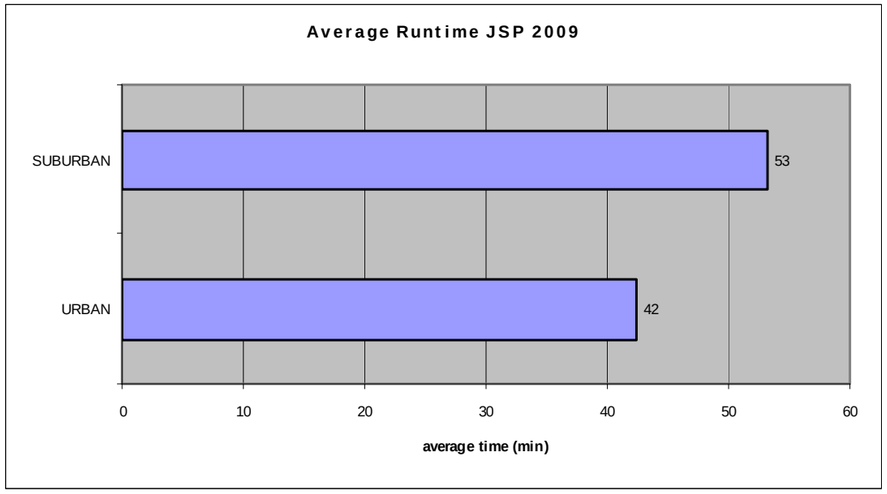
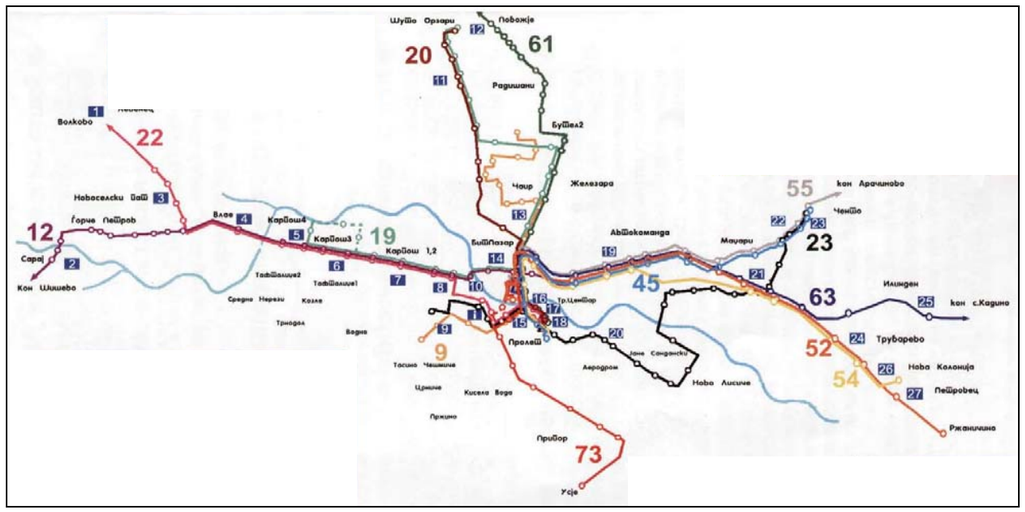


IMAGE 16, PRIVATE URBAN AND SUBURBAN LINES, SOURCE: SLOBODA PREVOZ 2010



6.1.2.3. Metropolitan Bus Fleet

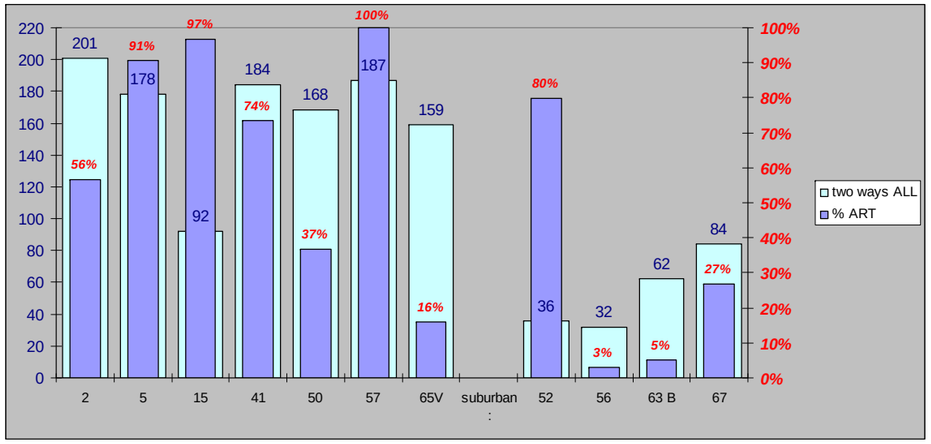
There are four types of buses operating in Skopje:

- Interurban coaches on the regional lines
- Regular buses on the private and most of the JSP lines with a capacity of 30 seats with 100 – 110 passengers
- Articulated buses on some of the busiest urban routes of JSP. Capacity: 45 seats with 150 – 180 passengers

IMAGE 17, ARTICULATED BUS ON L-50, SOURCE: IDOM

Articulated buses are found on 11 services. Only JSP line 57 is exclusively operated by articulated vehicles. Their use varies, depending on the peak periods for each line. The table below shows all lines with those services – 7 urban and 4 suburban – comparing the number of total services against the percentage of bendy buses ("ART").

GRAPHIC 5, ARTICULATED VS REGULAR SERVICES, SOURCE: IDOM WITH JSP DATA



The fleet on the private network is the oldest on the network. There is also on the JSP network a lack of modern and costumer friendly vehicles due to the lack of investment.

6.1.3. Road System

The main road network of the Metropolitan Region of Skopje is made up of:

- Two inner city rings - the first and second ring are shared by the Goce Delcev Road
- Main arteries branching off these rings
- The transit highway Alexander of Macedonia Blvd, also known as the "Magistrala"
- The suburban access highways (M4/ M3) and the new ring road ("tranzit").

IMAGE 18, REGIONAL ROAD NETWORK, SOURCE: INTERNET

6.2. CURRENT TRANSPORTATION DEMAND

6.2.1. Analysis of Household Survey Data. Mobility characteristics

The methodology used to analyze the mobility of the city of Skopje is based on the expansion of the surveys, individuals and households. The sample size of the survey is 3.228 households, meaning 11,418 individuals surveyed.

6.2.1.1. Macro zones / Municipalities

For the correct analysis of the traffic system, Skopje was divided into 10 macro-zones, whereby each stands for one municipality. The Consultant has calculated the expansion factor by municipalities.

TABLE 8, TOTAL HOUSEHOLDS SURVEY 2009, SOURCE: IDOM

Municipality	Total households survey 2009	% Households
Centar	339	11%
Kisela Voda	385	12%
Aerodrom	470	15%
Butel	217	7%
Gjorce Petrov	262	8%
Karpos	428	13%
Cair	377	12%
Saraj	175	5%
Gazi Baba	454	14%
Suto Orizari	121	4%
Total	**3.228**	**100,00%**

TABLE 9, TOTAL HOUSEHOLDS 2009, SOURCE: IDOM

Municipality	Total Households 2009	% Households
Centar	19.322	10%
Kisela Voda	23.199	12%
Aerodrom	29.288	15%
Butel	13.618	7%
Gjorce Petrov	15.183	8%
Karpos	24.676	13%
Cair	24.120	12%
Saraj	10.183	5%
Gazi Baba	27.147	14%
Suto Orizari	7.049	4%
Total	**193.784**	**100,00%**

TABLE 10, TOTAL INDIVIDUALS SURVEY 2009, SOURCE: IDOM

Municipality	Total individuals survey 2009	% Households
Centar	1.004	9%
Kisela Voda	1.330	12%
Aerodrom	1.583	14%
Butel	718	6%
Gjorce Petrov	936	8%
Karpos	1.393	12%
Cair	1.509	13%
Saraj	811	7%
Gazi Baba	1.647	14%
Suto Orizari	487	4%
Total general	**11.418**	**100,00%**

6.2.1.2. Population and their distribution

The total population of the city of Skopje is 527,842 citizens. The population is balanced between males and females with similar population rates, 49% males and 51% females. The distribution amongst the 10 metropolitan municipalities is as follows:

TABLE 11, POPULATION DISTRIBUTION 2009, SOURCE: IDOM

Skopje 2009	527,842
Centar	47,645
Kisela Voda	60,151
Aerodrom	75,749
Butel	38,017
Gorce Petrov	41,569
Karpos	60,222
Cair	68,112
Saraj	37,822
Gazi Baba	75,394
Suto Orizari (Sutka)	23,161

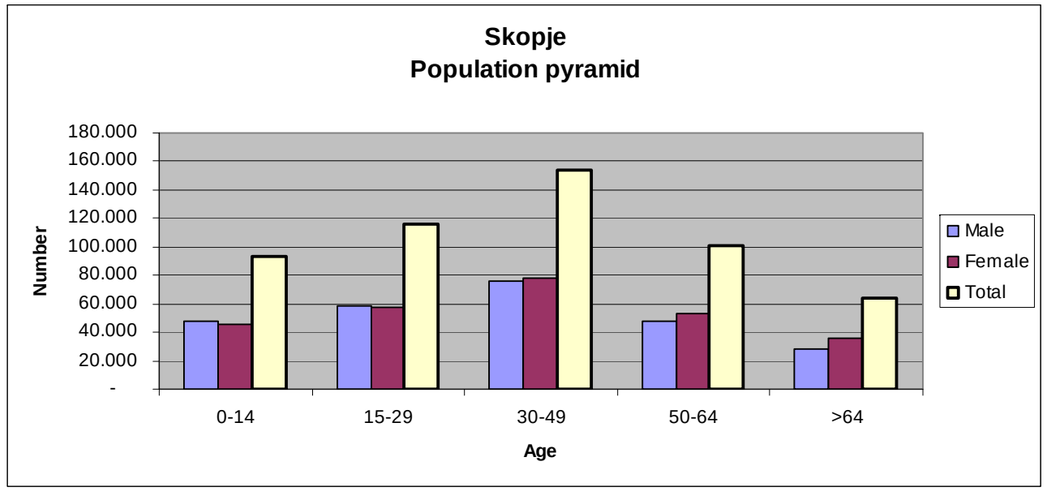
The population pyramid shape shows an ageing tendency, because of the amount of people between 30 and 49 years of age is the most representative group in the city. Moreover, there are not important differences between males and females in the different age range.

The bigger municipalities, in terms of population, are **Aerodrom and Gazi Baba with 39% of population in either municipality**. On the contrary, the municipality with the least population is Suto Orizari with 12% of the total population.

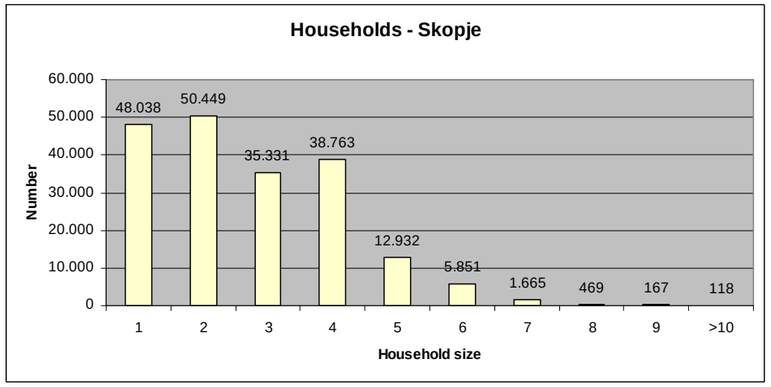
TABLE 12, HOUSEHOLDS BY SIZE IN ALL OF SKOPJE, SOURCE: IDOM

	Male					Female					Total
Household size	0-14	15-29	30-49	50-64	>64	0-14	15-29	30-49	50-64	>64	
1	-	1.671	10.388	3.150	6.499	-	1.910	4.724	7.576	12.118	**48.038**
2	1.035	11.742	13.228	12.182	13.583	1.101	8.257	10.894	16.433	12.443	**100.898**
3	6.097	14.767	15.405	13.368	2.735	7.687	12.112	18.233	12.521	3.067	**105.993**
4	21.269	20.236	21.753	12.615	1.488	17.052	21.391	26.811	9.923	2.513	**155.052**
5	10.026	6.290	8.343	3.768	1.837	9.955	7.925	10.338	3.287	2.889	**64.659**
6	6.737	2.154	4.732	1.725	1.659	6.543	3.472	4.681	2.000	1.406	**35.109**
7	1.970	918	1.125	579	702	2.343	1.247	1.567	564	643	**11.656**
8	383	464	584	225	76	584	545	494	257	142	**3.751**
9	197	148	161	128	82	132	158	260	113	123	**1.502**
>10	171	26	295	122	9	158	70	162	143	29	**1.184**
Total	**47.885**	**58.416**	**76.015**	**47.861**	**28.669**	**45.555**	**57.087**	**78.163**	**52.817**	**35.374**	**527.842**

GRAPHIC 6, POPULATION PYRAMID, SOURCE: IDOM



GRAPHIC 7, HOUSEHOLD SIZES IN SKOPJE, SOURCE: IDOM



6.2.1.3. Family size

The next table shows the distribution of the population of the city of Skopje based on the size of households. The most important part of the population is concentrated in households with a size of 2, 3 and 4 households. In fact, summing up the population of the 2,3 and 4 households, approximately 68,37% can be found in this group.

TABLE 13, FAMILY SIZE, SOURCE: IDOM

	households members	Household size	individual households									
			1	2	3	4	5	6	7	8	9	>10
Skopje	**527.842**		**50.816**	**102.557**	**105.963**	**152.365**	**63.583**	**34.001**	**11.337**	**3.930**	**1.695**	**1.595**
Centar	**47.645**		6.631	9.703	9.413	11.804	5.760	2.737	864	388	162	184
Kisela Voda	**60.151**		6.421	11.938	13.070	19.552	5.533	2.755	601	149	67	67
Aerodrom	**75.749**		8.086	15.034	16.459	24.622	6.968	3.469	756	188	84	84
Butel	**38.017**		3.200	7.028	7.431	10.738	5.497	2.684	925	283	136	94
Gjorce Petrov	**41.569**		3.538	7.894	8.561	13.412	4.528	2.552	663	253	84	84
Karpos	**60.222**		9.108	14.578	13.146	16.469	4.468	1.817	403	110	55	67
Cair	**68.112**		5.733	12.591	13.314	19.238	9.849	4.809	1.657	507	244	169
Saraj	**37.822**		601	5.646	6.133	9.370	7.822	4.792	2.269	707	254	227
Gazi Baba	**75.394**		6.252	14.932	15.074	21.964	8.866	5.179	1.767	716	291	354
Suto Orizari	**23.161**		1.246	3.213	3.363	5.197	4.292	3.207	1.431	629	317	265

6.2.1.4. Parking in residence

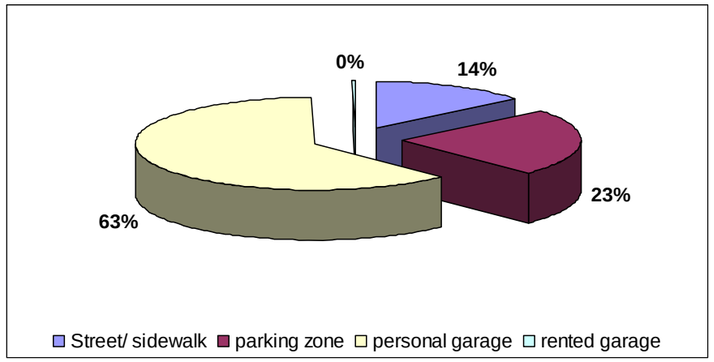
Characterizing the type of parking is essential for understanding the mobility of Skopje. In this way, it is significant to know the amount of cars that are parking in private garage with a sum of 103.371 cars (62.3% of total cars).

Analysing municipality by municipality, the consultant highlights the amount of households without cars in Centar, representing 58.45% (for more details see ANNEX "Results of Survey per Municipality").

TABLE 14, TYPE OF PARKING IN RESIDENCE, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	rented garage	Total
Centar	3.846	5.934	6.152	123	**16.054**
Kisela Voda	2.795	4.094	15.336	86	**22.310**
Aerodrom	1.177	15.049	11.727	73	**28.026**
Butel	986	1.293	9.950	0	**12.230**
Gjorce Petrov	1.129	1.760	14.427	0	**17.316**
Karpos	6.345	4.216	14.717	42	**25.320**
Cair	4.635	3.031	4.824	45	**12.535**
Saraj	156	50	6.903	50	**7.159**
Gazi Baba	2.119	3.251	18.395	0	**23.765**
Suto Orizari	182	77	939	0	**1.198**
Total	**23.370**	**38.755**	**103.371**	**419**	**165.914**

GRAPHIC 8, TYPE OF PARKING IN RESIDENCIAL AREAS, SOURCE: IDOM



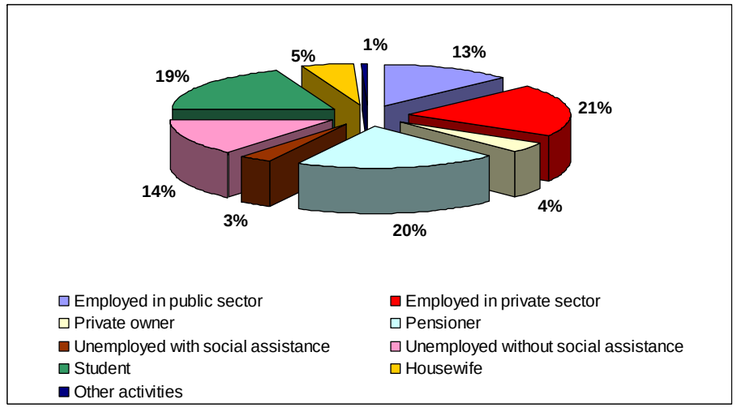
6.2.1.5. Activity and employment of the population

Another relevant variable that the consultant has studied for a correct analysis of transport in Skopje is the type of employment of the population of Skopje.

TABLE 15, TYPE OF EMPLOYMENT, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	6.083	10.207	2.624	13.254	285	4.739	9.238	887	145	47.462
Kisela Voda	7.908	16.962	3.075	13.628	879	7.180	9.343	919	192	60.084
Aerodrom	12.696	18.150	1.545	16.993	918	8.276	15.023	1.495	569	75.665
Butel	4.357	7.593	1.068	10.348	102	6.302	6.425	1.346	193	37.734
Gjorce Petrov	6.782	10.232	1.846	8.182	372	4.613	7.659	1.344	370	41.401
Karpos	10.012	13.783	2.232	15.753	936	4.514	11.470	1.141	259	60.100
Cair	7.812	7.344	4.186	10.553	4.363	11.394	13.348	8.403	708	68.112
Saraj	5.371	956	3.440	823	894	7.213	10.029	8.233	262	37.221
Gazi Baba	6.933	19.324	2.009	16.270	1.508	11.726	13.808	3.174	641	75.394
Suto Orizari	1.482	938	254	1.747	5.920	7.796	4.532	462	29	23.161
Total	69.436	105.489	22.279	107.551	16.177	73.754	100.876	27.403	3.368	526.334

GRAPHIC 9, TYPE OF EMPLOYMENT IN THE CITY, SOURCE: IDOM



In this chapter the consultant analyzes **the activity** of the population by municipalities. From the result, the consultant can emphasize that the majority group of activity is the **"No workers" (Students, unemployed, pensioners and housewives) with 62% of the population** (see graphic below).

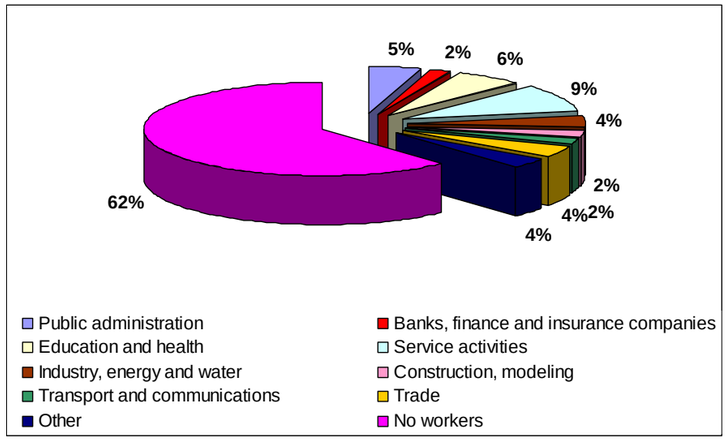
In the relative of group of activity, the most representative group, with incomes, is *Services activities* with approximately 8.12% of population. On the other hand, the group with the least activity, with incomes, is *Banks, finance and insurance companies* with 1.6% of the total population.

TABLE 16, SECTOR OF EMPLOYMENT (ACTIVITY), SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
Centar	2.440	1.402	3.139	4.721	1.174	1.253	708	1.680	2.618	28.326	47.462
Kisela Voda	2.478	2.350	4.157	7.012	5.101	1.241	1.305	3.112	1.333	31.994	60.084
Aerodrom	5.177	1.968	5.206	6.877	3.169	1.746	1.091	2.937	4.778	42.715	75.665
Butel	1.733	382	1.592	2.832	2.133	786	1.164	1.835	648	24.630	37.734
Gjorce Petrov	2.157	1.311	3.269	5.457	2.222	1.630	1.975	2.728	1.268	23.983	46.001
Karpos	4.303	1.855	5.005	7.396	1.240	835	944	1.917	2.718	33.887	60.100
Cair	2.787	673	2.468	6.265	2.125	627	592	2.699	1.775	48.101	68.112
Saraj	2.091	0	2.489	805	559	1.115	108	1.250	1.632	27.173	37.221
Gazi Baba	1.912	599	3.774	7.389	5.100	1.392	1.992	4.051	2.398	46.789	75.394
Suto Orizari	276	0	72	1.241	320	315	155	297	39	20.447	23.161
Total	20.177	8.571	25.964	43.117	19.974	9.194	8.943	19.568	14.430	285.331	530.934

* Student, unemployed, pensioner, housewife

GRAPHIC 10, SECTOR OF EMPLOYMENT (ACTIVITY) SKOPJE, SOURCE: IDOM



For more details in relation to the above please study the ANNEX "Results of Survey per Municipality".

6.2.1.6. Number of trips

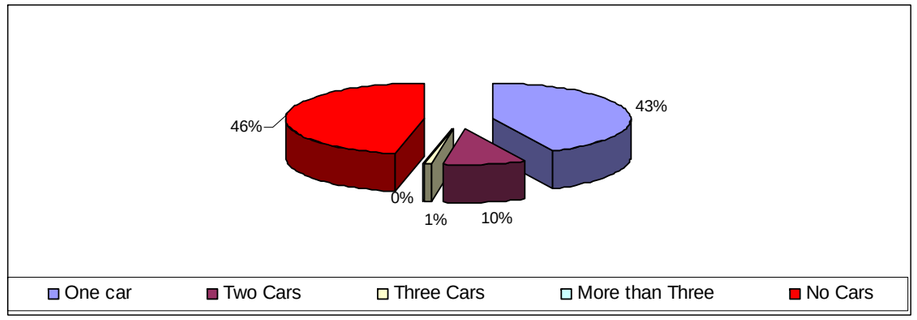
In order to project the sample size of the survey to the total population of Skopje, IDOM was using the technique of **bi-proportional fitting** (Modelling Transport, Ortúzar and Willumsen, 1993), that guarantees that the household size, age groups and sex distribution of the sampled data represent proportionally those in the population, based on Skopje Census data.

The application of this method has the advantage of converging data in very few iterations and not requiring the subsequent calculation of expansion factors.

As shown in this Report, all data has been determined by this method via projecting the sample over these three variables, i.e. household size, age groups and sex distribution, including also the number of trips per person or the number of cars per household.

The survey showed that more than 50% of all households in Skopje have at least one car, and little less than 50% do not have any.

GRAPHIC 11, CAR AVAILABILITY AND OWNERSHIP, SOURCE: IDOM



Among the total of 193,784 households there are **126,043 vehicles** which have been used for the private car modelling of this exercise, doing on an average day 337,809 trips. There is an increase of approx 6% compared to the number of cars from 2002 (see results of UKIM Mobility Study, explained in Chapter 5.2). It is assumed that a similar growth rate will be maintained over the next decade.

Two thirds of those households with car count only with one vehicle. The following table breaks down car ownership by households for each of the 10 Municipalities.

TABLE 17, CAR OWNERSHIP PER MUNICIPALITY, SOURCE: IDOM

	One Car	Two Cars	Three Cars	More than Three	
Centar	7.759	4.363	636	144	12.903
Kisela Voda	10.862	5.782	407	0	17.051
Aerodrom	13.012	8.269	522	54	21.857
Butel	6.276	2.132	347	321	9.075
Gjorce Petrov	7.401	3.461	350	0	11.211
Karpos	11.591	6.139	1.002	138	18.870
Cair	7.771	2.391	165	0	10.327
Saraj	5.749	684	266	0	6.698
Gazi Baba	12.106	4.296	653	309	17.365
Suto Orizari	613	71	0	0	684
Total	**83.140**	**37.587**	**4.348**	**967**	**126.043**

For more details about the number of cars in each household divided by municipalities, see tables in 9. Annex. Considering a population of 527.842 inhabitants in Skopje, the mobility rate is an average of 2.1 daily trips per person.

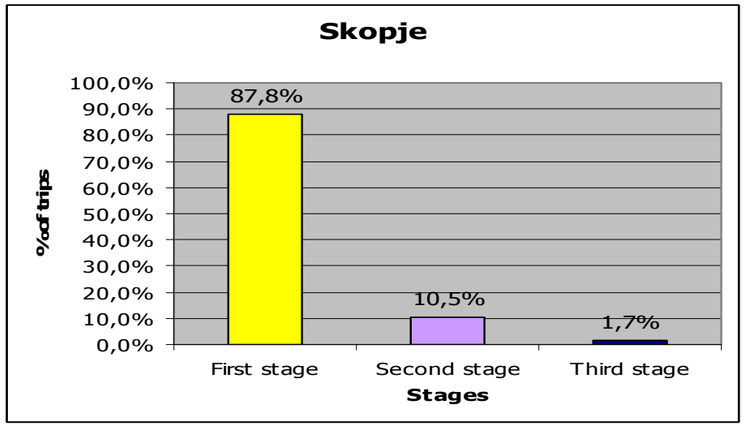
TABLE 18, AVERAGE DAILY TOTAL TRIPS IN SKOPJE, SOURCE: IDOM SURVEY OUTPUT

TOTAL TRIPS	1.108.168	100,0%
Mec Private	372.786	34%
Mec Public	337.809	30%
Walkin+bicycle	397.572	36%

Considering the different stages of the trips, it is possible to observe that most of trips are only one stage trip.

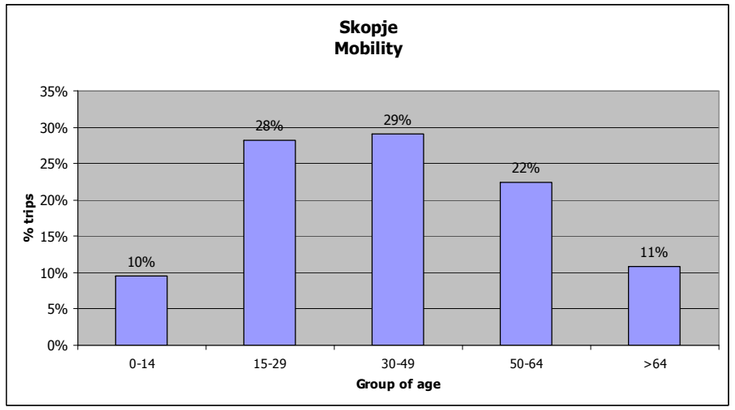
- A 88% of people do not make a second stage, a 12% do
- A 98% of people do not make a third stage, a 2% do.

GRAPHIC 12, TRIPS STAGES, SOURCE: IDOM



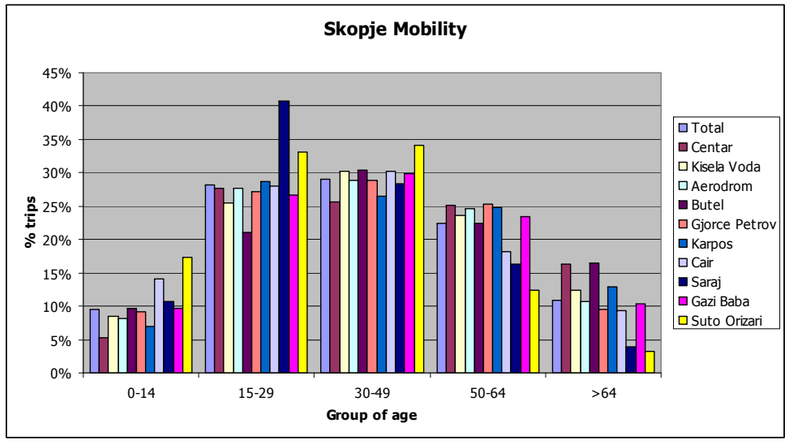
Most of population that makes trips in Skopje is doing so to go to work or study.

GRAPHIC 13, MOBILITY PER GROUP OF AGE, SOURCE: IDOM



Attending to the origin of population in Skopje:

GRAPHIC 14, MOBILITY PER GROUP OF AGE AND MUNICIPALITY, SOURCE: IDOM

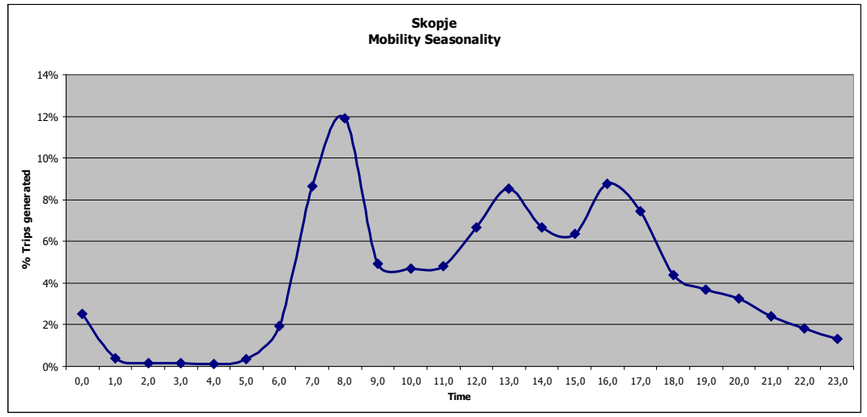


6.2.1.7. Trips seasonality

The results obtained show the mobility patterns in Skopje.

There is a peak hour around 7:30-8:30 h in the morning that represents around the 12% of daily trips. In the afternoon, there are two peak hours, one around 13:00 and other one around 16:30 h.

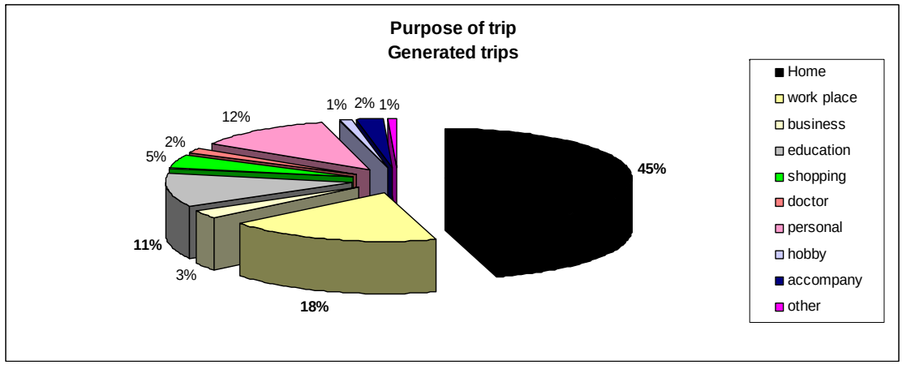
GRAPHIC 15, MOBILITY SEASONALITY, SOURCE: IDOM



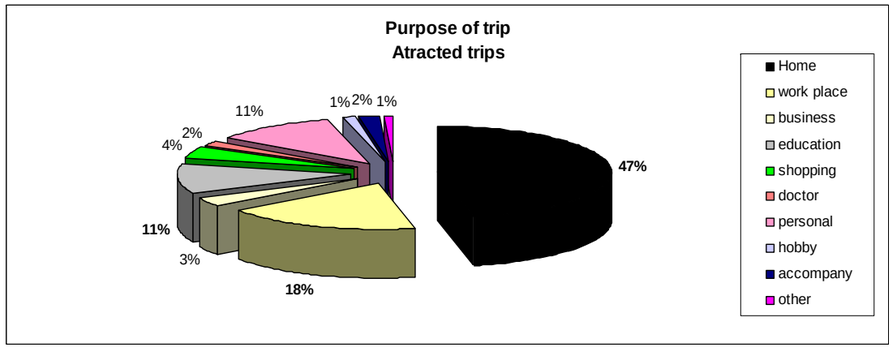
6.2.1.8. Purpose of trips

Most of trips generated or attracted are base at home and approximately a 20% of trips are because of work. The third purpose of trip is education (+-11%) and personal purpose (+-11%).Shopping is around 5%.

GRAPHIC 16, PURPOSE OF GENERATED TRIPS, SOURCE: IDOM



GRAPHIC 17, PURPOSE OF ATTRACTED TRIPS, SOURCE: IDOM

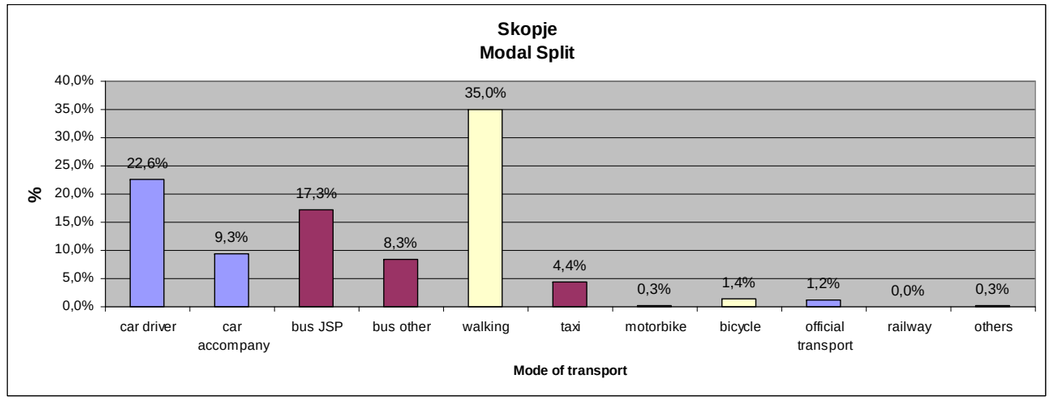


6.2.1.9. Mode of transport

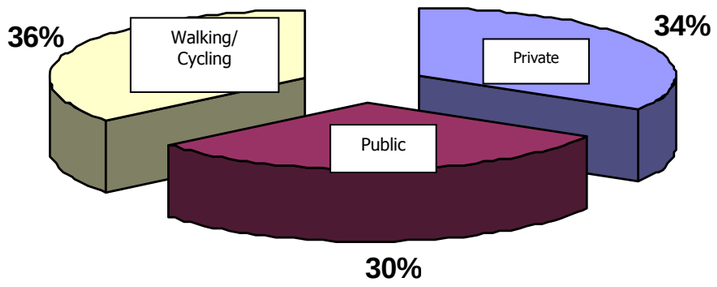
Given the size of the city, highlights the high percentage of trips on foot, with 36%. Public transport, despite the poor conditions of buses, represents a 30% of trips.

The modal split in Skopje, obtained in the household survey, is the following.

GRAPHIC 18, MODAL SPLIT 2009. SOURCE: IDOM



GRAPHIC 19, MODAL SPLIT 2009. SOURCE: IDOM

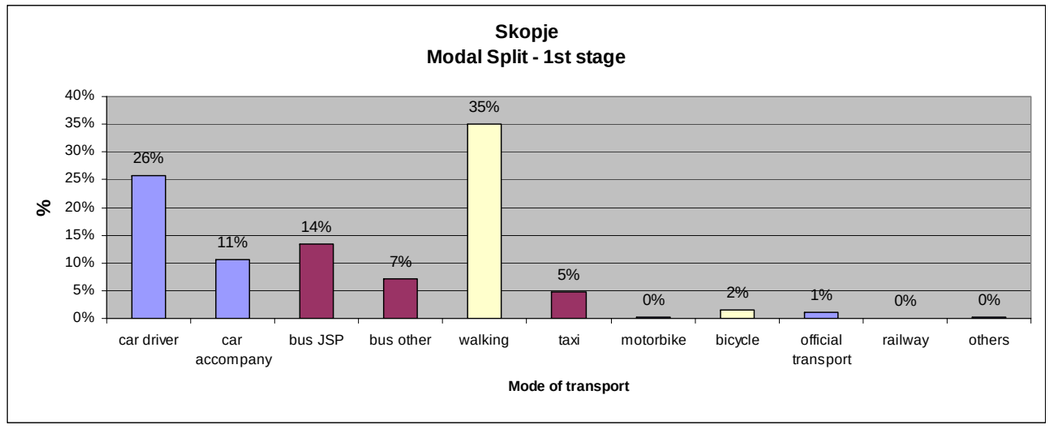


Analyzing the trips by stage, the results are the following:

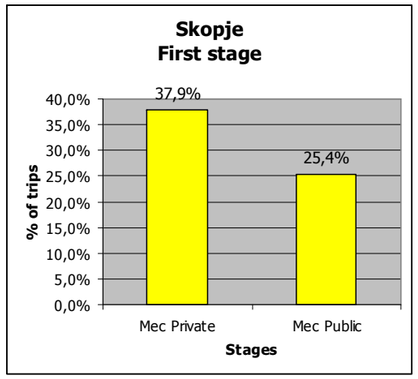
- o A 35% of people go walking in the first stage
- o A 37% of people use the car (as driver or companion) in the first stage
- o A 21% of people use the bus (JSP or other company) in the first stage
- o **The 99% of people who use the car in the first stage, do not make a second stage**
- o A 6% of people use the bus in a second stage.
- o The 64% of people who use the bus JSP in the first stage, do not make a second stage
- o The 74% of people who use the bus other companies in the first stage, do not make a second stage

The so called "door to door" modes of transport reduce the number of stages, and the mode of transport bus generates a great number of interchanges mainly in the same mode of transport.

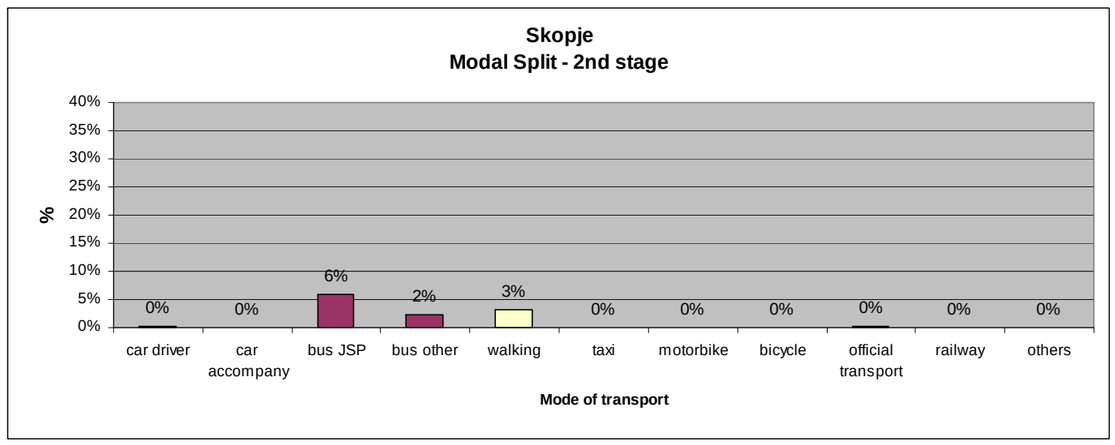
GRAPHIC 20, MODAL SPLIT 2009 FIRST STAGE. SOURCE: IDOM



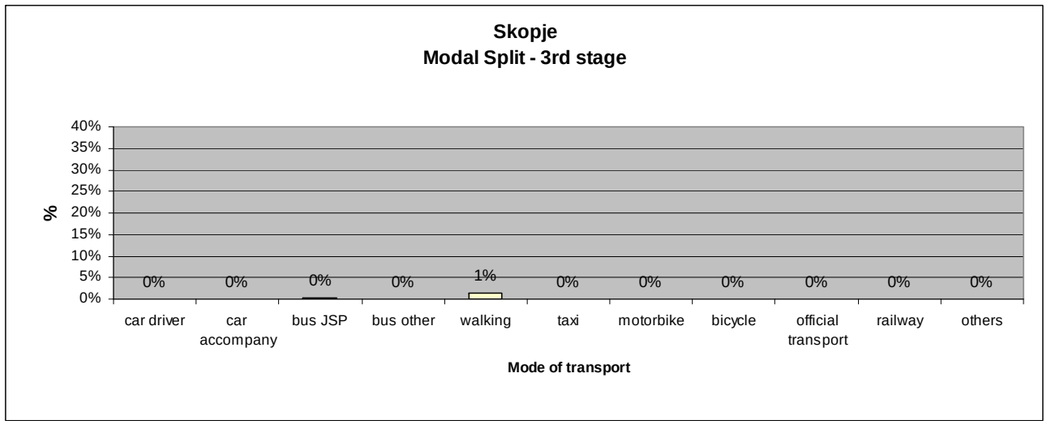
GRAPHIC 21, MODAL SPLIT 2009 MECHANICAL TRIPS, SOURCE: IDOM



GRAPHIC 22, MODAL SPLIT 2009 SECOND STAGE, SOURCE: IDOM



GRAPHIC 23, MODAL SPLIT 2009 THIRD STAGE, SOURCE: IDOM



6.2.2. Generation/attraction model

The generation / attraction model analyse the relationship between different variables that affect mobility. Different variables that are significant have been studied searching its correlation in the model.

The main figures that support this analysis are the following:

TABLE 19, AGE GROUPS VS HOUSHOLD SIZE, SOURCE: IDOM SURVEY OUTPUT

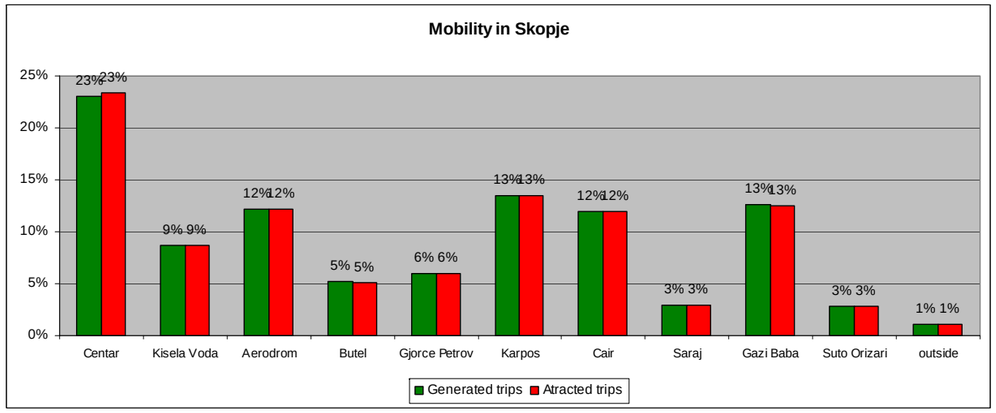
SKOPJE 2009

	Male					Female					Total
Household size	**0-14**	**15-29**	**30-49**	**50-64**	**>64**	**0-14**	**15-29**	**30-49**	**50-64**	**>64**	
1	-	1.671	10.388	3.150	6.499	-	1.910	4.724	7.576	12.118	**48.038**
2	1.035	11.742	13.228	12.182	13.583	1.101	8.257	10.894	16.433	12.443	**100.898**
3	6.097	14.767	15.405	13.368	2.735	7.687	12.112	18.233	12.521	3.067	**105.993**
4	21.269	20.236	21.753	12.615	1.488	17.052	21.391	26.811	9.923	2.513	**155.052**
5	10.026	6.290	8.343	3.768	1.837	9.955	7.925	10.338	3.287	2.889	**64.659**
6	6.737	2.154	4.732	1.725	1.659	6.543	3.472	4.681	2.000	1.406	**35.109**
7	1.970	918	1.125	579	702	2.343	1.247	1.567	564	643	**11.656**
8	383	464	584	225	76	584	545	494	257	142	**3.751**
9	197	148	161	128	82	132	158	260	113	123	**1.502**
>10	171	26	295	122	9	158	70	162	143	29	**1.184**
Total	**47.885**	**58.416**	**76.015**	**47.861**	**28.669**	**45.555**	**57.087**	**78.163**	**52.817**	**35.374**	**527.842**

TABLE 20, HOUSHOLD SIZES PER MUNICPALITY, SOURCE: IDOM SURVEY OUTPUT

SKOPJE 2009	1	2	3	4	5	6	7	8	9	>10	**Total**
Centar	6.542	4.810	3.156	2.992	1.163	466	125	50	18	0	**19.322**
Kisela Voda	6.273	5.933	4.373	4.931	1.114	463	87	19	0	7	**23.198**
Aerodrom	7.992	7.486	5.491	6.193	1.402	583	109	24	9	0	**29.288**
Butel	3.157	3.516	2.503	2.718	1.112	453	134	0	15	10	**13.618**
Gjorce Petrov	3.524	3.950	2.869	3.374	911	428	95	32	0	0	**15.183**
Karpos	7.784	6.556	4.251	4.528	1.011	435	88	23	0	0	**24.676**
Cair	5.356	6.327	4.459	4.838	1.986	808	239	64	27	17	**24.120**
Saraj	0	2.849	2.071	2.381	1.596	814	331	90	29	23	**10.183**
Gazi Baba	6.125	7.401	5.036	5.519	1.785	869	254	90	32	36	**27.147**
Suto Orizari	1.284	1.622	1.122	1.290	853	534	205	79	35	27	**7.049**
Total	**48.039**	**50.451**	**35.334**	**38.767**	**12.937**	**5.857**	**1.672**	**477**	**176**	**118**	**193.784**

GRAPHIC 24, ORIGEN AND DESTINATION OF TRIPS PER MUNICIPALITY, SOURCE: IDOM



The main elements to design the model in Skopje are the following data of the transport zones:

- Population and number of cars, key element in the generation model
- Students, Employees, total, Employees, private sector, and Employees in the public sector, key elements in the attraction model.

Trips generated total

The following formula explains more than 94% of trips:

Trips gen_total = 0,8755* Population + 2,977* Population active

TABLE 21, STATISTICS TO TOTAL OF GENERATED TRIPS "TRIPS GEN_TOTAL", SOURCE: IDOM, 2009

Estadísticas de la regresión	
Coeficiente de correlación múltiple	0,976440354
Coeficiente de determinación R^2	0,953435765
R^2 ajustado	0,943372648
Error típico	48,75033443
Observaciones	106

ANÁLISIS DE VARIANZA

	Grados de libertad	*Suma de cuadrados*	*Promedio de los cuadrados*	*F*	*Valor crítico de F*
Regresión	2	5060897,109	2530448,554	1064,73692	1,57986E-69
Residuos	104	247165,8911	2376,595107		
Total	106	5308063			

	Coeficientes	*Error típico*	*Estadístico t*	*Probabilidad*	*Inferior 95%*	*Superior 95%*	*Inferior 95,0%*	*Superior 95,0%*
Intercepción	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Population 2009	**0,875539306**	0,047717304	18,34846542	2,19587E-34	0,780914103	0,970164508	0,7809141	0,970164508
Active 2009	**2,977191363**	0,106460424	27,96524047	3,44139E-50	2,766076353	3,188306374	2,76607635	3,188306374

Trips attracted total

The following formula explains more than 80% of trips:

Trips atr_total = 3,979* Active population

TABLE 22, STATISTICS TO TOTAL OF ATTRACTED TRIPS "TRIPS ATR_TOTAL", SOURCE: IDOM, 2009

Estadísticas de la regresión	
Coeficiente de correlación múltiple	0,900560598
Coeficiente de determinación R^2	0,81100939
R^2 ajustado	**0,80148558**
Error típico	98,41142932
Observaciones	106

ANÁLISIS DE VARIANZA

	Grados de libertad	*Suma de cuadrados*	*Promedio de los cuadrados*	*F*	*Valor crítico de F*
Regresión	1	4363812,011	4363812,011	450,5831577	1,36773E-39
Residuos	105	1016904,989	9684,809421		
Total	106	5380717			

	Coeficientes	*Error típico*	*Estadístico t*	*Probabilidad*	*Inferior 95%*	*Superior 95%*	*Inferior 95,0%*	*Superior 95,0%*
Intercepción	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Active 2009	**3,979481634**	0,187473129	21,22694415	8,87094E-40	3,607757061	4,35120621	3,607757061	4,351206206

Trips gen_pri

The following formula explains more than 60% of trips:

Trips gen_pri = 2,333* Cars

TABLE 23, STATISTICS TO TOTAL OF GENERATED PRIVATE TRANSPORT TRIPS "TRIPS GEN_PRI", SOURCE: IDOM, 2009

Estadísticas de la regresión	
Coeficiente de correlación múltiple	0,783881868
Coeficiente de determinación R^2	0,614470782
R^2 ajustado	**0,604946973**
Error típico	51,11937471
Observaciones	106

ANÁLISIS DE VARIANZA

	Grados de libertad	*Suma de cuadrados*	*Promedio de los cuadrados*	*F*	*Valor crítico de F*
Regresión	1	437325,0006	437325,0006	167,352899	2,17151E-23
Residuos	105	274384,9994	2613,19047		
Total	106	711710			

	Coeficientes	*Error típico*	*Estadístico t*	*Probabilidad*	*Inferior 95%*	*Superior 95%*	*Inferior 95,0%*	*Superior 95,0%*
Intercepción	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Cars 2009	**2,333246194**	0,180361545	12,93649485	1,8262E-23	1,975622578	2,69086981	1,97562258	2,69086981

Trips atr_pri

The following formula explains more than 82% of trips:

Trips atr_pri = 2,349* Employees private sector

TABLE 24, STATISTICS TO TOTAL OF ATTRACTED PRIVATE TRIPS "TRIPS ATR_PRI", SOURCE: IDOM

Estadísticas de la regresión	
Coeficiente de correlación múltiple	0,914776263
Coeficiente de determinación R^2	0,836815611
R^2 ajustado	**0,827291802**
Error típico	33,67103064
Observaciones	106

ANÁLISIS DE VARIANZA

	Grados de libertad	*Suma de cuadrados*	*Promedio de los cuadrados*	*F*	*Valor crítico de F*
Regresión	1	610454,4781	610454,4781	538,4439	6,43045E-43
Residuos	105	119042,5219	1133,738304		
Total	106	729497			

	Coeficientes	*Error típico*	*Estadístico t*	*Probabilidad*	*Inferior 95%*	*Superior 95%*	*Inferior 95,0%*	*Superior 95,0%*
Intercepción	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Employees 2009 - Private sector	**2,349474179**	0,101251262	23,20439406	3,92E-43	2,148711636	2,55023672	2,148711636	2,550236722

Trips atr_pub

The following formula explains more than 83% of trips:

Trips atr_pub = 0,513* Students + 1,169* Active

TABLE 25, STATISTICS TO TOTAL OF ATTRACTED PUBLIC TRANSPORT TRIPS "TRIPS ATR_PUB", SOURCE: IDOM, 2009

Estadísticas de la regresión	
Coeficiente de correlación múltiple	0,921939262
Coeficiente de determinación R^2	0,849972003
R^2 ajustado	**0,838914042**
Error típico	31,80663238
Observaciones	106

ANÁLISIS DE VARIANZA

	Grados de libertad	*Suma de cuadrados*	*Promedio de los cuadrados*	*F*	*Valor crítico de F*
Regresión	2	596075,1662	298037,5831	294,601975	2,44941E-43
Residuos	104	105212,8338	1011,661864		
Total	106	701288			

	Coeficientes	*Error típico*	*Estadístico t*	*Probabilidad*	*Inferior 95%*	*Superior 95%*	*Inferior 95,0%*	*Superior 95,0%*
Intercepción	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Students Destination 2009	**0,51359555**	0,076912216	6,677685028	1,22099E-09	0,361075745	0,666115356	0,361075745	0,666115356
Active 2009	**1,1696484**	0,070784977	16,52396379	7,48889E-31	1,029279138	1,310017662	1,029279138	1,310017662

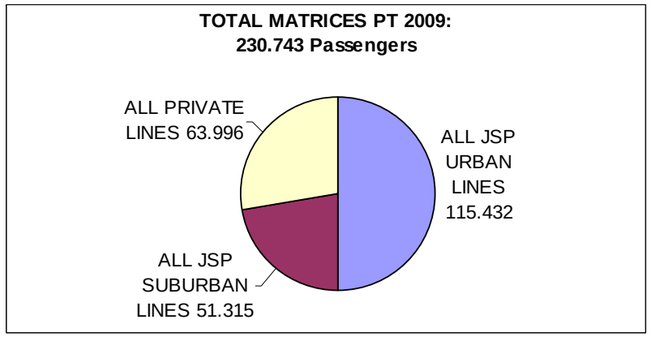
6.2.3. Global mobility of the residents

6.2.3.1. Global public transport data

The global demand of public transport data was provided by the operators JSP and SLOBODA. The Consultant has then broken down these annual numbers to obtain passenger numbers for each line.

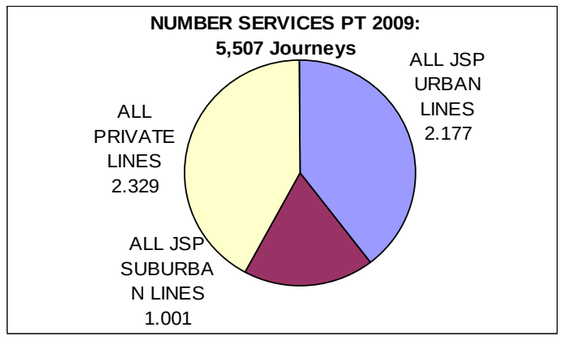
The total number of bus passengers in 2009 was **230,743**, meaning that numbers have been dropped significantly since 1998 where bus patronage was 31% higher. However, it needs to be stressed that Skopje has never had a continuous stable development and hence no linear evolution of data can be found either. The following diagram shows the totals used for preparing the matrices which have been modelled in the base year assignation of the demand modelling exercise (Year 2009):

GRAPHIC 25, TOTAL PASSENGER NUMBERS IN 2009 OF PUBLIC TRANSPORT, SOURCE: IDOM



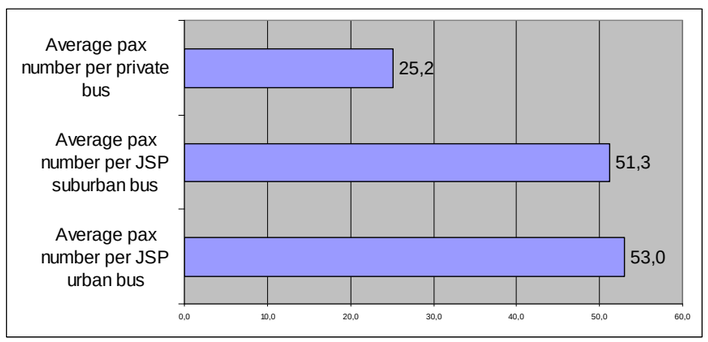
The numbers have been roughly cross- checked with the numbers of daily services of each of the operators. The current total of services on an average working days are summarised below:

GRAPHIC 26, NUMBERS OF BUS SERVICES IN 2009 (AVERAGE WORKING DAY), SOURCE: IDOM



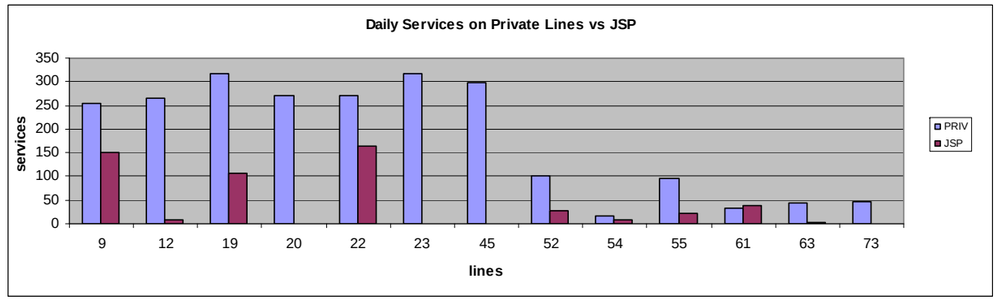
It can be concluded that services on private lines are more frequent, whereby private buses are, as a consequence less busy. The following chart gives a comparison of this matter:

GRAPHIC 27, OCCUPATION PER BUS IN 2009 (AVERAGE WORKING DAY), SOURCE: IDOM



Although private and public lines run on almost identical routes, it has been noted, that both private and public operators have been concentrated on particular lines. Over the last years the private operators have been set up their own network, which counts now with an own tariff system, called MOJA CARTA. Concerning this issue, the following chart shows the number of services on private lines versus the total services on the public equivalents. It can be seen that only on Lines Nº 9, 22 and 61 the numbers are similar and hence there would be some sort of direct competition. The remaining private lines do not have a public competitor yet, or JSP services have been reduced significantly over the last years.

GRAPHIC 28, NUMBER OF SERVICES PRIVATE VERSUS JSP (AVERAGE WEEK DAY), SOURCE: IDOM



6.2.3.2. Global private transport data

The number of private vehicles (heavy and light) has been derived from two different sources:

- Trips coming and going to Skopje were calculated using the household survey results (cars only)
- Car trips with origin and destination outside of Skope as well as all heavy vehicle trips by using traffic counts in the access roads.

The total number of light vehicles (cars) trips is **273,688** in the base year 2009, whereby only 32,000 cars cross Skopje by transit. The methodology, which was applied, can be briefly explained in the five steps below:

1. Survey data was grouped by municipality, gender, household size and age group in order to characterize the population in a representative way
2. The survey question of the transport behaviour of each citizen was filtered to exclude trip data by persons who only make use of the private vehicle, both as driver and as passenger
3. All trips of these citizens were put in an extended trip matrix using all 133 transport zones (i.e. Skopje internal zones)
4. The trip number for each origin-destination-pair of these 133 zones was finally expanded by the factor, which came out of the mobility analysis for each of the population groups from step 1.

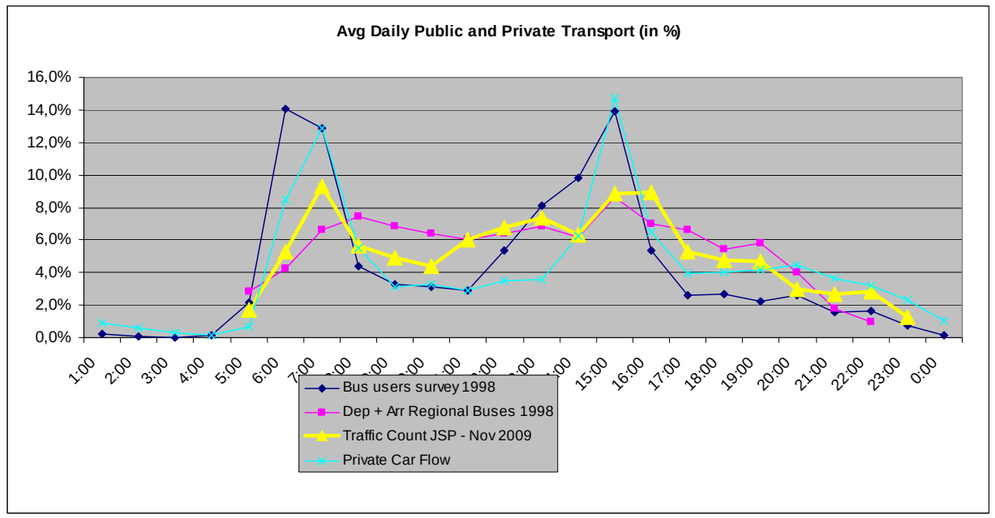
The total trips by car of the residents of Skopje are approx of 241,000 trips on an average working day in 2009.

6.2.4. Hourly distribution and spatial mobility

In order to determine the hourly distribution of traffic in the City of Skopje, bus timetable and traffic count data from various years of reference has been analysed. It can be said that distribution and traffic peaks have not been changed over the last 10 years, since the last important survey was undertaken (in 1998). There are **two peak hours** across the city highway network for both private and public transport:

- a morning peak period, from 7 to 8 o'clock
- a longer afternoon peak period, from 15 to 17 o'clock

GRAPHIC 29, VARIOUS DAILY DISTRIBUTIONS OF TRAFFIC (AVERAGE W. DAY), SOURCE: IDOM



6.2.5. Generation and attraction of trips

An important number of trips have its origin and destination around the city centre ring, as shown in the table below with the ten transport zones that attract and generate most of the City's traffic:

TABLE 26, THE 10 BUSIEST TRANSPORT ZONES OF SKOPJE, SOURCE: IDOM (VISUM)

Ranking	Key Location	"Transport Zone"	Municipality
1	Macedonia Square	ce17	Centar
2	Bit Pazar (Old Bazaar), Mavrovka Shopping Center	c1	Cair
3	State Clinical Center	ce14	Centar
4	University Complex "St. Cyril and Methodius" and Head of the Administration of Justice	ce15	Centar
5	Biser Shopping Center	a14	Aerodrom
6	Cair Center	c4	Cair
7	Leptokarija Shopping Center	k9	Karpos
8	Electro – Technical, Mechanical Engineering and Technological Faculties	k8	Karpos
9	Leningraska Street	ce4	Centar
10	Avtokomanda	gb4	Gazi Baba

It is obvious, that around these zones occur also the highest concentrations in private and public traffic volumes, which causes especially in AM and PM peak hours congestion in some junctions (8:30 – 9:30, 16:30 – 17:30). Traffic counts have shown, that approx 15% of the daily volume occurs in these two peak hours.

The main attraction comes from the dense residential areas to the south of the river and some more dense housing areas in the north:

- Residential areas of Karpos 3 and Karpos 4
- Aerodrom
- Avtokomanda in the west of Gazi Baba
- Sutka (Suto Orizari)
- Cair

As explained in the previous table, the transport zones of CENTAR attract city wide trips a great deal. This is due to the fact that main shopping, medical and administrative uses are all concentrated in CENTAR. Of special importance are:

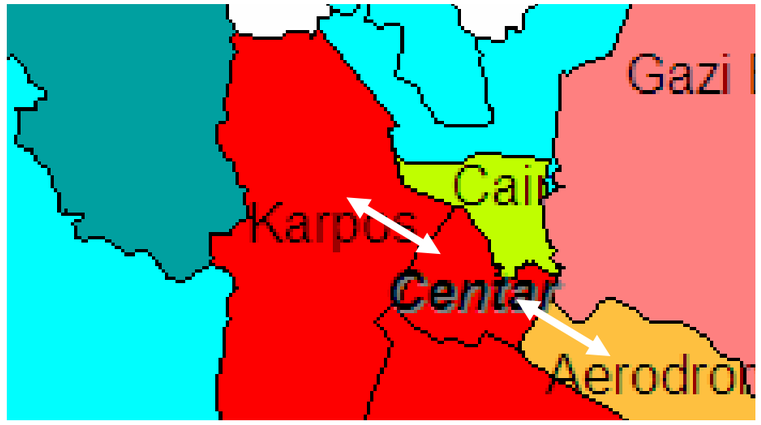
- Offices and shops around Macedonia Square and Ramstore Shopping Centre
- The most important hospital complex of the country (BOLNITZA) in the south of this district
- Faculties of the Universities
- Komplex Banki and other commercial and administrative organisation of national importance

6.2.6. General Flows of Mobility

6.2.6.1. Global mobility: Trips between municipalities

The highest cross-city flows have been identified between Karpos – Centar – Aerodrom, as shown on the following map. This east-west "main axis of mobility" is also been reflected in the structure of the road network, as the main boulevards follow also this east west-corridor, south of the River Vardar.

IMAGE 19, MAIN INNER SKOPJE TRAFFIC FLOW, SOURCE: IDOM



There are furthermore high internal flows within the districts of Saraj and Gazi Baba, one of the bigger municipalities with spread communities within its limits and also within multi-functional, mixed districts, like Cair and Karpos, where both residential and commercial use can be found. In these four municipalities, around half of the trips are those of inner-municipality nature, according to the survey:

- Cair 57%
- Karpos 51%
- Saraj 46%
- Gazi Baba 46%

6.2.6.2. Daily Commuting

For model purposes, the Consultant has also determined the number of commuters. On a daily basis, i.e. from Monday to Friday, approx 94.000 individuals commute between the City of Skopje and their suburban (or regional) residential homes. This total can be broken down in following modes:

- Car users, co-driver and other passengers of private cars, numbers and occupation rates have been obtained by traffic counts (60%)
- Passengers on private and public suburban bus lines (39%)
- Other bus passengers, arriving and departing on regional bus lines (1%)

GRAPHIC 30, DAILY EXTERNAL COMMUTING (AVERAGE WORKING DAY), SOURCE: IDOM

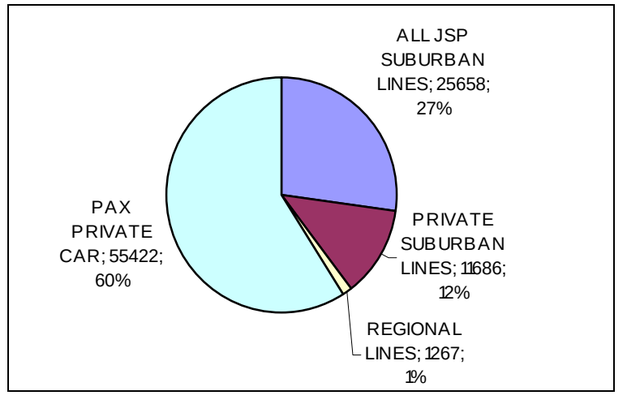


IMAGE 20, REGIONAL BUS STATION UNDERNEATH TRAIN PLATFORMS AT TRANSPORTEN CENTAR, SOURCE: IDOM

6.2.6.3. Mobility and modal structure

In 2007, JSP undertook a survey which was destined to analyse what sort of mobility can be found amongst the citizens. Three relevant questions in terms of modal characteristics and the reasons behind this behaviour can be found below:

Question: What kind of transportation you use?

- A car 27.6%
- Public transportation 59.1%

- Other transportation 13.3%

Question: Do you use the buses of JSP?

- Yes 74.9%
- No 25.1%

Question: What in your opinion needs to be correct in the PT?

- Conditions in the buses 38.2%
- Time of travel and waiting 33.7%
- More bus lines 25.8%
- Something else 2.3%

IDOM's household survey of 2009 gives more detail about the use of each transport mode in Skopje. The mode split shows an almost equal distribution between private car, public transport and walking, whereas it is important to stress that 23% of the inhabitants do not realize any trips (longer than 10 min by definition).

TABLE 27, DETAILED MODE SPLIT BREAKDOWN IN SKOPJE, SOURCE: IDOM (SURVEY)

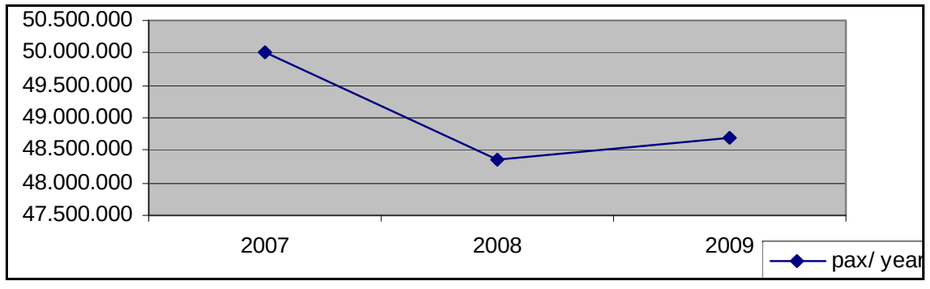
Detailed Mode Split Breakdown		Public Transport	**30.0%**
Source: Survey IDOM 2009		Bus - JSP	17.3%
Private Transport	**33.6%**	Bus - other operators	8.3%
car driver	22.6%	Taxi	4.4%
car accompany	9.3%	Railway	0.0%
motorbike	0.3%	Walking + Bicycle	**36.4%**
official transport	1.2%	Walking	35.0%
others	0.3%	Bicycle	1.4%

6.2.7. Global Bus Passenger Demand

The average total of Regional Bus Passengers arriving or leaving at the Central Bus Station on a normal working day (Mon – Fri) is 2.533 passengers, whereby 242 buses circulate every day. In 2009, there were around **800,000 people** travelling with regional buses in and out Sklopje. Approx 10.5 pax sit on each bus. The highest in and out flow of buses occurs between 12am and 4pm.

The total number of transported passengers on urban and suburban lines by JSP SKOPJE over the last three years has reached around **50 million passengers** in 2007, although there has been a sharp decrease in patronage due to economic hardship in the country.

GRAPHIC 31, JSP PASSENGERS PER YEAR, SOURCE: IDOM WITH JSP DATA



On private lines, there were around **18 million passengers** in 2009. In this total, all services include minibuses, private shuttles as well as the two big private operators SLOBODA PREVOZ and the smaller association MAK EXPRESS, which has an agreement to share services with SLOBODA on most of its lines.

6.2.8. Passenger Demand per Line

There has been a profound analysis undertaken, in order to calculate the daily passenger number on all bus lines in the Skope area. As there is no current count data available, nor for JSP nor for private lines, following approach has been taken to be able to conclude the flows along the bus network on an average working day of 2009:

1. Gathering all available data as a starting point:
    - o global bus passenger demand for all operators
    - o results of household survey in relation to line use
    - o last global counts on all lines, taken from Masterplan 1998 and JSP study ELABORAT in 2003
    - o last count data for lines JSP 2 and 5 (November 2009)
2. Contact operators to identify an approximate ranking starting with the busiest lines and stops
3. Analyse timetable to see frequency and service patterns, such as service concentration in peak hour or number of fleet of articulated vehicles
4. Analyse demand split of ELOBORAT done in 2003 and cross-check with service patterns and latest traffic counts, both from 2009
5. Adjust with household survey data, whereby minibus use and other regional operators needed to be subtracted and global demand to be considered as a threshold.
    a. Other private lines and minibus services were mainly found in in Saraj, Cair and Karpos (see transport zones S3, S4, also C1, C10, C4, K3 in model description)
    b. Regional and minibus flows have not been included in the model as their numbers are fairly low. It has been assumed that 5419 passengers use these minibus services and 2533 passengers can be found on regional buses within the Skopje area.

The three networks which will be included in the overall Skopje model are summarised below. The busiest JSP urban line is the important east-west-link-line 5 connecting Novo Lisice- Deksion, whereas the busiest private line Nº 22 to Volkovo counts only with half of its patronage. The passenger numbers on suburban lines are in general lower, headed by the Line 67 to Zelenikovo.

TABLE 28, PASSENGERS ON JSP URBAN LINES (AVERAGE WORK DAY 2009), SOURCE: IDOM

Ranking	Line Number	Pax
		On board
1	5	13,051
2	57	12,235
3	2	11,008
4	41	8,528
5	50	7,107
6	22	7,313
7	65V	6,756
8	24	5,287
9	19	5,549
10	9	5,012
11	7	4,333
12	3	4,096
13	15	3,836
14	4	3,429
15	16	2,962
16	7A	2,313
17	8	2,218
18	35	1,996
19	21	1,419
20	13	1,378
21	7B	1309
22	2A	442
23	17A	989
24	59	689
25	3B	442
26	22A	442
27	3A	442
28	12	442
29	26	442
30	59A	*)
31	59B	*)

TABLE 29, PASSENGERS ON JSP SUBURBAN (AVERAGE WORK DAY 2009), SOURCE: IDOM

Ranking	Line Number	Terminal	Direction	Pax
				On board
1	67	Zelenikovo	southeast	4,306
2	63B	Mralino	east	3,178
3	31	Dolno Lisice	southeast	2,563
4	60	Matka	west	2,461
5	61	Pobozje	north	2,256
6	53	Katlanovo	southeast	2,051
7	55	Aracinovo	south	1,948
8	58	Brsovec	east	1,948
9	52	Rzanicino	east	1,846
10	66	Bucinci	southeast	1,846
11	56	Bojane	south	1,640
12	70	Batinci	west	1,538
13	47	Ljubanci	north	1,435
14	68	Vince	east	1,435
15	18	Vizbegovo	southeast	1,333
16	51	Studenicani	north	1,333
17	11	Rasce	north	1,230
18	65	Rastak	north	1,230
19	71	Banjane	east	1,230
20	74	Preslap (Crvena Voda)	west	1,128
21	66B	Deljadrovci	southeast	1,128
22	62	Ognjanci	north	1,025
23	81	Blace (border Kosovo)	southeast	1,025
24	32	Ljubin	east	923
25	58A	Sveta Petka	south	923
26	63A	Ajvatovci	west	923
27	47A	Ljuboten	north	820
28	51ª	Dracevo	south	820
29	56A	Kopanica	north	820
30	65A	Stracinci	west	820
31	80A	Cvetovo	east	820
32	55A	Brnjarci	south	718
33	58B	Jabolci	southeast	615
34	64A	Nikistane	west	513
35	10	Skopsko Polje	southeast	410
36	54	Idrizovo	southeast	410
37	69	Divlje	east	308
38	63	Marino	southeast	205
39	64	Kuckovo	north	51
40	65B	Smiljokovci	north	51
41	65G	Vinice	west	51

TABLE 30, PASSENGERS PRIVATE LINE (AVERAGE WORK DAY 2009), SOURCE: IDOM

Ranking	Line Number	Pax
		On board
1	22	6,443
2	23	6,151
3	52	5,916
4	12	5,858
5	9	5,565
6	61	5,272
7	19	4,979
8	63	4,276
9	45	4,159
10	73	3,807
11	55	2,636
12	20	2,050
13	54	1,464

The Consultant is aware that all data above are estimates based on a wide range of detailed assumptions although they could not be based on real traffic counts, except for those undertaken by JSP for urban bus lines 2 and 5.

According to JSP information, busiest stops and main interchanges in the centre are listed and marked in the maps below:

- Central area:
    - Transporten Centar – 64,000 passenger movements a day (alightings + boardings, i.e. passengers getting off and on the buses)
    - Rekord (key interchange) – 28,000 passenger movements a day
    - Komplex Bank – 20,000 passenger movements a day
    - Partizanski Odredi near St Kliment (key interchange)

- North to central area:
    - Bit Basar (key interchange) – 52,000 passenger movements a day
    - Others: Cair, Kino Butel, Basar Butel
- East to central area: Biser, Bisera, Avtokomanda
- West to central area: Construction Faculty Partizanski Odredi, Faculties Karpos 3,
- South to central area: Clinic

IMAGE 21, BUSIEST BUS STOPS, SOURCE: IDOM (VISUM)

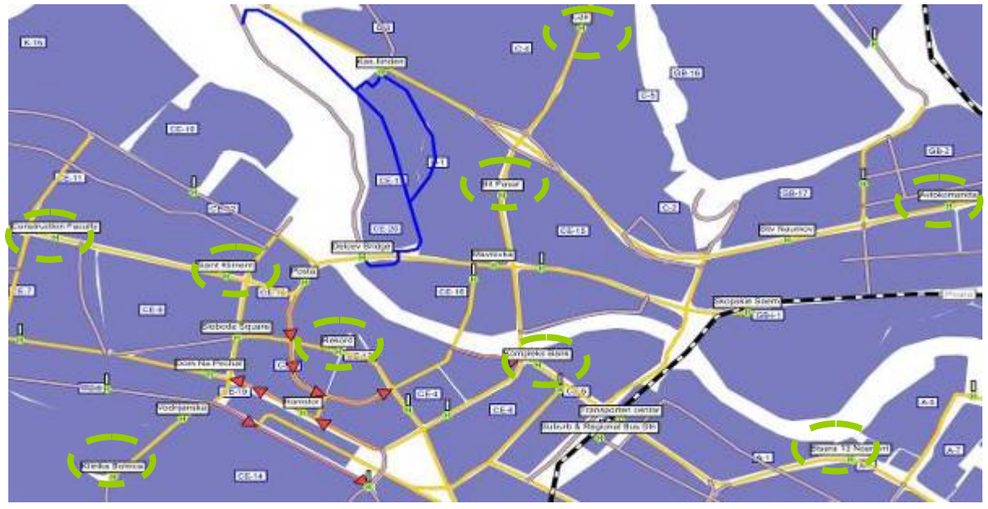
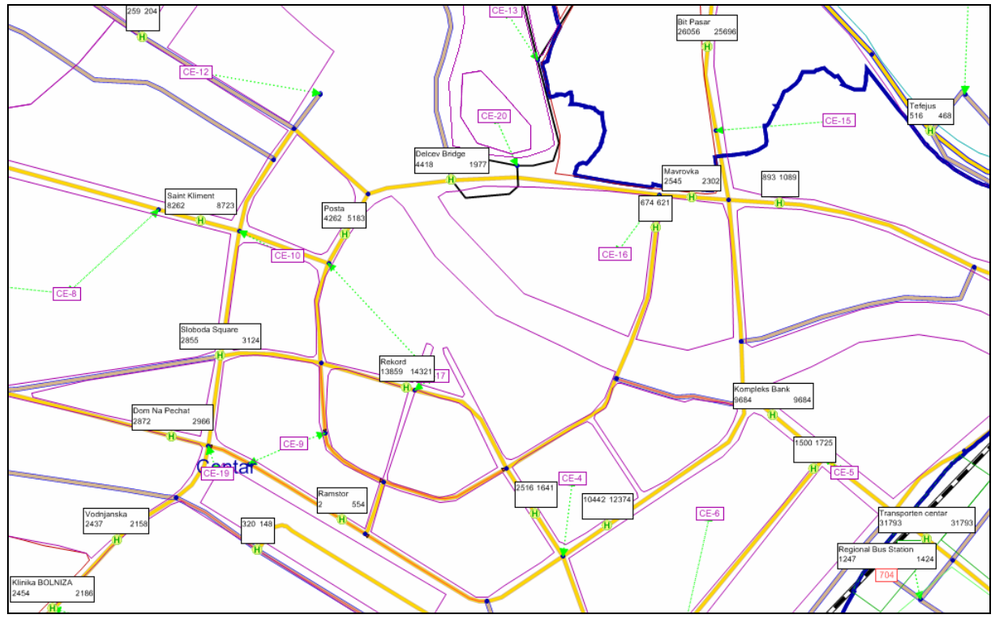


IMAGE 22, PRINT SCREEN OF MODEL BASE YEAR SCENARIO 2009, SOURCE: IDOM (VISUM)



Note to labels: Under stop names are listed the total of alightings and boardings at CENTAR stops (2009)

7. TRANSPORT MODEL

7.1. MODEL STRUCTURE

The model has been prepared by using following methodology:

1. Load the latest cartographical data in the VISUM model. The most detailed mapping was received by the Ministry of Transport divided by Municipality.
2. Draw macro-zoning in the Model. This step is required prior to the definition of the more specific "traffic zones".
3. Define Zoning by determining all traffic zones for each of the 10 Municipalities. Each one shall have its own characteristics and land-use, e.g. zones with mainly industrial use or high concentration of employment remain without residential areas. Their coding indicates in which Macro-zone they are located, i.e. CE 17 – Macedonia Square is the 17th zone of CENTAR. There are a total of 133 internal zones and furthermore 7 external traffic zones, outside the 10 Municipalities.
4. Draw model network, both for public and private transport via nodes and links in VISUM. The light rail and train lines are defined as separate links. As bus lines share the road space with private vehicles, there is no separate bus link network installed. In order to be able to load the network with traffic, connectors between the zones and nodes for all 140 traffic zones need to be installed. They are usually at the exit of car parks or at interchanges or important access roads. There are three networks in total, one for the base year 2009 and two for the future networks in 2015 and 2030.
5. Check network paths. This needs to be done to check if the network has been configured closely to the real base year flows. First of all, desired lines between all traffic zone pairs give an idea about the relation of each zone with other parts of the network. The City Centre of Skopje is the area which attracts the highest number of trips. As already explained previously, the highest cross-city flows occur between Karpos – Centar – Aerodrom. This "main axis of mobility" is also been reflected in the structure of the road network, as the main boulevards follow also this east west corridor, south of the River Vardar. Another important tool regarding good network performance is the shortest path analysis.
6. Matrix assignment and network calibration. After finishing the link adjustments, the traffic can be loaded onto the network. This has been done by two types of trip matrices, which were calculated summarising data from counts and surveys. These matrices were expanded to 2015 and 2030 and also loaded onto the future networks. The model gives a wide range of tools in order to calibrate the assignment to the closest level at reality. There are different types of assignments, as well as different types of volume delay functions for each link type.

The following 7 maps demonstrate these steps in the development of the traffic model for Greater Skopje:

- Cartography – model background of Centar with complete road network and building structure
- Greater Skopje with its 10 Municipalities – each Municipality will equal one macro-zone
- Zoning (133 internal and 7 external zones)
- Links, nodes and zone connectors
- Desired lines zones, as a basic network check, highlighting the importance of the City Centre. These results are illustrative and show how Skopje has an ideal structure for the implementation of mass rapid transit system. **A corridor east-west should be reinforced by public transport**
- PrT Assignment
- PuT Assignment

Insert 7 maps (6a_Maps_Model_Structure .pdf)

1

IMAGE 23, CARTOGRAPHY – MODEL BACKGROUND OF CENTAR, SOURCE: IDOM

2

IMAGE 24, GREATER SKOPJE WITH ITS 10 MUNICIPALITIES – EACH MUNICIPALITY WILL EQUAL ONE MACRO-ZONE, SOURCE: IDOM

3

IMAGE 25, ZONING (133 INTERNAL AND 7 EXTERNAL ZONES), SOURCE: IDOM

4

IMAGE 26, LINKS, NODES AND ZONE CONNECTORS, SOURCE: IDOM

5

IMAGE 27, DESIRED LINES ZONES, SOURCE: IDOM

6

IMAGE 28, ASSIGNMENT OF PRIVATE TRANSPORT MATRIX, SOURCE: IDOM

7

IMAGE 29, ASSIGNMENT OF PUBLIC TRANSPORT MATRIX, SOURCE: IDOM

7.2. DEMAND MODEL ASSUMPTIONS AND VALIDATION DATA

The objective of the model calibration was to reflect as close as possible real life data in the macro-simulation VISUM model. For this reason, a long and time-consuming process of model adjustment and calibration was invested. Some of the obtained results are put against real life data in the comparison table below.

TABLE 31, SOME MODEL CALIBRATION CRITERIA FOR BASE YEAR, SOURCE: IDOM

	Real data - SKOPJE 2009 FIELD WORK	Model data - VISUM BASE 2009
PUBLIC TRANSPORT		
TOTAL TRIP NUMBER	261,072	259,178
MEANJOURNEYTIMEPUT	46 min	34 min
AVERAGE NUMBER OF TRANSFER BETWEEN BUS LINES	1,417	1,465
PRIVATE TRANSPORT		
Total vehicle flow one way at REKORD in CENTAR (Dimitrie Cupovski)	19.817	18.678
Total vehicle flow one way at HAMAM BRIDGE in CENTAR (Boulevar Goce Delcev)	23.534	24.876

Following model assumptions have been applied for all scenarios:

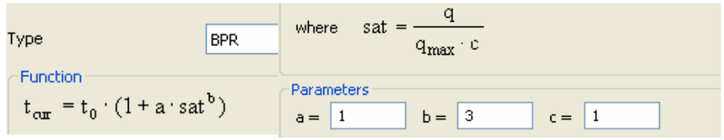
Demand Segments:

- Private: Car, Truck
- Public: Bus, Light Rail, PUT Walk
- Capacities of public transport vehicles:
    - articulated bus "ARTBUS": 150 PAX (45 seats). Source: JSP
    - regular bus "REGBUS": 100 PAX (30 seats). Source: JSP
    - light rail car 40 metres: 224 PAX (96 seats). Source: ALSTOM

Network assumptions:

- types of highways and railways: motorways, access ramps, city boulevards, Blvd Boulevard Alexander of Macedonia (Ex Blvd Yugoslavia), primary and road, walking links, railway, light rail
- the initial capacity of highways in the model prior to assignation depends on the number of lanes, which varies between 1000 and 2000 vehicles/ hour
- maximum speed per highway type between 40 km/h (secondary road) and 130 km/h (motorway)
- volume – delay – function for private transport: BPR where A=1, B=3, C=1

GRAPHIC 32, TYPE OF VDF CHOSEN FOR SKOPJE, SOURCE: VISUM



Bus and light rail service assumptions:

- Used bus stops, frequencies and vehicle capacities in base year scenario (2009), as obtained through site visits and by stakeholders
- Scenario 2009: Service periods of the Model have been taken from the fractions of JSP timetables:

TABLE 32, SERVICE PERIODS JSP LINES, SOURCE: IDOM

5:00 - 6:00	6:00 - 8:00 AM PEAK	8:00 - 13:00	13:00 - 16:00
16:00 - 18:00 PM PEAK	18:00 - 20:00	20:00 - 22:00	22:00 - 23:00

- Details for future light rail and bus frequencies and stop locations, please see "6.4.2. Bus and Light Rail Services in 2015 and 2030"
- Scenario 2009: Daily bus passengers at base year have been adjusted, using data of "5.2.8. Passenger Demand per Line" and in line with observed use per bus stops and count data of JSP
- Scenario 2009: Total number of services and those per daily period are the same as in real life

TABLE 33, VISUM TIMETABLE EDITOR L-50 WEST – EAST, ARTICULATED ONLY, SOURCE: IDOM

Headway start	05:02:00	06:00:00	08:00:00	13:00:00	16:00:00
HeadwayEnd	05:02:00	07:45:00	12:56:00	15:41:00	18:00:00
Headway time		21min	37min	23min	30min
Number of vehicle journeys	1	6	9	8	5
Number	4190	*	*	*	*
Name					
Line	L-50	L-50	L-50	L-50	L-50
Direction	»	»	»	»	»
Line route	50 ART W- E	50 ART W- E	50 ART W- E	50 ART W- E	50 ART W- E
Time profile	1	1	1	1	1
Operator					
Service Trip Pattern Number	0	0	0	0	0
Veh. journey sections	1	1	1	1	1
Start stop point	588 O.U. Koco Razin	588 O.U. Koco Razin	588 O.U. Koco Razin	588 O.U. Koco Razin	588 O.U. Koco Razin
End stop point	631 Hipodrom L-50	631 Hipodrom L-50	631 Hipodrom L-50	631 Hipodrom L-50	631 Hipodrom L-50
Departure	05:02:00	*	*	*	*
Arrival	05:14:22	*	*	*	*
Coupled	0	0	0	0	0
Vehicle combination	2 ARTBUS	2 ARTBUS	2 ARTBUS	2 ARTBUS	2 ARTBUS
ValidDay	1 daily	1 daily	1 daily	1 daily	1 daily

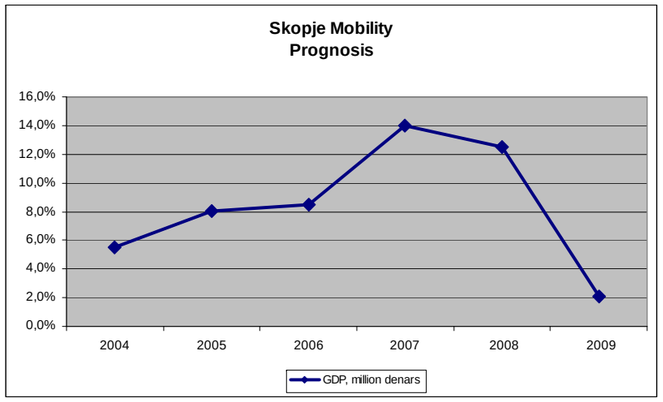
7.3. MODEL SCENARIOS FOR 2015 AND 2030

7.3.1. Prognosis

The last ten years in Macedonia has been a period of important economic growth but with a general affection of general crisis like in the rest of Europe.

The Gross Domestic Product (GDP) had an important growth in 2006-2008 with rates over the 12%.

GRAPHIC 33, SKOPJE MOBILITY FORECAST, SOURCE: IDOM

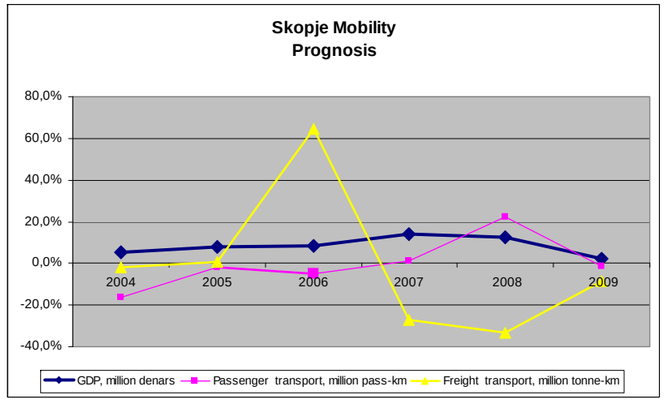


Analyzing the transport parameters in the road and rail system, or even with the urban transport, there is no significant correlation with the main Economic figures.

TABLE 34, DATA EVOLUTION OF GDP, PASSENGER AND FREIGHT TRANSPORT, SOURCE: IDOM

	2003	2004	2005	2006	2007	2008	2009
GDP, million denars	251,49	265,26	286,62	310,92	354,32	398,49	406,65
Passenger transport, million pass-km	1,44	1,20	1,18	1,12	1,14	1,39	1,37
Freight transport, million tonne-km	4,50	4,43	4,46	7,35	5,34	3,56	3,25

GRAPHIC 34, GDP, PASSENGER AND FREIGHT TRANSPORT 2004 - 2009, SOURCE: IDOM



For that reason, a fix annual rate of 1% is been used on the projection of Mobility in the period 2010-2015 and 2016-2030.

7.3.2. Network Changes for All Scenarios

The road network in 2015 and 2030 has been adjusted in agreement with the Mayor and the responsible traffic department of the City Council. Following highway infrastructures - all part of the General Urban Plan GUP 2020 - have been added or modified:

SCENARIO 2015:

- New scheme to relieve congestion in Avtokomanda: link from M. Andanov - Cento to Blvd Vojvodina via new rail underpass
- New peripheral Blvd Croatia (outer ring northeast 2+2) between Blvd Bosnia and Vojvodina via Butel – Zelesara – Avtokomanda
- Two underground city links added: A North South Link via Kliment Ohridski/ Kale and an East West Link via Macedonia Square
- Blvd Serbia in Naselba Lisice to 3+3 lanes (one side finished already)
- Blvd 11 Octomvri and Prvmosaska in Kisela Voda/ Pintija from 1+1 to 2+2 lanes
- Widening of Makedonska Vojska to 2+2 lanes in Gorce Petrov
- Widening of Blvd Bosnia in Butel from 1+1 to 2+2 lanes
- Karpos – Centar: widening of Blvd Ilinden from 1+1 to 2+2 lanes
- Widening of Blvd Makonska Brigada in Aerodrom from 1+1 to 2+2 lanes

- Prvmosaska – Pripor: outer ring southeast 2+2
- Goce Delcev Extension with Blvd Asnom (Aerodrom): new river crossing 2+2
- Blvd Todorovski Extension in Butel to motorway 2+2 (starting at Blvd Bosnia)

"SCENARIO 2030 GUP":

- South Blvd: M4 Junction Saraj – Gologanov- Kisela Voda, 3+3 lanes
- North Blvd: connection Blvd Slovenia – Gorce Petrov - M4 Junction Saraj, 2+2
- Cento – Madzari – Nove Lisice: new river crossing 2+2
- Zelesara – Goce Delcev Extension (before projected new bridge): 2+2
- Karpos – Volkovo: Extension Blvd Ilinden to motorway with new river crossing

This scenario includes the foreseen projects by the City Council in accordance with the GUP.

However, the Consultant proposes two more Scenarios in order to contrast the foreseen infrastructures by the Mayor with an alternative development of Skopje:

"DO NOTHING SCENARIO 2030"

This scenario will maintain the highway and bus network of the base year 2009, whereby the number of trips will grow as also applied to the other 2030 scenarios. Like this, capacity constraints such as bottlenecks in the centre or at mayor junctions can be identified.

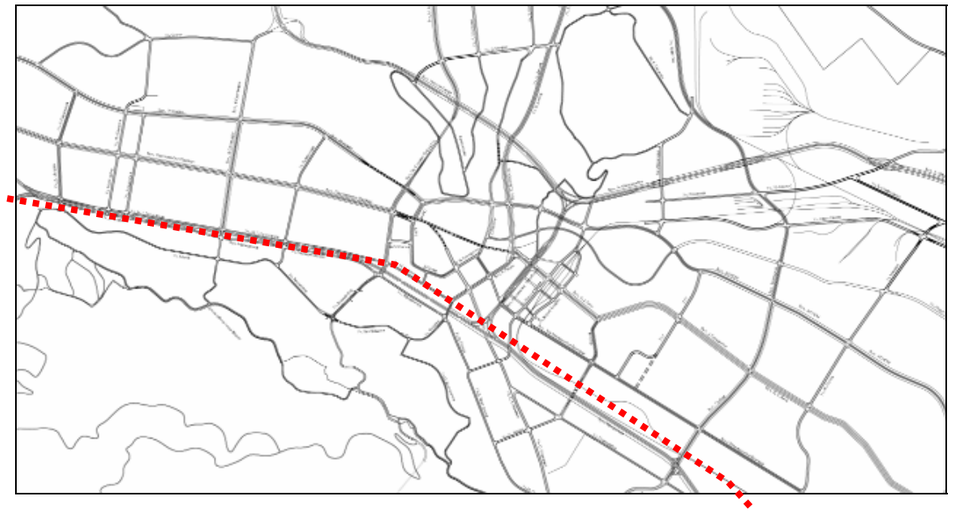
All bus routes remain the same as in the base year scenario, the light rail network has not been included either.

"SCENARIO 2030 PLUS"

The aim of this scenario is a more sustainable mobility in Skopje, extending the light rail network further and traffic calming the centre (por instance also Cupovski Street). Further differences to the "SCENARIO 2030 GUP" are listed below:

1. In order to guarantee a quality public transport for all 10 municipalities and to ensure more equality and accessibility for all citizens alike, the light rail as the new rapid mass transit system should be extended to the municipalities of Saraj and Suto Orizari also:
   - T2 with a farther north terminal near the market of Suto Orizari
   - T1 with a farther west terminal at Saraj Village
2. Another measure to reduce social inequality between several social groups in the city will affect the area of Cento in Gazi Baba which has currently a high capture of bus passengers. Therefore, it should be considered to extend Line T3 from Agroservice to the Centre of the village of Cento. This new branch has also been included in "2030 PLUS"
   - These three light rail extensions require further adjustments of the bus network compared to "2030 GUP", which are listed in the Chapter 6.5.2 (Results)
3. Some of the projected road infrastructures of the GUP could not justified by the modelling exercise of IDOM. For this reason they have been taken out in "2030 PLUS":
   - 2030 – Macedonia Boulevard ("South Blvd"), marked in image below as a rather disturbing and environmentally damaging new highway through the southern central areas as well as the heart of the City. It has been shown that any additional east west cross city flows are well absorbed by the new northern ring boulevards (Montenegro, Slovenia, etc.) and the upgraded Ilinden Blvd. Apart from this there will be still in function the other two main axes: Partizanski Odredi and Metropolit Gologanov.

IMAGE 30, ROADS IN GUP - RED MARKING: NEW MACEDONIA BLVD, SOURCE: GUP 2020

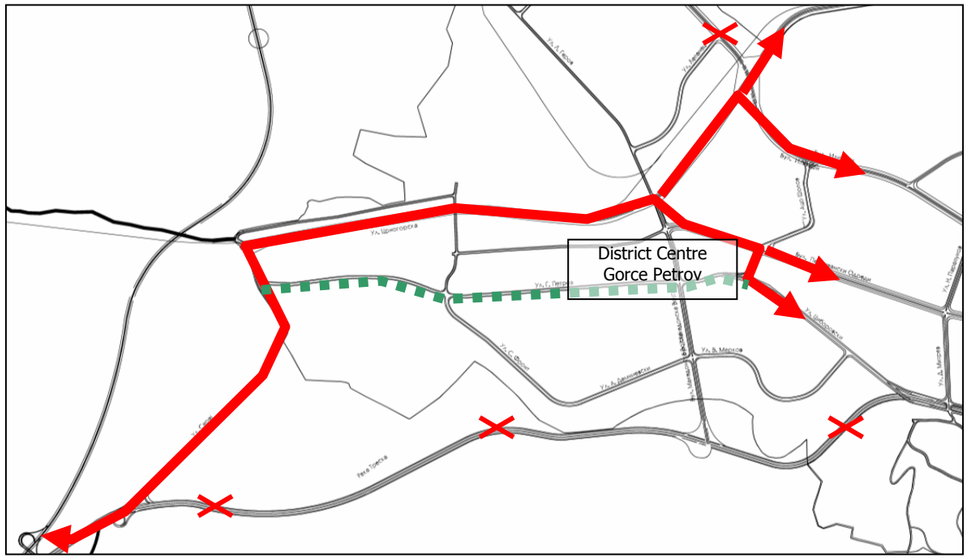


   - 2015 and 2030 - Outer Ring Southeast in Kisela Voda between Prvmosaska – Pripor. As beyond Pripor there are rather low vehicle flows towards rural areas, no dual carriageway (2+2) can be justified in this area of the City. It would be a more worthwhile investment to improve the urban connections of Kisela Voda towards Centar, where most of the trips go, such as Dimo Hadji Dimov and Hristo Tatarcev
   - 2030 – Dual Carriageway between Junction Gorce Centre/ Blvd Montenegro Volkovo, which was planned as an xtension of Blvd Ilinden to motorway with new river crossing.

This highway would not be necessary either as traffic to/ from or through Volkovo/ Novo Selo/ Dame Gruev could alternatively use the Macedonia Boulevard and the ring motorway M3/ M4 which run on the other side of these by-passed neighbourhoods

4. Nevertheless, some network changes need to be undertaken, despite of the fact that they have not been considered in the scenario 2030 GUP. This includes the following:
    - Widening of Saraj Bridge, due to the population growth in this Municipality which counts only on this bridge link to enter the inner urban areas of Skopje
    - Closure of Cupovski Street except for LIGHT RAIL and PEDESTRIANS
    - Traffic-Calm and revitalise Gorce Petrov Blvd whereby through traffic will be divert onto new Montenegro Blvd which will function as a by-pass for this Local Municipality

IMAGE 31, BY-PASS-PROPOSAL FOR GORCE PETROV, SOURCE: GUP 2020



NOTE: proposal includes some modifications of the GUP (i.e. traffic calming of the main boulevard – see green dotted line, abolition of new highway proposals at Volkovo and Blvd Macedonia, see crosses)

Mapa 2015

IMAGE 32, NEW INFRASTRUCTURES FOR SCENARIO 2015, SOURCE: IDOM

Asig2015

IMAGE 33, MODEL ASSIGNMENT OF SCENARIO 2015, SOURCE: IDOM

Mapa 2030

IMAGE 34, NEW INFRASTRUCTURES FOR SCENARIO 2030, SOURCE: IDOM

Asig 2030

IMAGE 35, MODEL ASSIGNMENT OF SCENARIO 2030, SOURCE: IDOM

7.3.3. Flows forecast for major inner city junctions

The flows shown in this chapter correspond to the Scenario 2030 GUP, i.e. the foreseen projects by the City Council in accordance with the GUP.

An analysis of road capacity for the main junctions in the centre in the future has been undertaken, in order to determine the required number of lanes. The farthest model scenario of the year 2030 has been taken as a reference. A total of seven major junctions have been selected for this exercise:

1) Cathedral Junction (Synodal Church)
2) Junction Partisanski Odrdedi/ Inner City Ring Blvd
3) General Post Office Junction (with tunnel end of new east west link)
4) Kompleks Banki Junction
5) Mavrovka Junction
6) Junction at Blvd Ilinden/ Kliment Ohridski
7) "Kale North" Nikola Karev/ new North South Link

The capacity at the all junctions has been calculated by using following methodology:

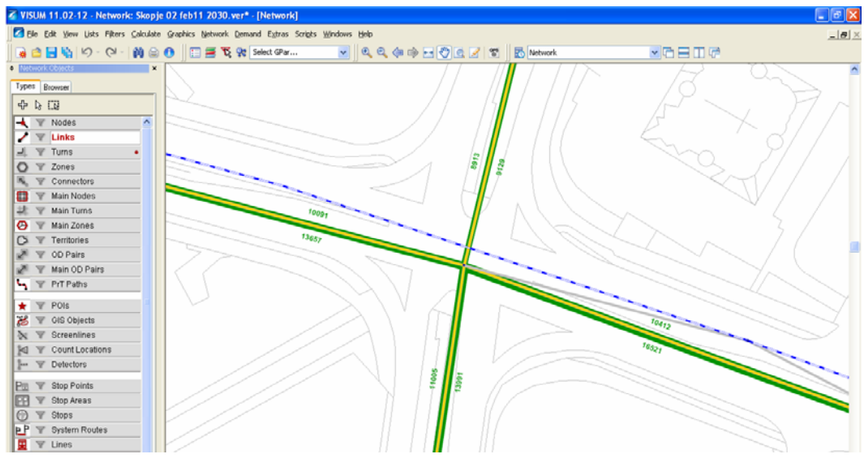
1. Extract the flows at the junction for 2030 as the year with the highest traffic volumes
2. Select the access road with the higher flow (Partizanski: west side, St Kliment: south side)
3. Assume equal flows in each direction ("one way")
4. Break down average flow per lane (3 lanes at Partizanski, and one less at St Kliment)
5. Junction Macedonia- Kosovska Brigada/ Nikola Karev

Nevertheless, it needs to be highlighted that all proposals regarding traffic lights cycles are if preliminary nature as the VISUM model is a macro-simulation model and does not cater for the possibility of micro-simulating an optimal traffic management at junctions or low-scale city centre areas.

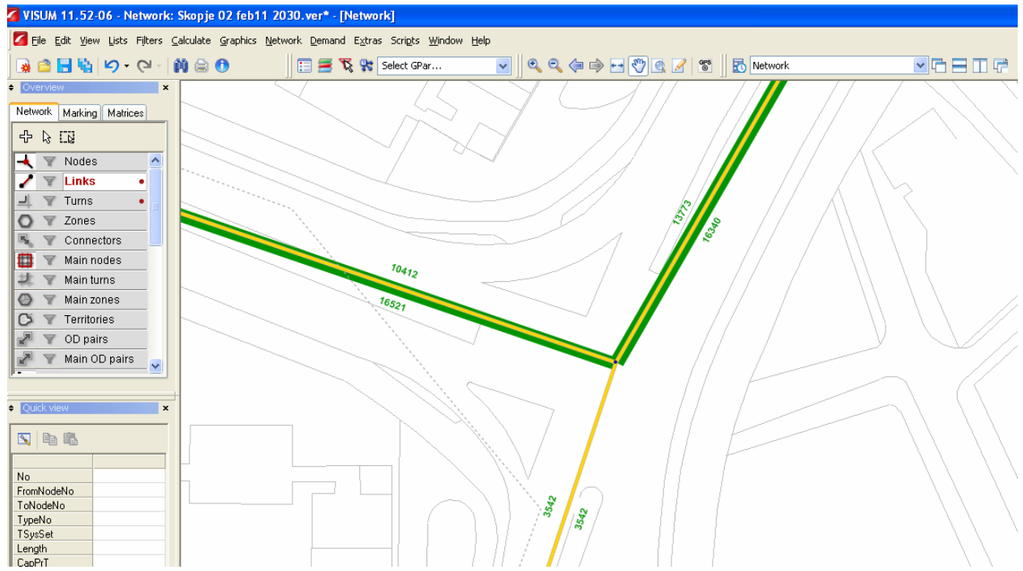
VISUM model outputs of the city centre and for each of the seven major junctions can be studied on the next images:

GRAPHIC 35, SEVEN MAJOR JUNCTIONS TO BE ANALYSED, SOURCE: IDOM

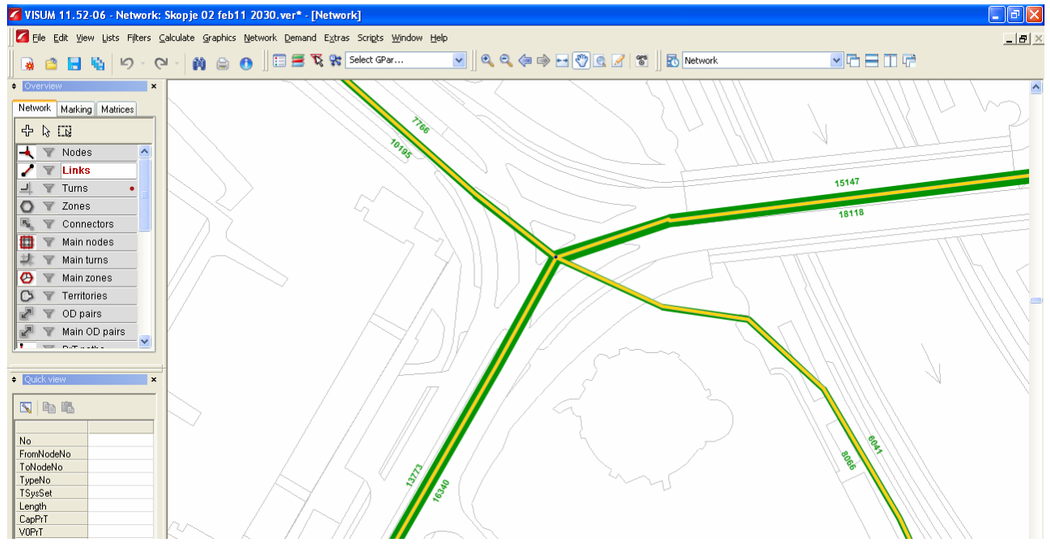
GRAPHIC 36, CATHEDRAL JUNCTION (SYNODAL CHURCH), SOURCE: IDOM



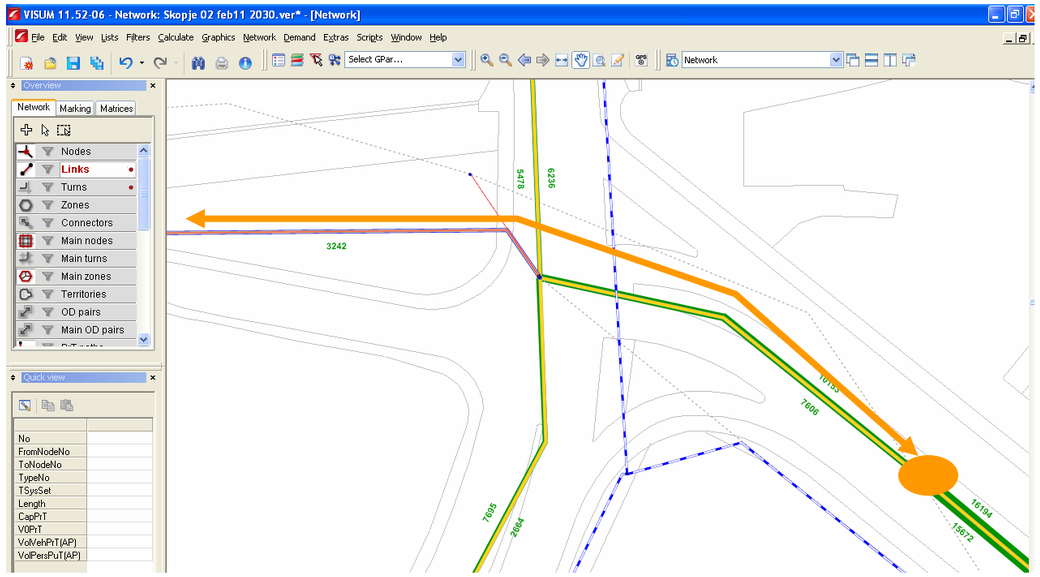
GRAPHIC 37, JUNCTION PARTISANSKI ODRDEDI/ INNER CITY RING BLVD, SOURCE: IDOM



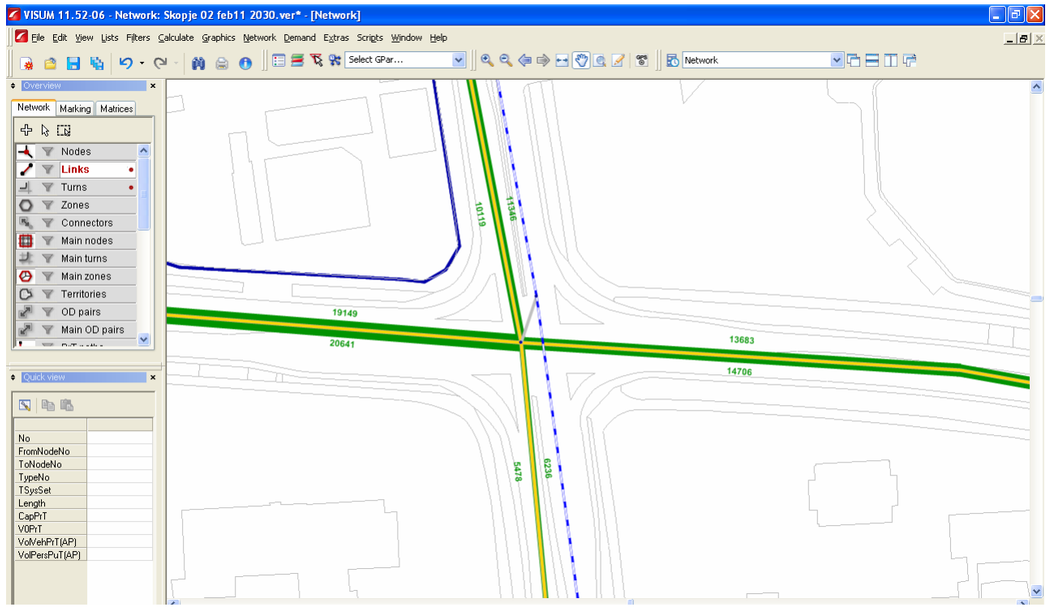
GRAPHIC 38, GENERAL POST OFFICE JUNCTION (WITH TUNNEL END OF NEW EAST WEST LINK), SOURCE: IDOM



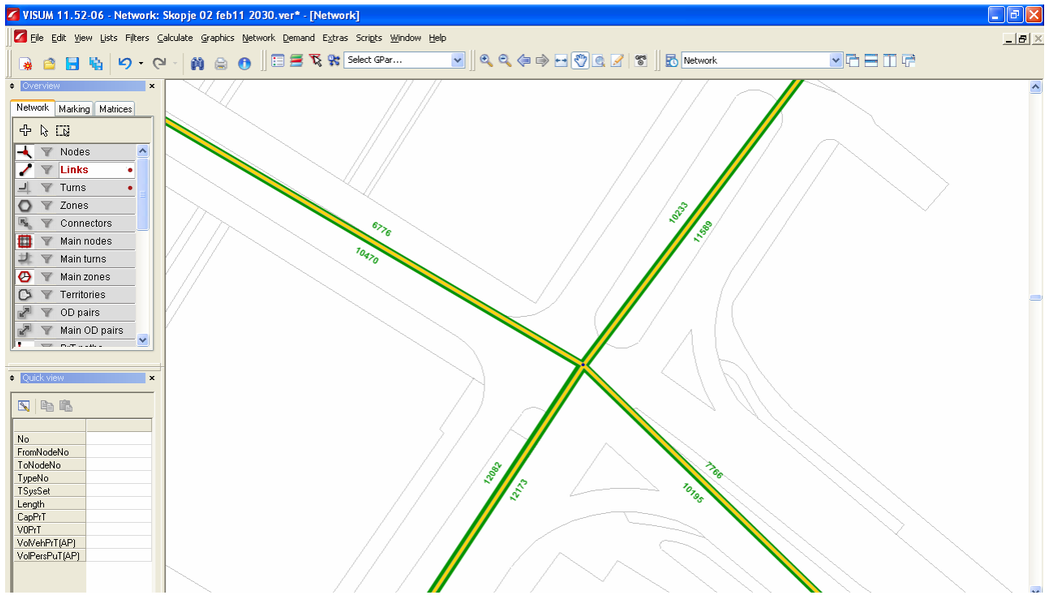
GRAPHIC 39, KOMPLEKS BANKI JUNCTION (ONLY AT GRADE, MARKINGS: TUNNEL END OF NEW EAST WEST LINK), SOURCE: IDOM



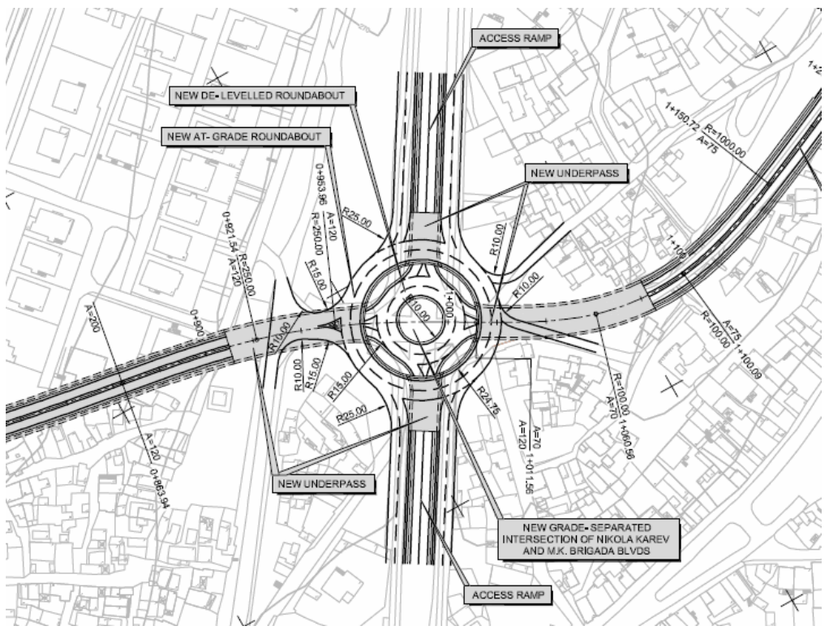
GRAPHIC 40, MAVROVKA JUNCTION, SOURCE: IDOM



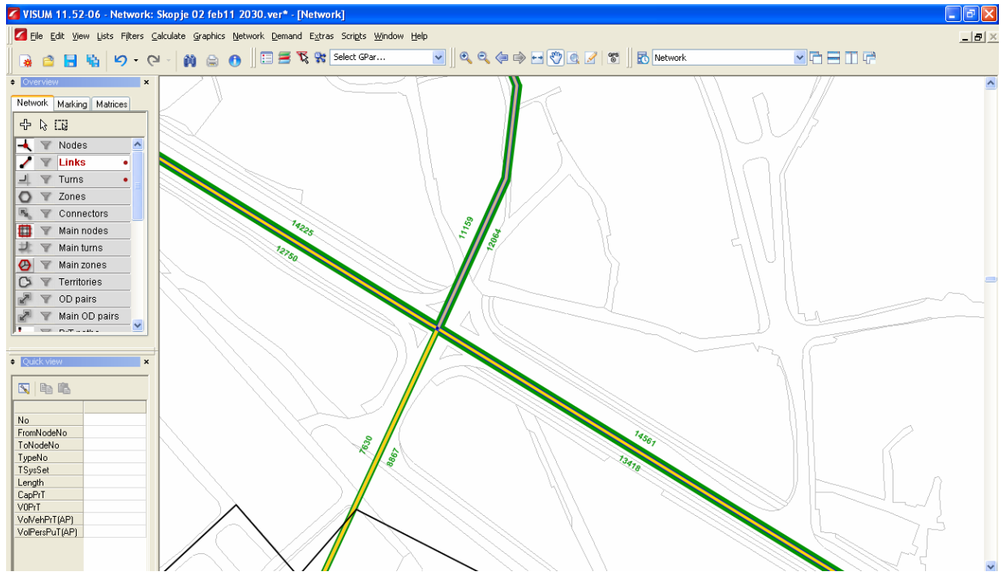
GRAPHIC 41, JUNCTION AT BLVD ILINDEN/ KLIMENT OHRIDSKI, SOURCE: IDOM



GRAPHIC 42, JUNCTION MACEDONIA- KOSOVSKA BRIGADA/ NIKOLA KAREV (PRELIM DESIGN), SOURCE: IDOM



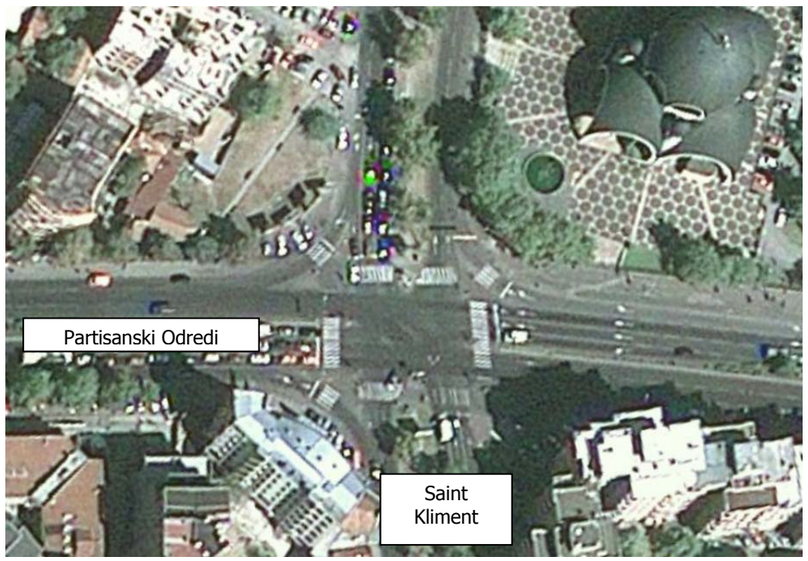
GRAPHIC 43, MODEL OUTPUT FOR JUNCTION MACEDONIA- KOSOVSKA BRIGADA/ NIKOLA KAREV, SOURCE: IDOM



7.3.4. Lane and Turning Characteristics at The Cathedral Junction

The first junction to be analysed is that where traffic flows of both links join: the crossroads at the Cathedral.

IMAGE 36, AERIAL PHOTO OF CATHEDRAL JUNCTION, SOURCE: IDOM



The image does not show the approved widening of Saint Kliment to three lanes per direction which has already been contemplated in IDOM's calculation (see below). Using the preferred design of the two identified new city link, i.e. with tunnel ramps at the Post and at the northern end of Kliment Ohridski, following flows have been obtained:

TABLE 35, Scenario with ramps infront of Post and NS link, Source: IDOM

Scenario with ramps infront of Post and NS link	both ways	one way	one lane
Partisanski Odredi (3 lanes/ direction)	26.933	13.467	4.489
Kliment Ohrdiski (3 lanes/ direction)	24.996	12.498	4.166

Flows at the southern side of Saint Kliment are equal in both scenarios. Only flows at Partisanksi are different. Using international practice capacity assumptions, flows across junctions is determined by the time period required by each vehicle:

Time period per car (reaction time + start-up):	1.8 sec

This period would give an overall free flow capacity of a single urban lane of 2000 veh/ hour. However, as already explained, due to the traffic lights in place there will not be free flow conditions, hence a traffic light cycle has been defined over a length of one minute (60 sec.)

The peak hour will be used as it is the heaviest assumed hourly load during an average 24 hour working day. Due to the equal distribution, one proposes an equal and simplified traffic light cycle as follows:

TABLE 36, Traffic lights cycle at 1ST JUNCTION, Source: IDOM

Traffic Lights Cycle (in second)	**green:**	amber:	red	amber:	cycle
Partisanski Odredi (3 lanes/ direction)	**29**	3	25	3	60
	red:	amber:	**green:**	amber:	
Kliment Ohrdiski (3 lanes/ direction)	29	3	**25**	3	60

The modelled number of lanes was taken from the design proposal, already submitted to the Client. In order to determine the lane capacity, one needs to multiply the number of seconds by the time period per car which gives therefore following results.

TABLE 37, Capacity 1ST JUNCTION, Source: IDOM

	Capacity per h/ lane/ dir	Capacity per h Blvd per dir
Partisanski Odredi (3 lanes/ direction)	**967**	2.900
Kliment Ohrdiski (3 lanes/ direction)	**833**	2.500

The capacity check against the flows of the two options gives the following results:

TABLE 38, Capacity versus Flow 1ST JUNCTION, Source: IDOM

Capacity check	VISUM assignment		Capacity versus Flow
	vehicles/ day	vehicles/ peak hour	
Partisanski Odredi	4.489	449	**Proposed 3-lane set up is sufficient**
Kliment Ohrdiski	4.165	417	**Proposed 3-lane set up is sufficient**

Applying the flows of the two options to these conditions, one can resume that the proposed cycle will guarantee a good operation of the junction at any hour of the day. No under- or overground by-passes will be required at this crossroad.

In terms of turning movements following total traffic loads will cross the junction on an average working day in the year 2030:

TABLE 39, Turning movements at 1ST JUNCTION, Source: IDOM

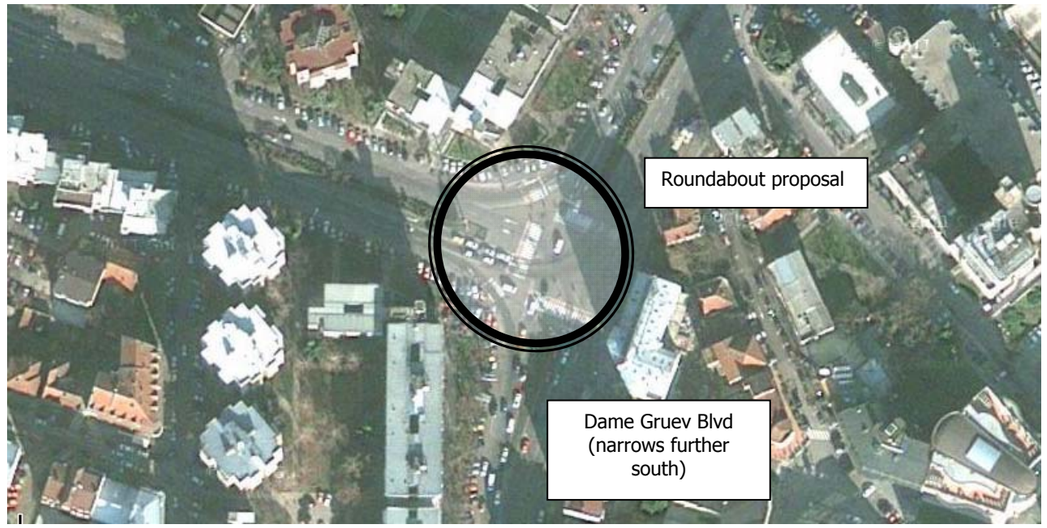
Origin of traffic (direction of road section)	W	W	W	S	S	S	E	E
Destination of traffic (direction of road section)	S	E	N	E	N	W	W	S
Total Daily Flow	**523**	**9.877**	**2.244**	**5.832**	**6.411**	**875**	**6.810**	**3.023**

7.3.5. Lane and Turning Characteristics at the Junction Of P. Odrdedi/ Inner City Ring Blvd

The second junction of the 2030 capacity analysis is the commencement of Partisanski Odredi Blvd at the inner city ring with Dame Gruev and VMRO Blvd. In order to optimise traffic flows and avoid congestion, a signal- controlled roundabout will be built.

Dame Gruev Blvd narrows from a three plus three lane boulevard arrangement to a two plus one set-up (which is not shown on the ortho photo).

IMAGE 37, AERIAL PHOTO OF 2ND JUNCTION, SOURCE: IDOM



The AM peak hour flow at this new roundabout junction will be in 2030 per lane as following table shows. For contingency reasons, capacity at Dame Gruev has been calculated with one lane as the road narrows significantly at its southern end where it will finally convert into a one way arrangement.

TABLE 40, Traffic lights cycle and capacity at 2nd JUNCTION, Source: IDOM

	Lights Cycle					Capacity per h/ lane	Lane flow/ peak h	Capacity vs Flow
	green:	amber:	red	amber:	cycle (sec)			
Partisanski Odredi Blvd (3 lanes/ direction)	**31**	3	23	3	60	**1.033**	449	**sufficient**
Blvd VMRO (3 lanes/ direction)	**31**	3	23	3	60	**1.033**	502	**sufficient**
Dame Gruev (1 lane/ direction)	31	3	**23**	3	60	**767**	354	**sufficient**

Turning movements of all access roads to the new round about on an average working day will be in the year 2030:

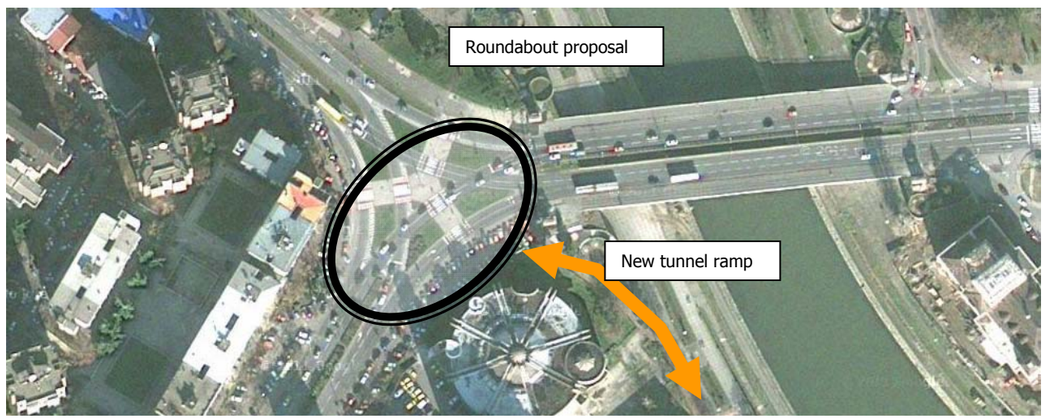
TABLE 41, Turning movements at 2nd JUNCTION, Source: IDOM

Origin of traffic (direction of road section)	N	N	W	W	S
Destination of traffic (direction of road section)	W	S	S	N	N
Total Daily Flow	**10.412**	**3.361**	**181**	**16.340**	**3.361**

7.3.6. Lane and Turning Characteristics at The General Post Junction

The third junction to be analysed is the General Post Office junction where the tunnel ramps of the new east west tunnel will join the city centre network. In order to optimise traffic flows and avoid congestion, a signal-controlled roundabout will be built, whereby two signal groups will be proposed (east/ west access approaches and south/ north approaches).

IMAGE 38, AERIAL PHOTO OF 3RD JUNCTION, SOURCE: IDOM



Following the same methodology as explained beforehand, the AM peak hour flow at this junction will be in 2030 per lane as follows:

TABLE 42, Capacity at 3rd JUNCTION, Source: IDOM

Road Section in Visum Model 2030	Location	both ways/ day	one way/ day	per lane/ day	per lane/ AM peak h
Ilinden (2 lanes/ direction)	west	17.961	8.981	4.490	449
Goce Delcev (3 lanes/ direction)	north	33.265	16.633	5.544	554
East West Tunnel (1 lane/ direction)	east	14.107	7.054	7.054	705
Blvd VMRO (3 lanes/ direction)	south	30.113	15.057	5.019	502

Applying the following signal cycles, the proposed number of lanes for all access roads (see table above) can be considered as been sufficient:

TABLE 43, Traffic lights cycle and capacity at 3rd JUNCTION, Source: IDOM

	Lights Cycle					Capacity per h/ lane	2030 Lane flow/ peak h	Capacity vs Flow
	green:	amber:	red	amber:	cycle (sec)			
Ilinden (2 lanes/ direction)	**31**	3	23	3	60	**1.033**	449	**sufficient**
East West Tunnel (1 lane/ direction)	**31**	3	23	3	60	**1.033**	705	**sufficient**
	green:	amber:	red	amber:	cycle (sec)			
Goce Delcev (3 lanes/ direction)	31	3	**23**	3	60	**767**	554	**sufficient**
Blvd VMRO (3 lanes/ direction)	31	3	**23**	3	60	**767**	502	**sufficient**

In terms of turning movements following total traffic loads will cross the junction on an average working day in the year 2030:

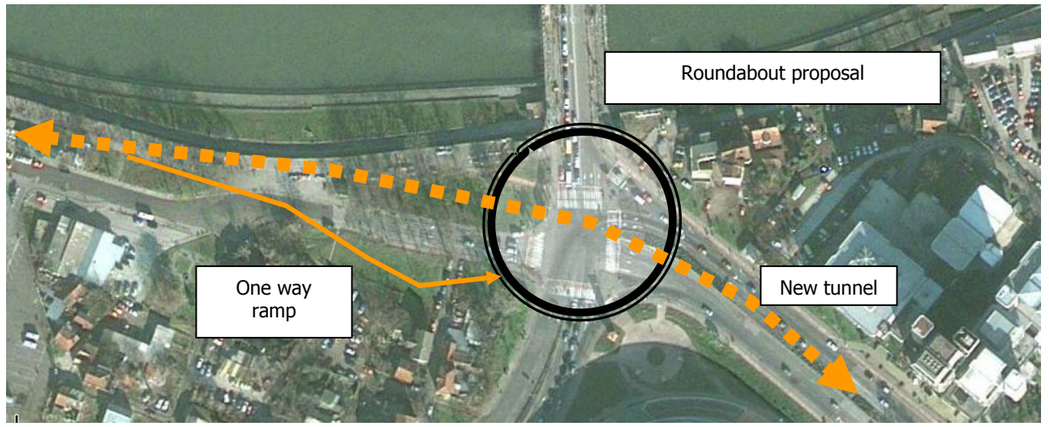
TABLE 44, Turning movements at 3rd JUNCTION, Source: IDOM

Origin of traffic (direction of section)	N	N	W	W	W	S	S	E	E
Destination of traffic (direction of section)	W	S	S	E	N	E	N	W	S
Total Daily Flow	**4.674**	**10.473**	**351**	**4.121**	**6.100**	**3.945**	**12.395**	**3.092**	**2.949**

7.3.7. Lane and Turning Characteristics at the Kompleks Banki Junction

The fourth junction to be analysed is the Kompleks Banki junction under which the tunnel of the new east west tunnel will cross before re-appearing in the centre of Pitu Boulevard. However, there will be an additional one-way tunnel access from this junction. In order to optimise traffic flows and avoid congestion, a roundabout has been proposed.

IMAGE 39, AERIAL PHOTO OF 4TH JUNCTION, SOURCE: IDOM



The three lanes at Pitu Boulevard on each direction will be narrowed to two in order to incorporate the city tunnel lanes before reaching Krusevska Republika junction.

The following peak hour traffic loads of 2030 prove that flows on each access road are fairly equal and not higher than at present. Peak flows are actually much lower than the benchmarked capacity limit of 700 vehicles, due to the flow compensation via the northern city ring or other new itineraries. Therefore, the Consultant proposes a further micro-simulation to investigate the need to install a signal system at this circle.

TABLE 45, Capacity at 4th JUNCTION, Source: IDOM

Road Section in Visum Model 2030	Location	both ways/ day	one way/ day	per lane/ day	per lane/ AM peak h
13 November (2 lanes/ direction) ONE WAY	west	3.242	3.242	1.621	162
Krste Misirkov (3 lanes/ direction)	north	11.714	5.857	1.952	195
Kuzman Josef. Pitu (3 lane/ direction)	east	17.759	8.880	2.960	296
Koco Racin (3 lanes/ direction)	south	10.559	5.280	1.760	176

In terms of turning movements following total traffic loads will cross the junction on an average working day in the year 2030:

TABLE 46, Capacity at 4th JUNCTION, Source: IDOM

Origin of traffic (direction of road section)	N	N	W	S	S	E	E
Destination of traffic (direction of road section)	S	E	E	E	N	N	S
Total Daily Flow	**2.080**	**3.662**	**3.242**	**945**	**1.719**	**4.517**	**5.636**

7.3.8. LANE AND TURNING CHARACTERISTICS AT THE MAVROVKA JUNCTION

The fifth junction to be analysed is the Mavrovka junction on the northern city ring which is also the crossroad with the highest traffic volumes in Greater Skopje at present. The junction will gain importance due to a new direct link to Aeodrom via Goce Delcev crossing the Vardar River near the SAEM complex.

IMAGE 40, AERIAL PHOTO OF 5TH JUNCTION, SOURCE: IDOM

The flow along Goce Delcev will be the highest of any road section in Skopje. As the lane set up of 4 lanes will be maintained in the future, the level of service will make sure good flow conditions up to 2030.

TABLE 47, Capacity at 5th JUNCTION, Source: IDOM

Road Section in Visum Model 2030	Location	both ways/ day	one way/ day	per lane/ day	per lane/ AM peak h
Goce Delcev (4 lanes/ direction)	west	39.790	19.895	4.974	497
Krste Misirkov (4 lanes/ direction)	north	21.465	10.733	2.683	268
Goce Delcev (4 lanes/ direction)	east	28.389	14.195	3.549	355
Krste Misirkov (3 lanes/ direction)	south	11.714	5.857	1.952	195

As shown above, each road section remains below the stated lane capacity limit. In terms of turning movements following total traffic loads will cross the junction on an average working day in the year 2030:

TABLE 48, Capacity at 5th JUNCTION, Source: IDOM

Origin of traffic (per road section)	N	N	N	W	W	W	S	S	E	E
Destination of traffic (per road section)	W	S	E	S	E	N	N	W	N	W
Total Daily Flow	**4.838**	**4.963**	**411**	**779**	**14.496**	**5.738**	**5.492**	**744**	**116**	**13.567**

7.3.9. Lane and Turning Characteristics at Blvd Ilinden/ Kliment Ohridski

The sixth junction to be analysed is the junction at the two boulevards Ilinden/ Kliment Ohridski (next to the President's Palace) which will be at the southern end of the new north south link bridge very near the banks of the Vardar River.

IMAGE 41, AERIAL PHOTO OF 6TH JUNCTION, SOURCE: IDOM

According to the VISUM model, maximum hourly flows at this junction are as follows:

TABLE 49, Capacity at 6th JUNCTION, Source: IDOM

Road Section in Visum Model 2030	Location	both ways/ day	one way/ day	per lane/ day	per lane/ AM peak h
Ilinden (2 lanes/ direction)	west	17.246	8.623	4.312	431
St. Kliment Ohrdiski (2 lanes/ direction)	north	21.822	10.911	5.456	546
Ilinden (2 lanes/ direction)	east	17.961	8.981	4.490	449
St. Kliment Ohrdiski (2 lanes/ direction)	south	24.255	12.128	6.064	606

As this junction is adjacent to the Cathedral, traffic lights cycles of Saint Kliment have been coordinated with this point aiming flows optimisation and guaranteeing a progressive signal system across junctions:

TABLE 50, Traffic lights cycle and capacity at 6th JUNCTION, Source: IDOM

	Lights Cycle					Capacity per h/ lane	2030 Lane flow/ peak h	Capacity vs Flow
	green:	amber:	red	amber:	cycle (sec)			
St. Kliment Ohrdiski (2 lanes/ direction)	**25**	3	29	3	60	**833**	546	**sufficient**
St. Kliment Ohrdiski (2 lanes/ direction)	**25**	3	29	3	60	**833**	606	**sufficient**
	green:	amber:	red	amber:	cycle (sec)			
Ilinden (2 lanes/ direction)	25	3	**29**	3	60	**967**	431	**sufficient**
Ilinden (2 lanes/ direction)	25	3	**29**	3	60	**967**	449	**sufficient**

In terms of turning movements between the two Boulevards, following total traffic loads will cross the junction on an average working day in the model scenario for 2030:

TABLE 51, Turning Movements at 6th JUNCTION, Source: IDOM

Origin traffic (direction section)	N	N	W	W	S	S	S	E	E	E
Destination (direction section)	W	S	S	E	E	N	W	N	W	S
Total Daily Flow	1.364	8.869	1.862	8.985	1.587	10.354	232	1.235	5.180	1.351

7.3.10. Lane and Turning Characteristics at The Junction Kale North

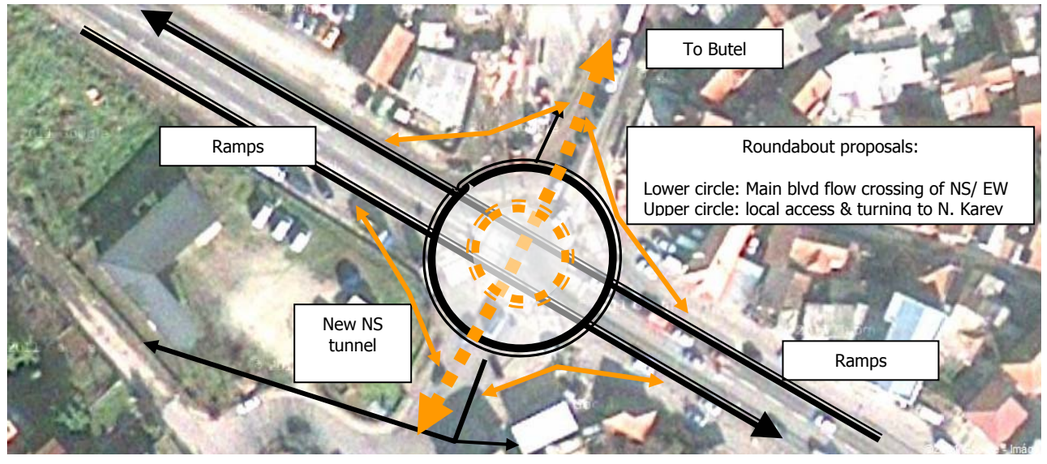
The seventh and last junction to be analysed is the Kale North junction where the north south tunnel underneath the Kale fortress will join the northern city network at the urban freeway Nikola Karev.

Simultaneously, there will be an extension of this new link towards the north (Butel, Sutka) which will give a fast and straight access of these areas to the south side and the city centre.

There will two roundabout proposals on two different level, whereby the lower circle handles the traffic flow passing and crossing over the two main blvd along the axes North-South and East-West.

The upper circle at grade guarantees local access and turning movements over ramps on to and off to N. Karev Blvd to the adjoining neighbourhoods on either side.

IMAGE 42, AERIAL PHOTO OF 7TH JUNCTION, SOURCE: IDOM



As shown above ramps on the upper circle to/ from the freeway will be one-way and separated from the other entries and exits. The modelled 2030 flows for the lower roundabout with all major flows are shown below:

TABLE 52, Turning Movements at 7th JUNCTION, Source: IDOM

Origin of traffic	N	N	N	W	W	W	S	S	S	E	E	E
Destination of traffic	W	S	E	S	E	N	E	N	W	N	W	S
Total Daily Flow	**2.206**	**6.068**	**2.946**	**579**	**11.569**	**2.533**	**895**	**5.844**	**2.128**	**3.687**	**9.891**	**983**

According to the prelim design, the two roundabouts can function separately, whereby the lower circle will bear the heavy city wide flows. Its roundabout accesses from the new north south tunnel and the northern Blvd Macedonia - Kosovska Brigada will be of one lane per direction. As following table shows, flows on all the four roads are rather balanced; hence the entry and exit flows will work smoothly without the need of being interrupted or signalled in general:

TABLE 53, Capacity at 7th JUNCTION, Source: IDOM

Road Section in Visum Model 2030	Location	both ways/ day	one way/ day	per lane/ day	per lane/ AM peak h
Nikola Karev (3 lanes/ per dir)	west	26.975	13.488	4.496	450
Macedonia- Kosovska Brigada (1 lane/ dir)	north	11.912	5.956	5.956	596
Nikola Karev (3 lanes/ per dir)	east	27.979	13.990	4.663	466
North South Link (1 lane/ dir)	south	11.912	5.956	5.956	596

The same applies to the upper circle with significantly lower flows: with 258 vehicles turning per peak hour from the north onto Nikola Karev and only 151 doing the same turning coming from the south.

7.3.11. Flows forecast for two new City links

As seen in the future assignations for 2015 and 2030 there is a sufficient capture of traffic for the two new city links.

Therefore, the Study confirms the need for these corridors as important solution for efficient flow of the traffic through the City Centre and the possibility for an efficient access to it.

It is highly recommended, that their construction will be part of **an integrated city centre management**, which displaces the dominant car traffic and gives priority for slower modes, like bicycle and walking and also which gives space for an efficient use of modern public city transport, like the light rail along Cupovski Street.

The following chapters detail the conclusions concerning management and design of these two links.

7.3.11.1. East West City Link underneath Macedonia Square

According to the tender documentation, the east west tunnel shall refer to "Light rail (mass rail) traffic, tracks, terminals and implementation" (page 10) and also that the width of the free profile for one direction should be two road lanes, each of 3.5m, one lane for light rail with 4.0m width and two pedestrian tracks with 0.75m width. (B=23x5+4.0+2x0.75=12.5m).

The Consultant wants to highlight, that the light rail proposal via the tunnel was a result of the GUP 2002 and that this has been superseded by the latest planning decision to construct an integrated over-ground light rail system, which is currently been tendered by the City of Skopje (summer 2010).

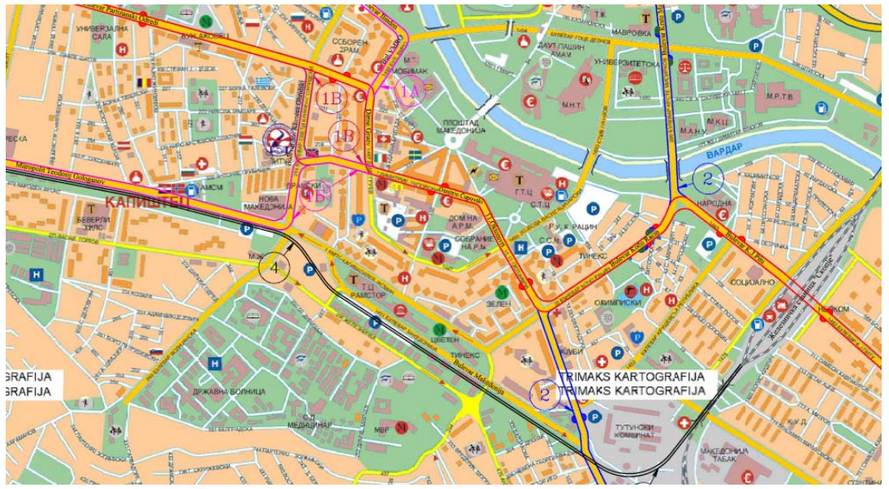
The light rail over-ground alignment proposal was part of the tender documentation and can be seen below. Line 1 will run between Saint Kliment Cathedral and Kompleks Banki via Dimitrie Cupovski, 11 Oktomvri and Koce Racin Blvd. Light Rail Stops shall be provided at:

- Saint Kliment Cathedral
- Rekord bus stop at Dimitrie Cupovski
- Near junction 11 Oktomvri/ Koce Racin Blvd
- Kompleks Banki

IDOM is in favour of this integrated over-ground network for the following reasons:

- Integration with other modes – better interchange with bus and pedestrians, time savings
- Proximity to the city tunnel. Therefore the Macedonia Square will be well served by the nearest light rail stop via Macedonia Street situated at Dimitrie Cupovski next to the bus stops at Rekord (approx 400 m to the Square)
- Lines 1 and 2 use the same stops and tracks – better inter-operability
- cost savings (no tunnelling and ramps)
- Passenger-friendly, as no level changes need to be undertaken: easy access for challenged users (handicapped, etc.)

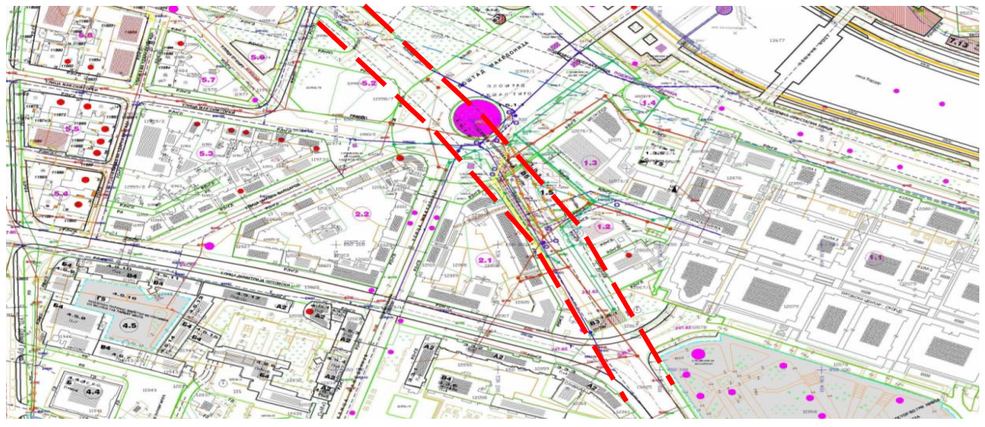
IMAGE 43, LIGHT RAIL ALIGNMENT WITH STOPS IN THE CITY, SOURCE: CITY COUNCIL



Tunnel Branch to 11 Oktomvri Blvd

A two lane wide tunnel connection, branching off underneath Macedonia Square and connecting with 11 Oktomvri Blvd has been included in the tender, the GPU 2002 as well as in the Area Masterplan of Centar for this area, see below:

IMAGE 44, APPROVED PLAN WITH NEW MONUMENTS, SOURCE: MUNICIPALITY CENTAR



The Consultant has serious doubts whether this tunnel branch to 11 Oktomvri Blvd is feasible, and would therefore like to highlight the following facts based on the latest planning decision and own traffic demand modelling exercises.

- **Incompatibility with major Emblematic Monuments**

  As it can be seen on the Masterplan of the Municipality Centar above, the remodelling of the Macedonia Square will have an important impact on the alignment and construction of the city tunnel.

  This is especially the case for the proposed branch, which lays directly underneath a 22 metres high monument of Alexander the Great riding his horse Bucephalus. The monument will be in the middle of a circular fountain and there will be soldiers from the Macedonian Phalanx around Alexander. Construction works are planned to be started soon.

IMAGE 45, ALEXANDER THE GREAT STATUE AT MACEDONIA SQUARE, SOURCE: INTERNET

Further south to the Monument there are two other emblematic buildings which are situated right underneath the tunnel also:

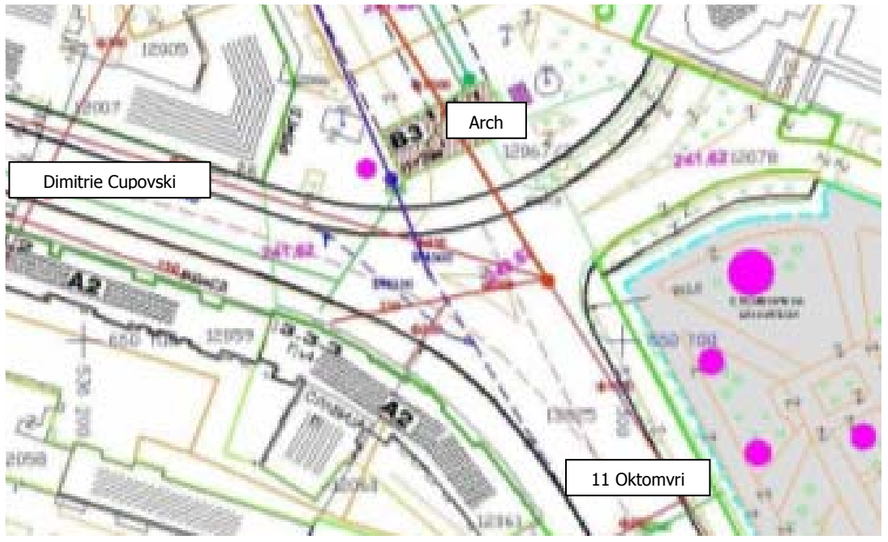
  - o The reconstruction of a 29 metres high historical orthodox church
  - o An Arch at the beginning of 11 Oktomvri Blvd, marking the entrance of the city centre

- **Functional Incompatibility with main tunnel**

  According to the outline of the plan the Consultant understands that this tunnel branch will be of two lanes and ramps up behind the Arch to be incorporated into 11 Oktomvri Blvd.

  However, the valid Masterplan of the Municipality does not detail how this tunnel and its access will be implemented. Tunnel depth, lengths of ramps, traffic management, etc. remain unclear. Furthermore, it seems to be questionable to locate a tunnel ramp right in front of this new Arch from an aesthetic point of view.

IMAGE 46, TUNNEL ACCESS AT ARCH, SOURCE: MASTERPLAN - MUNICIPALITY CENTAR



- **High Costs versus Low Benefits**

  Due to the limited space of the tunnel alignment vertically and horizontally underneath Macedonia Square, it is understood that the tunnel branch can only be provided on the south side of the main east west tunnel alignment, which would result in a one way access towards 11 Oktomvri Blvd. IDOM's own demand forecast shows that this branch would capture only 3700 vehicles per day at present, compared to the 10,000 vehicles per direction in the relation east west: Kompleks Banki – Saint Kliment.

  Due to the high traffic and pedestrian volumes in this traffic, especially the high concentration of buses along this road, it is highly recommended not to increase the traffic flow with additional private traffic.

As explained in the previous paragraphs, the tunnel branch to 11 Oktomvri Blvd would not be recommended for the following reasons:

1. Its design will cause conflicts with the three important new monuments at and around Macedonia Square which will be situated right on top of it: the Monument Alexander the Great, the Orthodox Church and the Southern Arch.

2. The incorporation of the tunnel at the busy junction Dimitrie Cupovski/ 11 Oktomvri will be problematic as there is little space for ramps along this busy road section where currently pass 14,500 vehicles per direction per day.
3. It is also clear that any additional traffic flows within the intermediate centre of the City will be against the City's policy of traffic calm the city centre, aiming an environmentally friendly transport and prioritize pedestrians.
4. The high costs of the tunnel would not justify a tunnel with rather low traffic flows of approx 3700 vehicles (in 2009).

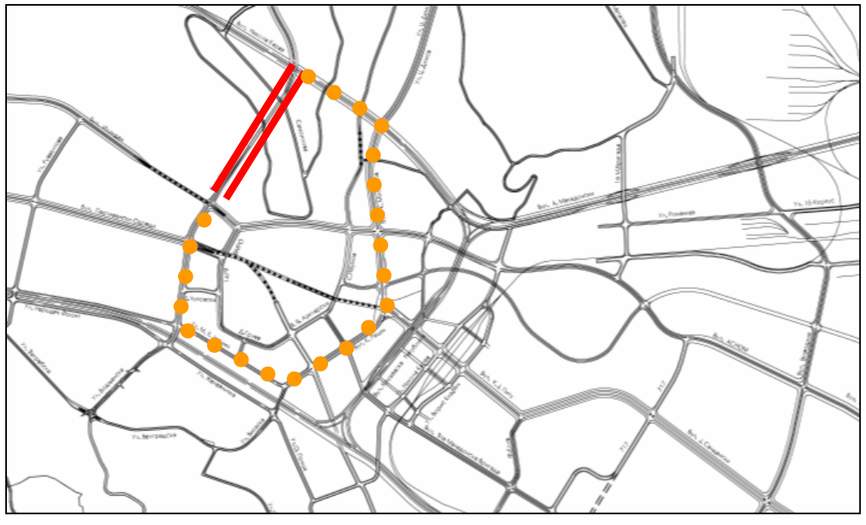
7.3.11.2. North South City Link underneath Kale Fortress

This new north south connection will ease traffic flows and take pressure of the city centre as it will be the missing link for the 2nd inner city ring road, as shown in the graphic below.

Explanatory Note:

- *Dotted orange line – existing 2nd city link*
- *Double red line – missing link which will be made of an elevated structure, a bridge crossing the Vardar Ruver and a tunnel underpassing Kale*

IMAGE 47, MISSING LINK OF 2ND CITY RING, SOURCE: GUP 2020



The ramps for the North South Link will be located north to Partizanzki Odredi in order to capture the traffic of this important Boulevard. It is not recommended to begin ramping up further south for two reasons:

1. Will cause a bottle neck further south at Kliment Ohridski and disturb the flow on this ring road
2. Visual impact at Cathedral and other emblematic buildings

7.3.11.3. Tunnel sections

As the results of this Traffic Study will also determine the capacity and subsequently the design for new highway links though the city centre (see previous chapter), the following traffic flows have been extracted from the future scenarios of the VISUM model for these two links.

Ramps will start on the western and southern side of the Cathedral, whereby their design will respect this emblematic area of the City Centre.

IMAGE 48, RAMP PROPOSALS AT CATHEDRAL JUNCTION, SOURCE: GOOGLE/ IDOM

Lane capacity depends on various factors, such as traffic composition, urban environment, number of lanes, lane widths, obstacles such as traffic lights, etc. It has been noted that in some road sections of Skopje capacity is as low as around 700 vehicles, mainly due to deficiencies in traffic management and local congestion.

Considering a smarter traffic management, it can be assumed that lane capacity values in a dense urban environment could be of 900 vehicles per hour range, whereby traffic lights need to be co-ordinated and congestion need to be avoided by rerouting of flows.

The outlook is very much optimistic to achieve this goal, as there will be more links and hence more itineraries across the network, by building new road links with less intersections and hence better flow conditions. The following screenshot from the assignment of 2030 shows the modelled network with both links.

GRAPHIC 44, MODEL ASSIGNMENT OUTPUT FOR CITY LINKS IN 2030, SOURCE: IDOM

The first exercise after the modelling will be the analysis of required lanes for the two new link roads, where a lane capacity of 900 vehicles / hour has been set as a given. The table below shows the average flow on a working day and the number of vehicles per peak hour. As peak flows are far below 900 units, it can be concluded that one lane per direction per link will be sufficient.

TABLE 54, Capacity at CITY LINKS, Source: IDOM

Link	Daily Flow 2030	Peak Hour Flow	Number of Lanes
EAST WEST TUNNEL	7054	**705**	**one lane sufficient**
NORTH SOUTH LINK	8249	**825**	**one lane sufficient**

7.4. RESULTS PUBLIC TRANSPORT

7.4.1. Planned light rail system. Scenarios

The Consultant has been set two future scenarios in order to analyse and predict the future operation of the traffic system: 2015 and 2030. This was mainly because of three reasons:

- The proposals of the current Masterplan will probably take another decade to be implemented, therefore 2030 as the final scenario
- The first light rail line as the new state-of-the-art transport system for the entire network will approximately take another 5 years to be up and running, therefore 2015 as the first scenario.
- The concession for the operation of the two new city link roads will need data for the next two decades as a base to calculate their costs and benefits. The years 2015 and 2030 will hence cover the first year of opening and some advanced year of their operation.

The City of Skopje is keen to implement a light rail system, based on 4 lines, whereby the design for the 1st line has already been finished and will be up and ready around 2015, the others by 2030:

TABLE 55, ROUTEING OF THE FOUR NEW LIGHT RAIL ROUTES FOR SKOPJE, SOURCE: IDOM

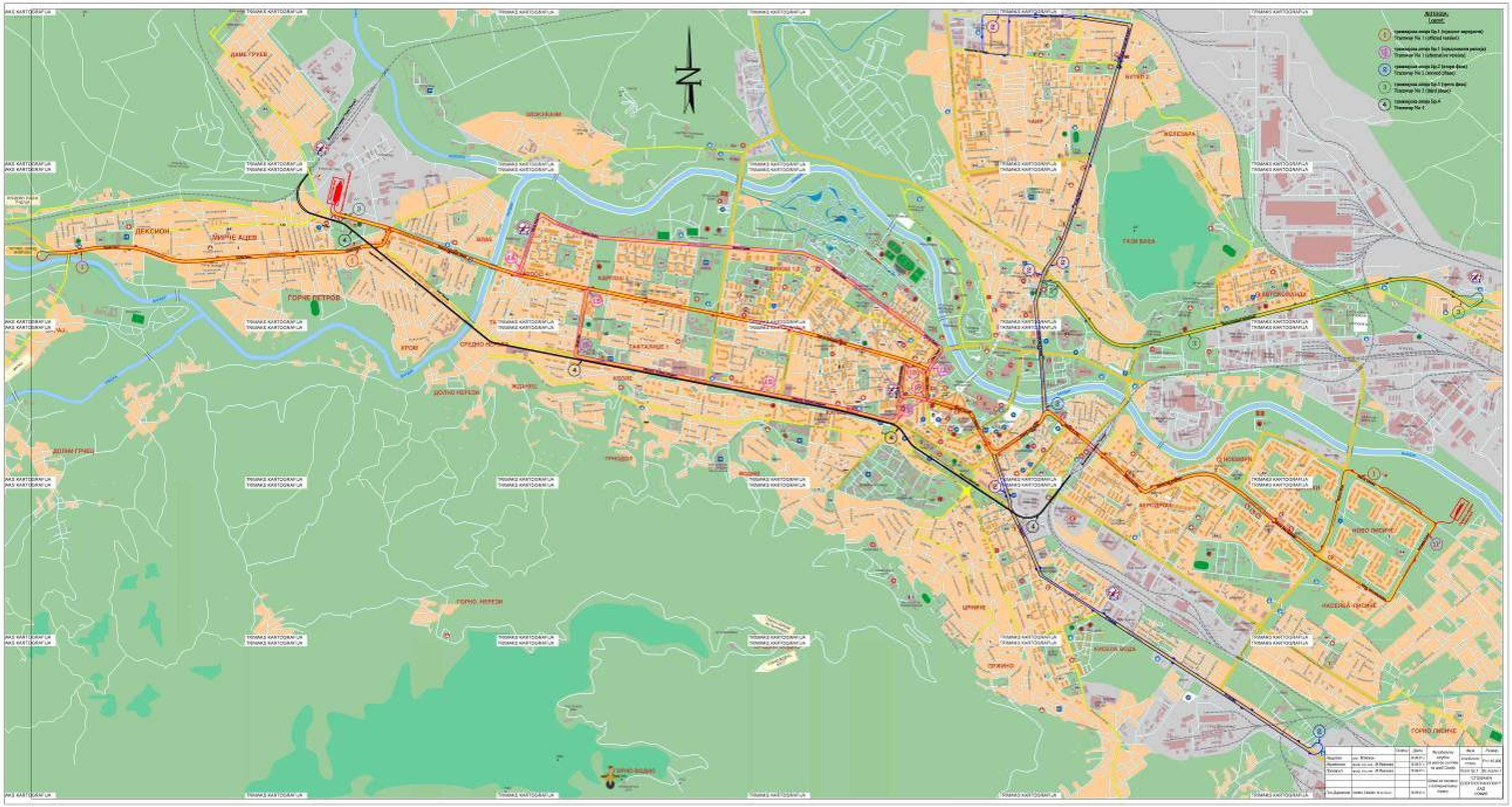
T1	Station I Saraj Bridge Terminal - Station IV Gorce Petrov - Station XIV Rekord - Station XVIII Transporten Centar - Station XXI Maternal Home - Station XXV Novo Lisice Terminal
T2	T2 OHIS Terminal - T2 Narodni Heroi - T2 Tutunski - T2 T3 Bit Pasar - T2 Station Sever - T2 Topansko Pole Terminal
T3	T3 Agroservice Terminal - T3 Avtokommanda - T2 T3 Bit Pasar - T2 T3 Mavrovka - Station XIV Rekord - T3 Gorce Petrov Terminal
T4	T4 T Centar - T4 Hrom South - T4 Gorce Petrov - T4 Sever - T4 Saem - T4 T Centar

All alignments are described down after:

- Line 1 will connect the east and the west part of the cit of Skopje. The total length is circa 30 km in both directions. As the eastern section has already been studied in design detail, this section going from the Depot Lisice to the City Centre might be built first.
- Line 2 will connect the south part of town – municipality of Kisela Vodain with the north part – municipalities of Chair and Butel 2. This line shall be connected with the main line 1 (total length circa 20 km in both directions).
- Line 3 will connect Avtokomanda with Bit Pazar respectively, i.e. connected with line number 2 at the junction in front of Hotel Continental. The entire route goes along Blvd. "Alexander the Great" (the total length is 8 miles in both directions).
- The circular city railway Line 4 will start from the central train station (Transport Center) and it will follow the railroad built towards the Skopje-Sever railway station and the Gorce Petrov railway station. A railroad already exists in this part, but no electricity is installed. A light rail route starts from the Gorce Petrov railway station which has not been built yet and is continuing forward to the Luka Gerov street and the Partizanski odredi Boulevard. The route of the line continues towards the Adolf Cibarovski street and goes towards the Moskovska street, where it shifts in the profile of the Macedonia Blvd. and near the Tobacco Factory it merges with the railway line, ending at the central

railway station (Transport Center). It is foreseen that a fast light rail-train can run on this line. The realization of this line requires cooperation with Macedonian Railways and it is conditioned upon the construction of the Macedonia Blvd.

IMAGE 49, NEW LIGHT RAIL NETWORK, SOURCE: CITY COUNCIL



7.4.2. Bus and Light Rail Services in 2015 and 2030 according to GUP

The Feasibility Study Chapter T5 – subchapters "*Variant solutions for development of light rail according to the layout plan of Skopje city*" and "*Determination of the necessary number of rail motor cars for work on the line per hours of 24 - hour - period*", has been used as a basis when the VISUM model was prepared (proposed stations and operational characteristics). Referring to this Study, the service intervals for Light Rail Line T1 in 2015 are as follows:

TABLE 56, HEADWAY PROPOSAL FOR T1, SOURCE: FEASIBILITY STUDY 2008

AM peak – 7 am to 8 am	3 min	PM peak –3 pm to 5 pm	3 min
Off peak – 8 am to 3 pm, 6 pm to 9 pm	6 min	Evening – after 9 pm to closing	9 min

As modelling showed a fairly low occupation by using peak headways of 3 min, the frequency has been modelled with light rail trains running every 5 minutes. The remaining three lines, mentioned in the Feasibility study, have been added in 2030. The service frequencies were adapted accordingly. Parallel running bus services have been also used as a reference. The modelled headways are summarised below and are the result of a thorough model assignment exercise:

TABLE 57, HEADWAY PROPOSAL FOR T1, T2, T3, T4 IN 2030, SOURCE: IDOM

Proposal IDOM	Scenario 2030
T1	Peak: 3 min, Off peak: 10 min (T1 Scenario 2015: peak 5 min/ off peak 10 min)
T2	Peak: 10 min, Off peak: 15 min
T3	Should be lower than T1, as west part shared with T1 and east part with lower demand than T1. Hence, peak headway: 5 min. Off peak: 10 min
T4	Peak: 12 min, Off peak: 20 min

In general, bus frequencies remain the same as in the base year. Those bus routes, affected by the T1 route configuration will be adjusted by incorporating most of the proposals of the Light Rail Feasibility Study, Chapter "*Analysis of the possibilities for reorganization of the bus route system*". Following table summarises which bus lines will be closed or shortened by 2015 caused by which light rail section. Bus operators whether JSP or Private are not mentioned separately. New proposals of the Consultant are marked with the word "IDOM".

TABLE 58, PROPOSED BUS ROUTE CHANGES FOR 2015, SOURCE: IDOM

Bus Line	Terminals	Affected LRT	Amendment on bus line	Due
L-2	s.Saraj- Avtokomanda	1 west	IDOM: Feeder Avtokomanda – Kompleks Banki.	2015
L-3	Kl.Bolnica- Sp.Sala Mzt	1 east	Ceased	2015
L-4	11 Oktomvri- nas. Hrom	1 west	Ceased	2015
L-5	Novo Lisice- Deksion	1 east + west	Ceased	2015
L-7	nas. Lisice - Karpos 3	1 west	IDOM: Feeder nas. Lisice – T Center	2015
L-12	Esero Treska - s.Saraj - Skopski Saem	1 west	IDOM: Feeder Esero Treska – Saraj Bridge	2015
L-15	Novo Lisice- Karpos 4	1 east + west	Ceased	2015
L-19	nas.S. Orizari- Karpos 4	1 west	Section cut Karpos to the Centre (IDOM: Kompleks Banki)	2015
L-21	s.Bardovci- Transporten Centar	1 west	IDOM: "21 NEW (with 59)": Bardovci – 8 Sep – Gologanov – Misirkov - Grobista Butel As L-21 has compared to L-59 twice as much bus vehicles in operation per day, there will be a significant improvement for pax (from 22 to 44 a day)	2015
L-22	Tr. Centar- Volkovo (Lepenec)	1 west	Route change: Volkovo – A. Tsiburovski – M.T. Gologanov – D.Chupovski – T Center	2015
L-23	M.A. Cento – Fev. Pohod Novo Lisice - Dom Na Pechat	1 east	IDOM: Shortened and route change: M.A. Cento – MZT Novo Lisice – T Centar	2015
L-24	Kisela Voda- Taftalidze 2 (Pripor)	1 west	IDOM: Nº 57 remains. Nº 24 Feeder KV - Kompleks Banki	2015

Light Rail Line T1 will capture in 2015 approx 55,491 passengers. Applying the assumptions, used during the model exercise, typical light rail cars will be occupied by around **95%** during the highest peak period (ref.: ALSTOM 40 m: 224 pax), i.e. in the a.m. peak around 8 o'clock. A sensibility check has been done, modelling T1 without any changes in the bus network:

TABLE 59, PASSENGER NUMBERS OF T1 WITH/ WITHOUT CHANGES ON BUS NETWORK, SOURCE: IDOM

	T1 per average working day	Pax per AM peak hour (approx 10%)	per direction	Average per light rail car (5 min headway)	Average occupation
With changes of bus network (see above)	**64,037**	**6,404**	**3,202**	**213**	**95%**
sensibility test without any network changes	39,824	3,982	1991	133	59%

The sensibility test "No network changes" gives reasonable results and underlines even more the importance of **modifying the current bus network in order to strengthen the light rail as the priority mode of**

public transport. The future bus network will function as a complimentary mode and feeds into the light rail network.

No references were available for T2, T3, T4, all due to be in operation in 2030. Idom has therefore proposed the following changes. In general, bus frequencies remain the same as in the base year and no changes are proposed for the suburban bus lines. Urban bus itineraries similar to those of light rail lines T2, T3, T4 will be amended by those shown in the following table. Changes foreseen for 2015 apply also to the below.

TABLE 60, PROPOSED BUS ROUTE CHANGES FOR 2030, SOURCE: IDOM

Bus Line	Bus Terminals	Affected LRT	Amendment on bus line	Due
L-2	s.Saraj- Avtokomanda	T3	Ceased	2030
L-8	nas. Vlae - Ljubotenski Pat	T2, T4	Shortened. Feeder: Ljubotenski Pat – Sever (T2, T4)	2030
L-19	nas.S. Orizari - Karpos 4	T1, T2	Shortened. Feeder: nas.S. Orizari – Sever (T2, T4)	2030
L-20	nas.S. Orizari – T Centar	T2	Shortened. Feeder: nas.S. Orizari – Cair (T2)	2030
L-22	Tr. Centar- Volkovo (Lepenec)	T4	Shortened further. Feeder: Volkovo – Gorje Petrov (T1, T3, T4)	2030
L-35	Novo Lisice- Z. Stanica Sever	T1, T2	Ceased	2030
L-41	nas. Dracevo- Tipo- Tr. Centar	T2	Shortened. Feeder: Dracevo – T2 OHIS – T1 Jane Sandanski	2030
L-45	M.A. Cento – T Centar	T3	Shortened. Feeder: M.A. Cento – T2 Agroservice – T1 Jane Sandanski	2030
L-57	Kozle - Radisani	T2, T4	Converted to Ring Line. Vlae - Ilinden – Hospital – Kozle - Vlae	2030
L-65	Stajkovski – T Centar	T3	Shortened. Feeder: Stajkovski – T3 Agroservice	2030

The passenger modelling results for 2030 can be observed down below:

TABLE 61, LIGHT RAIL PASSENGERS IN 2030 WITH OCCUPATION PER TRAIN, SOURCE: IDOM

LRT Line	Passengers per average working day	Pax per AM peak hour (approx 10%)	per direction	Peak headway	per light rail car	occupation per light rail
T1	70,198	7,020	3,510	3 min	175	**78%**
T2	26,414	2,641	1,321	10 min	220	**98%**
T3	50,910	5,091	2,546	5 min	212	**95%**
T4	18,203	1,820	910	12 min	182	**81%**

Daily passenger flows between light rail stations across the entire light rail network with its 4 lines in 2030 can be seen on the following VISUM map.

Insert light railflows_2030.pdf)

IMAGE 50, LIGHT RAILFLOWS OF SCENARIO 2030, SOURCE: IDOM

As a logical consequence, there is a significant decrease of use of urban bus lines owing to the implementation of the light rail network. However, passenger numbers on suburban lines rise as this network remains unchanged and functions more importantly as a feeder to the light rail network. The table below shows the change in passenger kilometres for each network between the scenarios Base Year, 2015 and 2030 GUP:

TABLE 62, CHANGE IN PASSENGER-KM BETWEEN ALL THREE SCENARIOS, SOURCE: IDOM

Change in Passenger-Kilometres		
	2009 - 2015	2015 - 2030
Urban Lines	-24%	-35%
Suburban Lines	20%	19%
Light Rail Lines		168%

Concerning the network changes between 2009 and 2015, following bus lines, all in the corridor of light rail line T1, will decrease in more than two thirds their numbers of Passenger-Kilometres:

- L-02: the only remaining itineraries will be those of 2A a the new feeder Avtokomanda – Kompleks Banki (see previous table of proposed bus network changes)
- L-07 due to its new feeder role (see previous table)
- L-12 JSP and the private line L-12 PRIV
- L-19, JSP and he private line L-19 PRIV
- L-23 PRIV
- L-24.

Concerning changes from 2015 to 2030, decreasing passengers-km numbers bigger than 60% can be observed on following urban bus lines:

- L-02: the only remaining itineraries will be those of 2A as the feeder will be substituted by T3
- L-08 due to its new feeder role (see previous table)
- L-19 and L-19 PRIV (further important decrease)
- L-22 and L-22 PRIV due to its new feeder role (see previous table)
- L-41 (see proposal above)
- L-45 PRIV (see proposal above)
- L-57 (see proposal above)
- L-65 (due to its new feeder role)

The following tables were taken from the VISUM model. Owing to the larger scaling when working with macro-simulation models, the mileage is somewhat different than in reality. Line T1, T2 and T3 stops have been taken from the Feasibility Study. This study from 2008 is the base document for the current light rail network tendering managed by the City of Skopje. Both directions have been included concerning Lines T1 and T2 due to some one way stop arrangements at the terminus loops of these two routes. Station numbering of T1 is equal to the Feasibility Study.

TABLE 63, STATIONS AND MILAGE OF T1 IN BOTH DIRECTIONS, SOURCE: IDOM

	LINE T1 - ROUTE WEST - EAST			LINE T1 - ROUTE EAST - WEST	
1	Station I Saraj Bridge Terminal	0,000km	1	Station XXV Novo Lisice Terminal	0,000km
2	Station II Deksion	0,581km	2	Station XXVI Serbia Blvd	0,426km
3	Station III Mirce Acev	1,348km	3	Station XXIII Jane Sandanski	1,057km
4	Station IV Gorce Petrov	2,087km	4	Station XXII Biser	1,560km
5	Station V Hrom North	2,994km	5	Station XXI Maternal Home	2,007km
6	Station VI Vlae	3,628km	6	Station XX Aerodrom	2,504km
7	Station VII Karpos 4	4,282km	7	Station XIX Franko Kluj	2,916km
8	Station VIII Moskovska	4,877km	8	Station XVIII T Centar	3,337km
9	Station IX Karpos 3	5,421km	9	Station XVII Kompleks Banki	3,878km
10	Station X 8th September	6,102km	10	Station XVI Olympic Pool	4,229km
11	Station XI Roosevelt	6,817km	11	Station XV Zelen Market	4,722km
12	Station XII - Karpos 2	7,336km	12	Station XIV Rekord	5,173km
13	Station XIII Saint Kliment	7,981km	13	Station XIII Saint Kliment	5,799km
14	Station XIV Rekord	8,608km	14	Station XII - Karpos 2	6,445km
15	Station XV Zelen Market	9,058km	15	Station XI Roosevelt	6,964km
16	Station XVI Olympic Pool	9,552km	16	Station X 8th September	7,679km
17	Station XVII Kompleks Banki	9,903km	17	Station IX Karpos 3	8,360km
18	Station XVIII T Centar	10,443km	18	Station VIII Moskovska	8,903km
19	Station XIX Franko Kluj	10,865km	19	Station VII Karpos 4	9,499km
20	Station XX Aerodrom	11,276km	20	Station VI Vlae	10,153km
21	Station XXI Maternal Home	11,773km	21	Station V Hrom North	10,786km
22	Station XXII Biser	12,221km	22	Station IV Gorce Petrov	11,694km
23	Station XXIII Jane Sandanski	12,723km	23	Station III Mirce Acev	12,432km
25	Station XXIV Fevruarski Pohod	13,971km	24	Station II Deksion	13,199km
26	Station XXV Novo Lisice Terminal	15,004km	25	Station I Saraj Bridge Terminal	13,780km

Line T2:

TABLE 64, STATIONS AND MILAGE OF T2 IN BOTH DIRECTIONS, SOURCE: IDOM

	LINE T2 - ROUTE SOUTH - NORTH			LINE T2 - ROUTE NORTH - SOUTH	
1	T2 OHIS Terminal	0,000km	1	T2 Topansko Pole Terminal	0,000km
2	T2 Cementarnica	0,578km	2	T2 Bosnia Hercegovina	0,325km
3	T2 Parvomajska	1,397km	4	T2 Station Sever	0,613km
4	T2 Narodni Heroi	2,223km	5	T2 Opstina Butel	0,996km
5	T2 Opstina K Voda	2,892km	6	T2 Butel 2	1,599km
6	T2 Tutunski	3,606km	7	T2 Kennedy	2,538km
8	Station XVI Olympic Pool	4,351km	8	T2 Cair	3,025km
10	T2 T3 Mavrovka	5,156km	10	T2 T3 Bit Pasar	3,991km
11	T2 T3 Bit Pasar	5,637km	11	T2 T3 Mavrovka	4,472km
13	T2 Cair	6,603km	13	Station XVI Olympic Pool	5,277km
14	T2 Kennedy	7,090km	15	T2 Tutunski	6,022km
15	T2 Butel 2	8,029km	16	T2 Opstina K Voda	6,735km
16	T2 Opstina Batel	8,632km	17	T2 Narodni Heroi	7,405km
17	T2 Station Sever	9,015km	18	T2 Parvomajska	8,231km
19	T2 Lazar Trpovski	9,672km	19	T2 Cementarnica	9,049km
20	T2 Topansko Pole Terminal	9,992km	20	T2 OHIS Terminal	9,628km

Line T3:

TABLE 65, STATIONS AND MILAGE OF T3 IN BOTH DIRECTIONS, SOURCE: IDOM

	LINE T3	
1	T3 Agroservice Terminal	0,000km
2	T3 ETUC M Pupin	0,578km
3	T3 Avtokommanda	1,639km
4	T3 Stiv Naumov	2,289km
5	T3 Opstina Gazi Baba	2,921km
6	T3 Cyril & Methodius University	3,650km
8	T2 T3 Bit Pasar	4,178km
9	T2 T3 Mavrovka	4,659km
11	Station XVI Olympic Pool	5,464km
13	Station XV Zelen Market	5,958km
14	Station XIV Rekord	6,408km
15	Station XIII Saint Kliment	7,035km
16	Station XII - Karpos 2	7,680km
17	Station XI Roosevelt	8,199km
18	Station X 8th September	8,914km
19	Station IX Karpos 3	9,595km
20	Station VIII Moskovska	10,139km
21	Station VII Karpos 4	10,734km
22	Station VI Vlae	11,388km
24	T3 Gorce Petrov Terminal	12,265km

The following graphics show the public transport flows at Skopje Sever interchange between the light rail stops T2 and T4 as well as the bus lines at the adjacent bus stop.

Sever

GRAPHIC 45, LIGHT RAIL + BUS FLOWS AT INTERCHANGE SEVER IN "2030 GUP", SOURCE: IDOM

7.5. ALTERNATIVE SCENARIOS "2030 DO NOTHING" AND "2030 PLUS"

7.5.1. Scenario "2030 DO NOTHING"

As mentioned earlier, this scenario will maintain the highway and bus network of the base year 2009 as a status quo, whereby the number of trips keeps growing.

Capacity constraints have been identified at following junctions and roads:

- Gorce Petrov – junction with turn to Saraj Bridge due to capacity constraints at the bridge which is the only link to Skopje for the growing neighbourhoods of Saraj
- Gorce Petrov/ Karpos – Skupi/ Aco Sopov Road due to elevated tangential flows Cair/ Butel – Gorce Petriv/ Saraj which have only this only peripheral link apart from going via the centre
- Bit Pazar – ramps for the turn Blvd Misirkov – Blvd Alexander Macedonia heavily congested due to elevated traffic circulating between Centar and Avtokomanda
- Madzari – ramps for the turn M. Andonov – Blvd Alexander Macedonia heavily congested due to elevated traffic circulating between Cento and Avtokomanda

Apart from the above, four major city junctions will not be able to cope with the heavy flows if nothing will be done by 2030. These four crossroads are:

- Mavrovka
- Kompleks Banki
- Dom Na Pechat
- Post

TABLE 66; TOP 7 OF HIGHWAY NETWORK AT 2030 DO NOTHING ASSIGNMENT, SOURCE: IDOM

Ranking	Road Section	Vehicles per Average Day 2030 (except buses and two-wheelers)
1	Boulevard Krste Misirlov at Pit Bazar	37,538 vehicles
2	Boulevard Jane Sandanski at Transporte Centar	35,884 vehicles
3	Boulevard Goce Delcev at Goce Delcev Bridge	35,473 vehicles
4	Boulevard Aleksander Makedonski at Avtokomanda	33,533 vehicles
5	Boulevard Partizanski Odredi at Construction Faculty	26,324 vehicles
6	Boulevard 8 de Septiembre at Momin Potok	25,926 vehicles
7	At Gorce Petrov Shopping Center	23,447 vehicles

For further details please see assignment of Scenario "2030 DO NOTHING" on the next page:

"2030 DO NOTHING" PRIVATE

IMAGE 51, "2030 DO NOTHING" PRIVATE CAR ASSIGNMENT, SOURCE: IDOM

7.5.2. Alternative Scenario "2030 PLUS"

As stated previously, IDOM proposed two light rail network extensions:

- T2 with a farther north terminal near the market of Suto Orizari (approx 3 km)
- T1 with a farther west terminal at Saraj Village (approx 1.5 km)
- T3 with a farther east terminal at the village of Cento (approx 2.5 km)

All subsequent changes of bus routings one can find below:

- Centre: re-routing of all lines running along Cupovski Road to free area of motorised traffic. All bus lines will run via city ring (Mavrovka , Delcev Bridge, General Post Office)
- North: Cede service of lines 19 and 20 as a consequence of T2 extension to Suto Orizari
- North: Bus coverage of Lazar Topovski area and feeding into T2 and T4 lines will be guaranteed by services of bus lines 9.
- West: Suburban Line 32 will be shortened to function as a feeder between Ljubin and the new T1 terminal at Saraj Village
- West: L-12 will work as a feeder between Shishevo/ Ezero Treska and the new T1 terminal at Saraj Village
- East: all L-65 services, both urban and suburban, will terminate at the new T3 Terminal at the Cento Interchange
- East: L-55 will work as a feeder between Aracinovo and the new T3 terminal
- East: L-23 will be re-routed as it will run similar as T3. Instead of going along Anton Popov. it will now give service to Madzari and connect this area with the T3 as well as with T1.

Regarding highway infrastructure, three projects have been taken out in "2030 PLUS":

- Macedonia Boulevard ("South Blvd")
- Outer Ring Southeast between Prvmosaska – Pripor
- Dual Carriageway between Junction Gorce Centre/ Blvd Montenegro– Volkovo: Extension Blvd Ilinden

Three NETWORK CHANGES have been included in the 2030 PLUS network:

- Widening of Saraj Bridge
- Closure of Cupovski Street except for LIGHT RAIL and PEDESTRIANS
- Traffic-Calm and revitalise Gorce Petrov Blvd whereby through traffic will be divert onto new Montenegro Blvd which will function as a by-pass for this Local Municipality

The passenger modelling results for the Scenario 2030 PLUS can be observed down below:

TABLE 67, LIGHT RAIL PASSENGER NUMBERS « 2030 PLUS « VERSUS « 2030 GUS », SOURCE: IDOM

LRT Line	Passengers per average working day	*Comparison data*	Difference
	Alternative Scenario "2030 PLUS"	*2030 GUS*	
T1	**77,675**	*70,198*	**+11%**
T2	**47,275**	*26,414*	**+79%**
T3	**66,156**	*50,910*	**+30%**
T4	**16,330**	*18,203*	**-10%**

The introduced changes have increased the demand by 25% although there would be only 7 km more light rail being laid to reach new terminals. Apart from the ring line T4 all lines gain patronage, most significantly light rail line T2 with its new terminal in Suto Orizari.

Due to this increase in demand new frequencies for all 4 lines have been determined, using the same specifications as in the previous chapter and not exceeding drastically the capacity of light rail in peak hour conditions.

TABLE 68, OCCUPATION PER TRAIN FOR SCENARIO « 2030 PLUS », SOURCE: IDOM

LRT Line	Passengers per avg working day	AM peak hour (approx 10%)	per direction	Peak headway	trains per peak hour	per light rail car	occupation per light rail (224 pax)
T1	70,198	7,020	3510	3 min	20	175	78%
T2	26,414	2,641	1321	10 min	6	220	98%
T3	50,910	5,091	2546	5 min	12	212	95%
T4	18,203	1,820	910	12 min	5	182	81%
TOTAL 2030 GUS		16,573	8286				
T1	77,675	7,768	3884	4 min	15	259	116%
T2	47,275	4,728	2364	5 min	12	197	88%
T3	66,156	6,616	3308	4 min	15	221	98%
T4	16,330	1,633	817	15 min	4	204	91%
TOTAL 2030 PLUS		20,744	10372				

It needs to be highlighted that in 2030, there will be a very dense light rail flow along Koco Racin Boulevard, with approx trains passing every 1.5 minutes per direction as Lines T1, T2 and T3 share the same tracks.

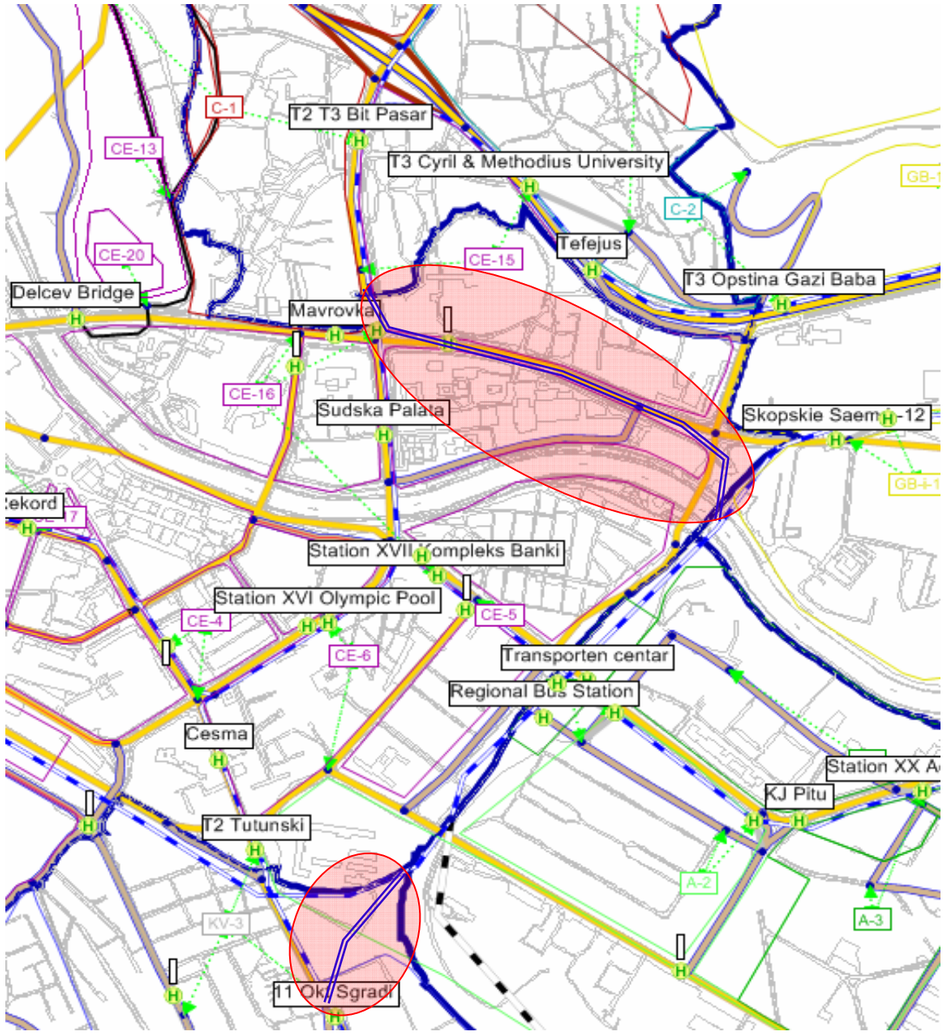
There are some cities where such an arrangement works well, for instance in the German city of Karlsruhe where 7 light rail lines – each of them with a 10 min headway – share the same track.

However, in order to avoid congestion and relieve flows, longer trains might be considered.

IMAGE 52, LIGHT RAIL AT DOUBLE TRACTION, SOURCE: VRR (INTERNET)

Another alternative would be a different alignment for Line T2 through the centre, which would result in a stable and fluent operation for T1 and T3 which share most of its alignment anyways. Line T2 - which needs to branch in and out of T1/ T3 tracks before and after the Olympic Pool stop - could cause difficulties in terms of service reliability. Therefore one might consider a new routeing via a ramp from 11 Oktober onto the Transporten Centar rail structures to integrate T2 into this interchange. The line could then slope down into Goce Delcev Boulevard. There might be a four tracks arrangement at Pit Bazar Interchange which would enable an independent service of light rail lines T2 and T3. However, a shared arrangement between both lines might also be feasible.

IMAGE 53, NEW SECTIONS TO SEPARATE T2 ALIGNMENT FROM T1 AND T3, SOURCE: IDOM



The private transport assignment for this alternative scenario with overall less new highway infrastructure compared to "2030 GUP" can been seen on the next page:

"2030 PLUS" PRIVATE

IMAGE 54, "2030 PLUS" PRIVATE CAR ASSIGNATION, SOURCE: IDOM

7.5.3. Alternative Scenario "East Blvd" (Blvd Krusevska Rubublika)

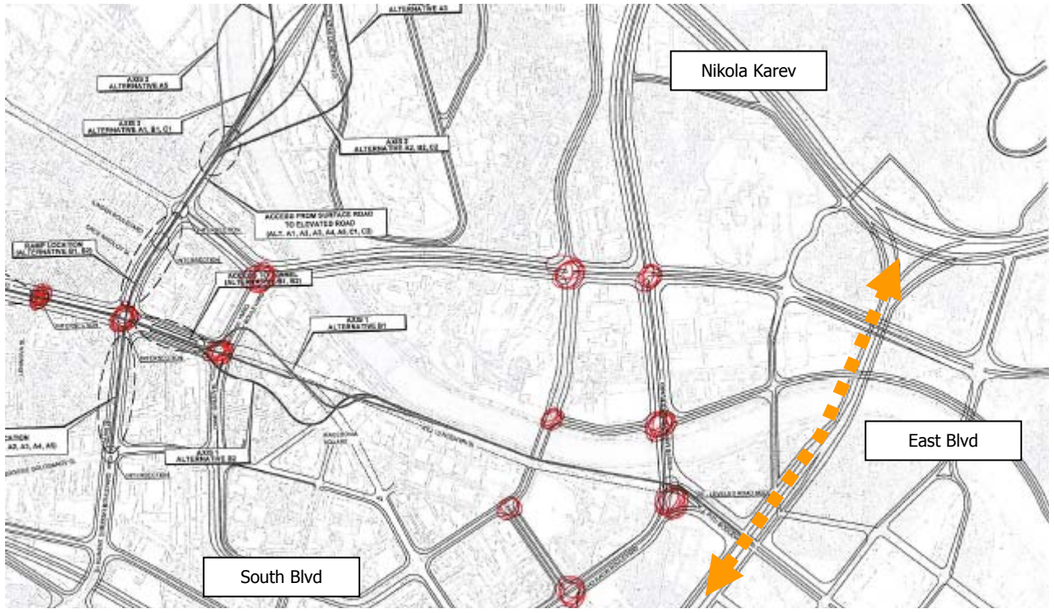
In the submitted Transport Masterplan, various future scenarios have been added:

- The "Scenario 2030 GUP" including a series of infrastructures which were selected by the City Council and which have their origin in the General Urban Development Plan of 2002 (and still in force)
- An alternative Scenario "2030 Plus" focussing on less private car use and more public transport use, resulting in other priorities of implementing new infrastructure
- Some interim scenarios for 2015 considering the phasing of new highway and tramway alignments

However, it has been noted that there is a commitment of including also the Boulevard Krusevska Republica ("East Boulevard") in the model, that should connect the Boulevards Aleksandar makedonski (North Boulevard) and the Makedonija Blvd ("South Boulevard").

This Boulevard was taken into consideration at GUP of City of Skopje from 2002, which allows transfer between regional and local traffic. Therefore, an additional "Scenario 2030 East Blvd" has been simulated to meet the demand of the supervision team.

GRAPHIC 46, THE EAST BLVD IN THE GUP (MARKED IN ORANGE), SOURCE: IDOM



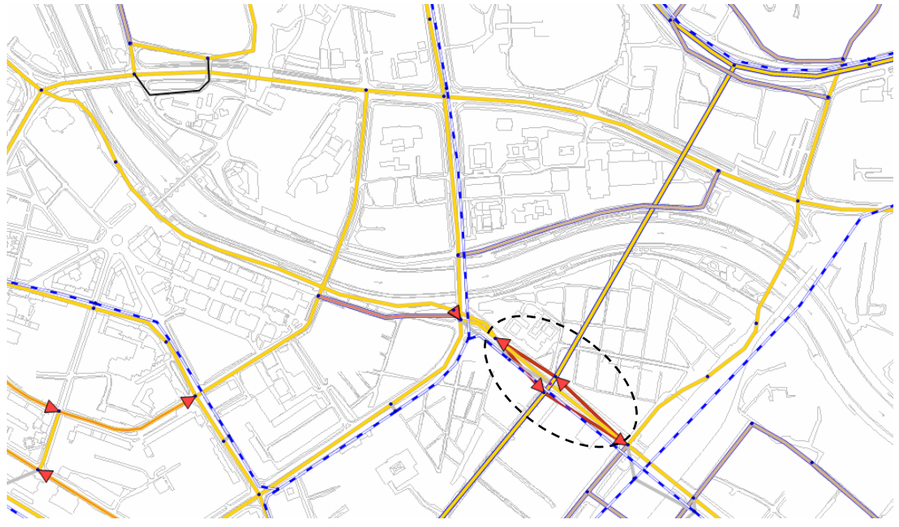
All remaining infrastructure has remains unchanged, i.e. the new city links NS (Kale) and EW (below Macedonia Square), Goce Delcev link bridge to Aerodrom, the four tram lines, etc. As shown in the GUP scheme, an access at Pitu Blvd has been included to ramp off and on to the East Blvd (near Transporten Centre, see image).

It can be concluded that there are two different section of the East Boulevard:

- The **Section North**: branching off at the Magistrala Nikola Karev west to the University and heading south. After crossing the river, the Pitu Blvd will be reached where access ramps guarantee connection with either side: to the west to reach the city centre and to the east to reach Transporten Centre and Aerodrom.

- The **Section South**: heading further south and following on an elevated structure the existing corridor of Krusevska Blvd. After passing over the grounds of Tutunski Kombinat there will be a new junction to link the East Blvd with Makedonija Blvd ("South Boulevard").

GRAPHIC 47, ACCESS RAMPS FOR EAST BLVD (VISUM SCREEN SHOT), SOURCE: IDOM



Following daily flows for the year 2030 have been obtained by adding this new Boulevard:

TABLE 69, Daily flows of East Blvd in 2030, Source: IDOM

	Southbound (VISUM)	Northbound (VISUM)	both ways	equalled one way
EAST BOULEVARD (NORTH)	18.106	11.724	29.830	**14.915**
EAST BOULEVARD (SOUTH)	6.259	6.850	13.109	**6.555**

In order to see the impact of the East Blvd, a flow comparison with other main boulevards of the City Centre has been done:

TABLE 70, Flows with/ without East Blvd in 2030, Source: IDOM

Daily Traffic Volume 2030	both ways			Reference
	with East Blvd	without East Blvd		
EAST BOULEVARD (NORTH)	**29.830**	0		
EAST BOULEVARD (SOUTH)	**13.109**	0		
Kuzman Josef. Pitu (3 lane/ direction)	**20.549**	17.759	slight increase	Access east at Kompleks Banki Jct (see 4.4)
Krste Misirkov (3 lanes/ direction)	**11.312**	11.714	indifferent	Access north at Kompleks Banki Jct (see 4.4)
Krste Misirkov (4 lanes/ direction)	**20.865**	21.465	slight decrease	Access north at Mavrovka Jct (see 4.5)
Goce Delcev (4 lanes/ direction)	**22.908**	39.790	important decrease	Access west at Mavrovka Jct (see 4.5)
Goce Delcev (3 lanes/ direction)	**23.430**	33.265	important decrease	Access north at Post Jct (see 4.3)
Blvd VMRO (3 lanes/ direction)	**31.041**	30.113	indifferent	Access south at Post Jct (see 4.3)

As it can be see, the new East Blvd captures an important load of the traffic passing Goce Delcev, whereby the north south flow passing Krste Misirkov parallel to the East Blvd decreases much less.

There was also a capacity analysis undertaken to determine the peak demand and the lane requirements for this new Boulevard. As the main conclusion it will be recommended to have a different design for the northern section than the southern due to very different traffic loads:

TABLE 71, Lane requirements for East Blvd in 2030, Source: IDOM

	with 2 lane design per dir		with 3 lane design per dir	
	avg lane flow	per lane/ AM peak h	avg lane flow	per lane/ AM peak h
EAST BOULEVARD (NORTH)	7458	746	4972	**497**
EAST BOULEVARD (SOUTH)	3277	**328**	2185	218

The table above shows clearly that the northern section should be of three lanes per direction whereas the southern section beyond Pitu Blvd would work without complications with only two lanes/ direction (see numbers in bold).

8. CONCLUSIONS FOR A MORE SUSTAINABLE MOBILITY IN SKOPJE

The following paragraphs are an overall outcome of the Transport Master Plan and can be seen as conclusions of the previous chapters. As IDOM has analysed Detailed Urban Plans as well as citywide Master Plans, like the General Urban Plan (GUP) 2020, this Report should be read as the basis with recommendations for any future planning frameworks, especially as the starting point for the new GUP for a horizon up to the year 2030. It should also be seen as the foundation for any future funding, which might be obtained from the European Union.

Strategic goals for implementation of the traffic policy in the City for future long-term period need to be clearly defined in the new GUP. There should be a clear statement that traffic policy should reflect Skopje's character as a compact, dense structure with short trips, mainly undertaken by modes other than by car.

This sustainable element of Skopje needs to be reflected in future policies, such as

- prioritising environmentally modes, like bus, light rail, bicycle and walking
- strengthen the accessibility of CENTAR by these environmentally modes, to which most trips are orientated
- in this respect regulate also parking policy by applying an area-wide tariff system, especially in CENTAR and other areas with high parking demand
- develop the potentials in respect to the above, i.e. the existing wide road corridors and the existing rail network
- institutional changes, such as concentrating both land-use and transport policies in the City Hall, at least for projects of a city wide importance
- better traffic management for the metropolitan area, including also national roads
- priority signalling for light rail cars, taxis and buses at key junctions
- Ideally would be the establishment of a Metropolitan Transport Authority to manage projects and operation of all modes, and to ensure a healthy and efficient interaction of mode changes and timetables.

The following chapters give more details to the goals above.

8.1. IMPROVE PUBLIC TRANSPORT NETWORK

Several measures to increase the use of the public transport system have already been mentioned in the previous chapter. As already mentioned, the Consultant opts for an integrated public transport system, which maximises the use of public transport and results in positive and sustainable effects for all, hence the creation of an additional scenario in the previous chapter, called "2030 PLUS".

Some additional conclusions have been included below:

- By 2030, the light rail will be the prioritised mode of mass transport in Skopje due to its environmentally friendly characteristics and costumer friendly performance, i.e. integrity, speed, capacity. IDOM highlights, that Skopje, with its compact and dense urban shape, would be an ideal city for an efficient light rail system. The general function of the bus network, which needs to be re-organised previously, can be defined as a feeder for the light rail network.
- The phasing of the new light rail projects needs to take into account the development of the City, such as the further progress in road works and any other projects, like construction works to improve the City Centre. Once, light rail tracks are put, they should not need to be moved again. Therefore following implementation is proposed:
  1. The light rail line T1 will be the first to be opened by 2015 to serve the main trip flows of the City: West to Centre, East to Centre. It is important that there will be an Integrated City Centre Traffic Calming Strategy in place, prior to the line construction, as T1 needs to have priority when crossing Cupovski Street and turning into the junctions at Kompleks Banki and the Synodal Church. The East West Tunnel needs also to be in operation prior to the line opening.
  2. T2 will be the 2nd line, operating by 2020, serving the dense residential areas in the north and Kisela Voda in the south.
  3. T3 will be next with a probable opening in 2025.
  4. Finally, T4 will be finished by 2030. As this circular light rail-train line runs mostly on railway corridors, the implementation depends on the development of the national railway network and the improvement works for the Central Station "Transporten Centar". Line T4 requires also a final decision weather the highway "Makedonia Bouevard" will be built as it coincides entirely on its southern ring section with this new motorway.
- The new Metropolitan Transport Authority should define concessions to private public transport operators to stimulate competitiveness whereby quality and operation will be ensured. Furthermore, all illegal transport services need to disappear; the power of the Authority should enable and manage this task, aiming a transparent, fair and equal system between all operators.
- This Authority will also regulate the taxi licenses, as taxis should be as a basic an integrated part of the overall public transport strategy, set out in the new GUP
- Nº 19 stations have been proposed for the new light rail-train line T4. All of these T4 access points have been identified by evaluating the environment of the corridor, which coincides in the north and east with the existing railway. Stops have been placed near existing or proposed bus or light rail interchanges and/ or nearby other main trip generators, see below:

TABLE 72, STATIONS AND MILEAGE OF T4 IN ONE DIRECTION, SOURCE: IDOM

STATION PROPOSAL OF CIRCLE LINE T4 OF IDOM (YET NOT DEFINED BY THE CITY COUNCIL)			
	Station Proposal	Mileage	interchanges in the vicinity/ key trip hubs in the area
1	T4 T Centar	0,000km	T1, bus and railway stations, urban bus lines
3	T4 Hospital - Ramstor	1,872km	Main Hospital, Ramstor Shopping Centre, City Centre, urban bus lines
4	T4 Roosevelt	3,385km	urban bus lines
5	T4 8th Sep	4,054km	urban bus lines
6	T4 Student Residency	5,170km	Student Residency Goce Delcev, urban bus lines
7	T4 Hrom South	6,483km	urban bus lines
8	T4 Hrom North	7,367km	T1, T3, urban bus lines
9	T4 Dame Gruev	8,147km	T1, urban and suburban bus lines
11	T4 Bardovci	10,726km	suburban bus lines, Bardovci Village
12	T4 Sutka	14,403km	urban and suburban bus lines
13	T4 Sever	15,279km	T2, urban bus lines
15	T4 Zelezara	18,477km	urban bus lines, industrial estates
18	T4 Saem	22,096km	T3, urban bus lines, industrial estates
19	T4 T Centar	23,156km	T1, bus and railway stations, urban bus lines

- Bus lanes should be implemented to give them priority, in particular at bottle necks and in the surroundings of major road junctions
- At major road junctions with light rail cars crossing, traffic light phasing needs to favour light rail operation and no left turn should be permitted across tracks
- Bus terminals or interchange facilities with bus bays and bus parking facilities need to be built at key stations of the light rail network, according to the proposed bus network changes listed in the previous chapter
- The Airport – the most important in the country - needs to be connected by an Express Bus Lines to the main spots of the Capital, such as the interchanges at Transporten Centar and the vicinity of Macedonia Square.

It is a matter of fact that the Central Railway Station **Transporten Centar** does not use its potential at all. The Consultant is aware, that there will be another study which focuses on the reactivation of the railway network and boosts the potential of this hub. In line with the above, facilities, platforms etc. at **Transporten Centar** need to be modernised to give also easy access and interchange between all urban modes, such as light rail lines T1, T4, urban and suburban buses as well as Park and Ride and pedestrians and cyclists.

All connections should be accessible for mobility challenged users, they need to be within a short distance to each other and they should be equipped costumer friendly for all weathers, etc.

IMAGE 55, UPGRADED INTERMODAL INTERCHANGE TRANSPORT CENTAR, SOURCE: IDOM

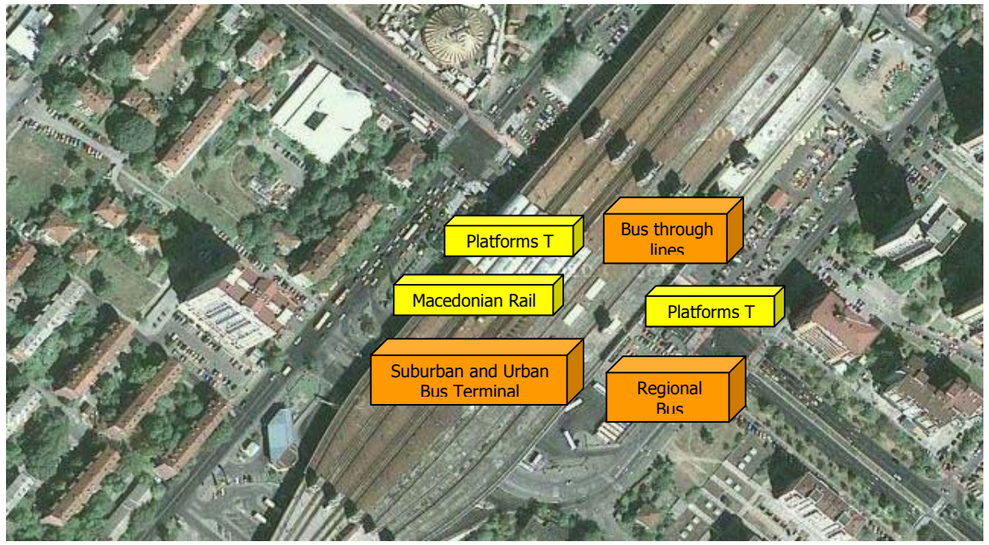


IMAGE 56, POSSIBLE PLATFORMS FOR T2 AND T4 AT TRANSPORT CENTAR, SOURCE: IDOM

8.2. IMPROVE PRIVATE TRANSPORT NETWORK

In terms of private transport the new GUP should adopt the following strategy. New road proposals should be developed in order to set new priorities compared to those set in the outdated GUP from 2000. In this respect, corrections of the primary traffic network should be made, such as alternative connections, more focussed on European sustainable guidelines to achieve optimal solutions for all: pedestrians, cyclists, mobility challenged persons, public transport users and vehicle user alike. Some measure might be:

- Evaluation of the unrealized part of the planned traffic solution in the old GUP (new phasing, change of project characteristics or its elimination)
- Indicators how successful is the functioning of the transport systems in the 2030 scenarios
- Integrated conceptual traffic solution for the central area, with emphasis on the underground roads.
- Introduction of new proposals, see details of Scenario "2030 PLUS" of IDOM, previously explained, concerning highway infrastructure:
    - Macedonia Boulevard ("South Blvd") - taken out
    - Outer Ring Southeast between Prvmosaska – Pripor - taken out
    - Dual Carriageway between Junction Gorce Centre/ Blvd Montenegro– Volkovo: Extension Blvd Ilinden - taken out
    - Widening of Saraj Bridge – high priority
    - Closure of Cupovski Street except for LIGHT RAIL and PEDESTRIANS – high priority
    - Traffic-Calm and revitalise Gorce Petrov Blvd whereby through traffic will be divert onto new Montenegro Blvd– high priority
- IDOM is aware, that the City Council is planning a new Traffic Management Centre, aiming a better and more coordinated control of traffic lights and other measures to improve flow conditions and restrict traffic if required. The activities of this centre need to comply with the guidelines set in the new GUP - all proposals of this Chapter refer.
- Closely related to the previous point is the fact that Skopje holds a high capacity ring road motorway which is currently under used. In order to achieve a better mobility management, some traffic flows should be re-directed via this alternative, as it will relieve the city, especially of heavy vehicle flows, which tend to use the City highways instead of the existing by-pass.

8.3. PARKING MANAGEMENT

As mentioned earlier, public transport needs to be prioritised against the use of private vehicles. Therefore, private car use needs to be discouraged, especially in the city centre.

An efficient parking management will be the key to reach this goad. Parking needs to be banned within and near public transport corridors and stops, such as bus and light rail lanes and especially on sidewalks, especially there where pedestrians cross and dwell.

IMAGE 57, CURRENT PARKING ON SIDEWALKS, SOURCE: IDOM

As it has been shown abroad, an efficient and more expensive parking ticket system would furthermore discourage the entry of cars into the city centre. As a general rule of thumb the public transport should always be cheaper than parking a car there.

There is an urgent need to develop an integrated parking strategy for the City to define the distribution of parking spaces across the urban areas on surface, under-ground or above-ground.

Within this strategy, there would be also measuress for improvement of the offer and use of the parking spaces in the City.

8.4. IMPROVE CONDITIONS FOR BICYCLES AND PEDESTRIANS

Some proposals to improve the situation for cyclists and pedestrians are summarised below.

- Movement and access of persons with special needs.

- Include cross sections
- Traffic-calm centre and close traffic at Cupovski and in wider zone of Turkish Bazaar
- Walking crossovers over the roads (de-levelled) (underground).

Good practice examples of light rail cars running within urban public space are shown in the following cross sections:

IMAGE 58, CROSS SECTION WITH SEPERATED LIGHT RAIL TRACKS IN PARTIZANSKI ODREDI, SOURCE: FEASIBILITY STUDY 2008

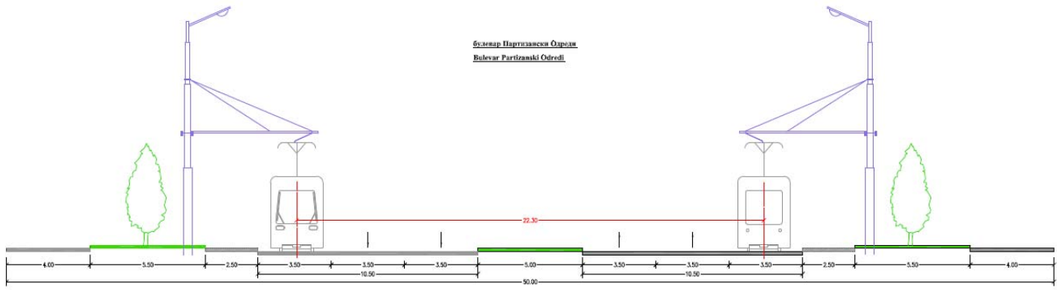


IMAGE 59, CROSS SECTION WITH COMBINED LIGHT RAIL TRACKS ADJACENT TO AN URBAN STREET: SIDEWALK – LANE – PARKING – SIDEWALK – LIGHT RAIL STOP, SOURCE: IDOM VITORIA

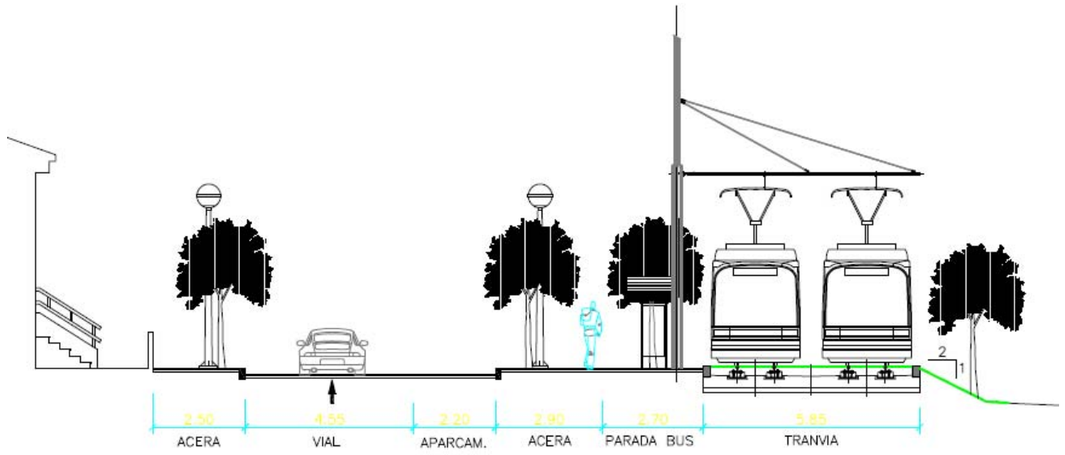


IMAGE 60, CROSS SECTION WITH COMBINED LIGHT RAIL TRACKS IN AN URBAN BOULEVARD, SOURCE: IDOM ZARAGOZA

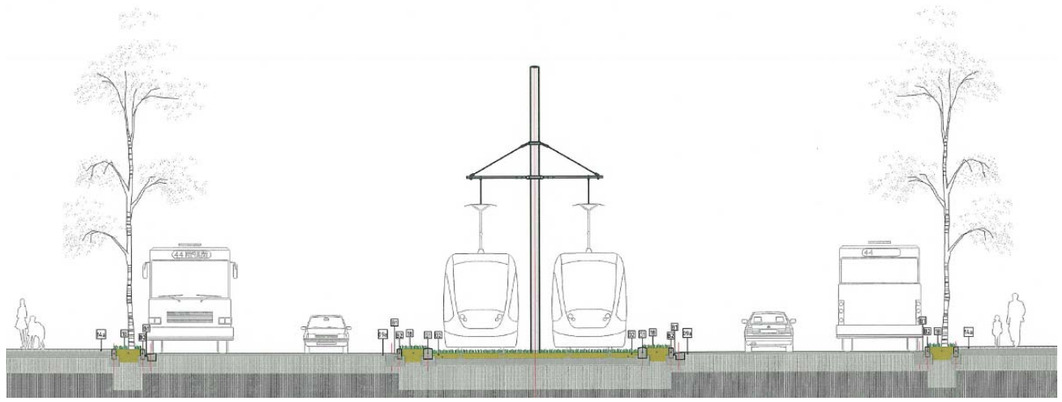
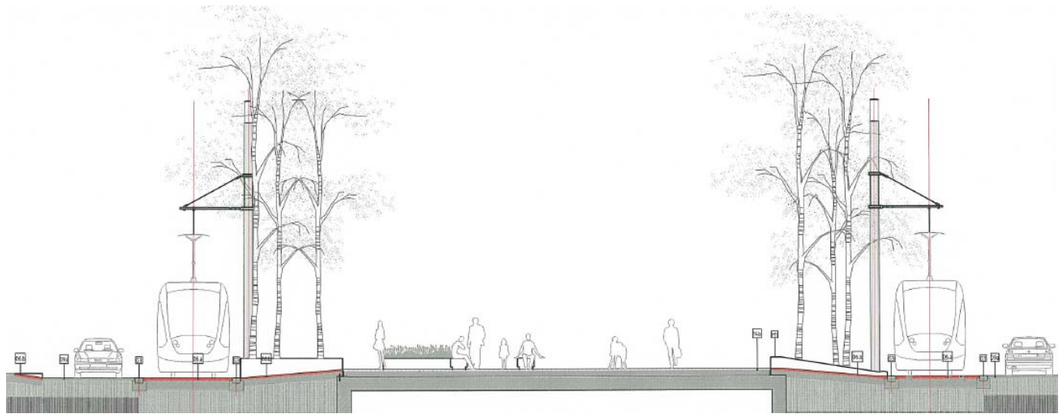


IMAGE 61, CROSS SECTION WITH SEPERATED LIGHT RAIL TRACKS IN AN URBAN BOULEVARD, SOURCE: IDOM ZARAGOZA



8.5. HELIPAD SITES

Any proposed helipads need to be compatible with the airborne movements of the City of Skopje. The applicable global legislation is the "International Aerodrome Standards and Recommended Practices - Annex 14 - to the Convention on International Civil Aviation - Volume II - Heliports - Second Edition - July 1995'

The landing surface would be circular type helipad in general of 28 m in diameter, and equals to 615 m^2. According to the above mentioned guidelines of ICAO, lighting needs to be installed around the landing area; most common are LED light buoys. Other required equipment is:

- Air traffic control facilities
- Windsocks
- Other equipment requested by the ICAO.

Heliports can be located on rooftops, for instance on the new high rise building east to Kompleks Banki. They should also be a Heliport on the grounds of the General Hospital.

However, any feasibility study of proposed locations for helipads will be dependent on more factors, especially local wind conditions, which need to be studied further.

8.6. IMPROVEMENT OF URBAN PUBLIC SPACE

- Another objective is the introduction of an integrated waste management which helps to empty the waste bins in a more efficient way while improving the environment of urban fabric.
- A weakness in this respect is that bins block and disturb public spaces fairly often; this is especially in the city centre a common nuisance.
- One alternative suitable for Skopje to overcome this matter would be to integrate them in the pavement (see photo)

IMAGE 62, UNDERGROUND WASTE CONTAINER IN AMSTERDAM, SOURCE: INTERNET

9. ANNEX. RESULTS OF SURVEY PER MUNICIPALITY

TABLE 73, TYPE OF EMPLOYMENT CENTAR, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	207	829	207	4.352	0	207	829	0	0	6.631
Kisela Voda	868	1.277	817	4.392	0	715	1.277	357	0	9.703
Aerodrom	1.298	2.515	771	1.501	41	1.136	1.988	122	41	9.413
Butel	2.025	3.362	497	840	76	1.566	3.285	115	38	11.804
Gjorce Petrov	967	1.429	168	1.345	168	631	1.009	42	0	5.760
Karpos	632	421	53	579	0	316	526	211	0	2.737
Cair	45	182	91	136	0	136	227	0	45	864
Saraj	41	123	20	61	0	20	61	41	20	388
Gazi Baba	0	70	0	46	0	12	35	0	0	162
Suto Orizari	0	0	0	0	0	0	0	0	0	0
Total	6.083	10.207	2.624	13.254	285	4.739	9.238	887	145	47.462

GRAPHIC 48, TYPE OF EMPLOYMENT CENTAR, SOURCE: IDOM

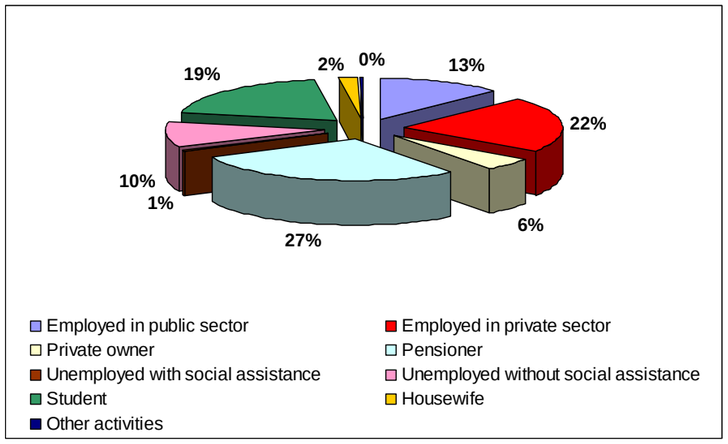


TABLE 74, TYPE OF EMPLOYMENT KISELA VODA, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	1.605	0	4.548	0	0	268	0	0	6.421
Kisela Voda	1.644	3.028	952	4.325	260	692	779	173	87	11.938
Aerodrom	2.557	3.921	625	1.875	341	2.046	1.421	284	0	13.070
Butel	2.756	6.115	1.077	1.120	172	3.402	4.694	129	86	19.552
Gjorce Petrov	590	1.598	271	1.008	49	566	1.230	221	0	5.533
Karpos	287	473	129	631	57	330	746	100	0	2.755
Cair	44	142	22	120	0	66	197	11	0	601
Saraj	30	60	0	0	0	60	0	0	0	149
Gazi Baba	0	0	0	0	0	0	0	0	0	0
Suto Orizari	0	19	0	0	0	19	10	0	19	67
Total	7.908	16.962	3.075	13.628	879	7.180	9.343	919	192	60.084

GRAPHIC 49, TYPE OF EMPLOYMENT KISELA VODA, SOURCE: IDOM

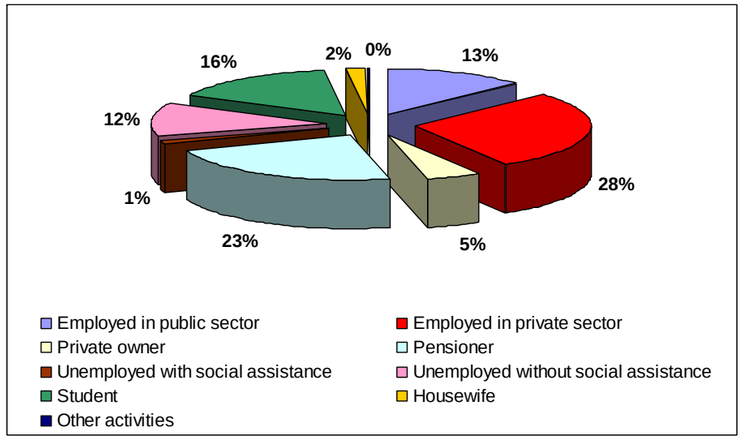
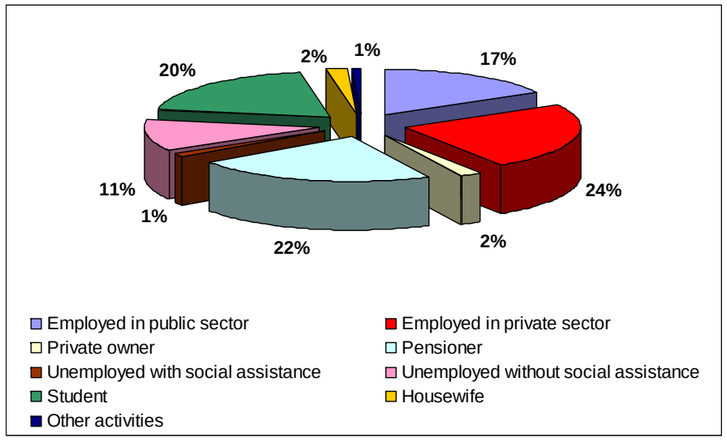


TABLE 75, TYPE OF EMPLOYMENT AERODROM, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	851	1.702	0	4.681	0	0	851	0	0	8.086
Kisela Voda	2.950	2.379	285	5.994	285	761	1.808	571	0	15.034
Aerodrom	2.883	4.742	465	2.511	372	2.464	2.511	325	186	16.459
Butel	4.354	6.831	601	1.651	150	3.378	7.056	375	225	24.622
Gjorce Petrov	1.125	1.344	62	1.312	62	1.125	1.812	31	94	6.968
Karpos	370	876	101	741	34	370	808	135	34	3.469
Cair	106	197	30	76	0	151	121	45	30	756
Saraj	58	43	0	14	14	14	43	0	0	188
Gazi Baba	0	36	0	12	0	12	12	12	0	84
Suto Orizari	0	0	0	0	0	0	0	0	0	0
Total	12.696	18.150	1.545	16.993	918	8.276	15.023	1.495	569	75.665

GRAPHIC 50, TYPE OF EMPLOYMENT AERODROM, SOURCE: IDOM



GRAPHIC 51, TYPE OF EMPLOYMENT BUTEL, SOURCE: IDOM

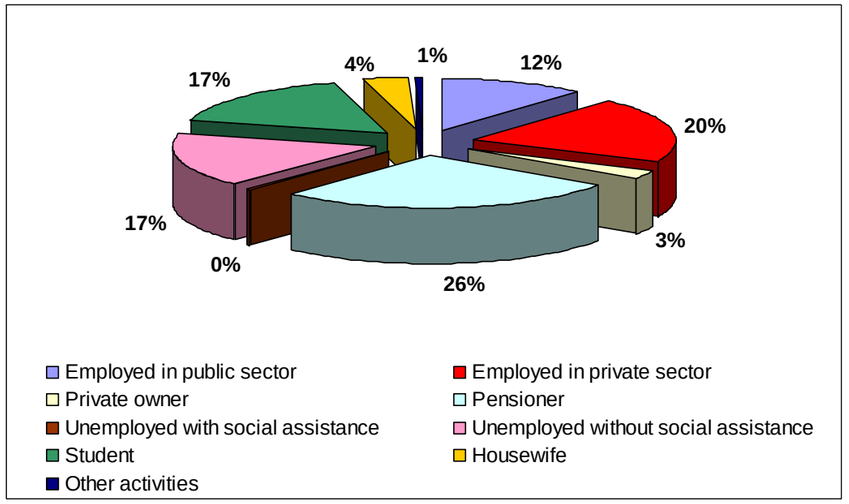


TABLE 76, TYPE OF EMPLOYMENT BUTEL, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	0	291	2.618	0	291	0	0	0	3.200
Kisela Voda	716	716	195	3.644	0	1.041	195	456	65	7.028
Aerodrom	967	2.115	60	1.450	60	1.571	1.148	60	0	7.431
Butel	1.617	2.606	314	1.213	0	1.797	2.830	314	45	10.738
Gjorce Petrov	620	1.529	165	785	41	744	1.281	289	41	5.497
Karpos	330	289	41	496	0	661	702	124	41	2.684
Cair	107	249	0	107	0	178	249	36	0	925
Saraj	0	0	0	0	0	0	0	0	0	0
Gazi Baba	0	58	0	19	0	19	19	19	0	136
Suto Orizari	0	31	0	16	0	0	0	47	0	94
Total	4.357	7.593	1.068	10.348	102	6.302	6.425	1.346	193	37.734

TABLE 77, TYPE OF EMPLOYMENT GJORCE PETROV, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	885	0	442	1.769	0	442	0	0	0	3.538
Kisela Voda	1.045	1.509	232	3.715	116	348	580	348	0	7.894
Aerodrom	1.487	2.819	461	513	103	1.384	1.333	410	51	8.561
Butel	2.495	3.626	585	897	39	1.404	3.899	195	273	13.412
Gjorce Petrov	406	1.219	87	610	58	755	1.132	232	29	4.528
Karpos	360	788	17	428	17	240	548	137	17	2.552
Cair	86	193	21	193	0	21	128	21	0	663
Saraj	19	78	0	58	39	19	39	0	0	253
Gazi Baba	0	0	0	0	0	0	0	0	0	0
Suto Orizari	0	0	0	0	0	0	0	0	0	0
Total	6.782	10.232	1.846	8.182	372	4.613	7.659	1.344	370	41.401

GRAPHIC 52, TYPE OF EMPLOYMENT GORCE PETROV, SOURCE: IDOM

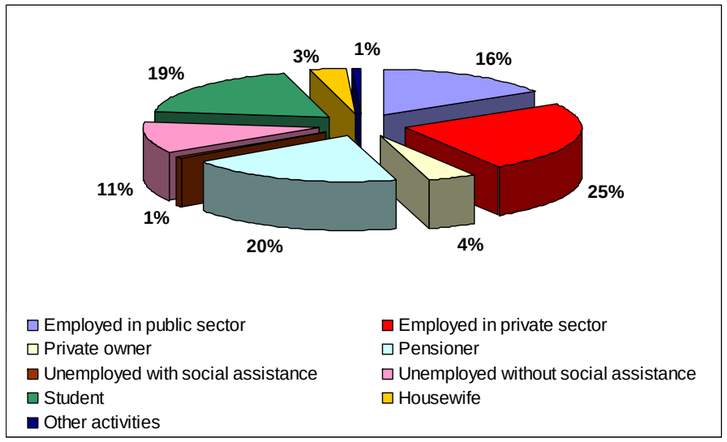


TABLE 78, TYPE OF EMPLOYMENT KARPOS, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	1.687	1.349	337	4.385	337	0	1.012	0	0	9.108
Kisela Voda	2.126	1.898	683	7.137	304	759	1.215	456	0	14.578
Aerodrom	2.443	3.908	533	1.643	133	1.510	2.620	178	178	13.146
Butel	2.648	4.876	452	1.259	97	1.679	5.134	291	32	16.469
Gjorce Petrov	926	1.228	161	845	40	302	866	101	0	4.468
Karpos	130	438	65	406	16	178	438	97	49	1.817
Cair	19	77	0	77	0	77	134	19	0	403
Saraj	34	8	0	0	8	8	51	0	0	110
Gazi Baba	0	0	0	0	0	0	0	0	0	0
Suto Orizari	0	0	0	0	0	0	0	0	0	0
Total	10.012	13.783	2.232	15.753	936	4.514	11.470	1.141	259	60.100

GRAPHIC 53, TYPE OF EMPLOYMENT KARPOS, SOURCE: IDOM

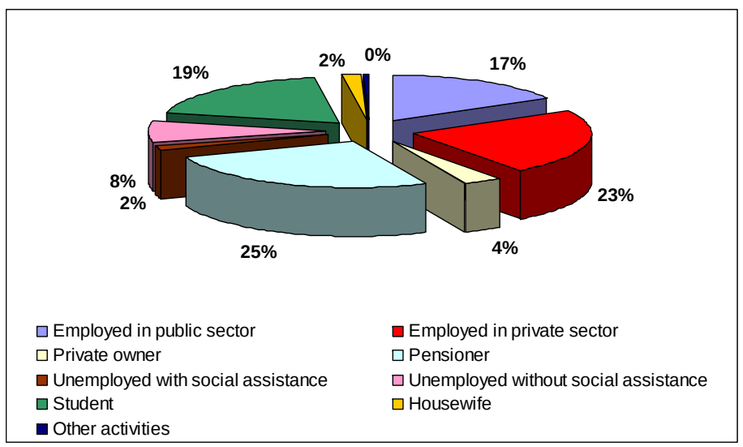


TABLE 79, TYPE OF EMPLOYMENT CAIR, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	0	0	0	2.867	2.867	0	0	0	5.733
Kisela Voda	2.222	741	148	5.037	296	1.629	1.185	1.185	148	12.591
Aerodrom	1.692	2.648	883	2.133	441	2.060	1.913	1.471	74	13.314
Butel	2.619	2.762	1.857	1.476	381	2.238	4.714	2.905	286	19.238
Gjorce Petrov	662	547	893	806	173	1.584	3.283	1.728	173	9.849
Karpos	412	445	329	692	82	659	1.466	708	16	4.809
Cair	47	129	59	294	71	176	588	282	12	1.657
Saraj	150	56	0	56	0	56	131	56	0	507
Gazi Baba	0	0	17	35	52	52	52	35	0	244
Suto Orizari	8	16	0	24	0	72	16	32	0	169
Total	7.812	7.344	4.186	10.553	4.363	11.394	13.348	8.403	708	68.112

GRAPHIC 54, TYPE OF EMPLOYMENT CAIR, SOURCE: IDOM

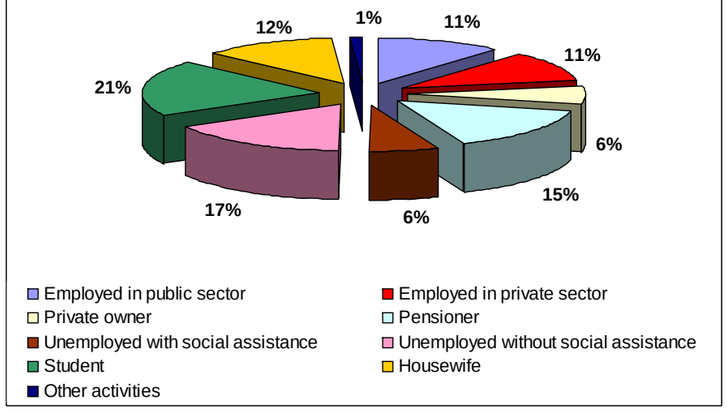


TABLE 80, TYPE OF EMPLOYMENT SARAJ, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	0	0	0	0	0	0	0	0	0
Kisela Voda	1.412	0	0	0	0	0	2.823	1.412	0	5.646
Aerodrom	1.326	0	497	166	166	1.989	829	1.160	0	6.133
Butel	1.370	219	1.370	110	329	1.808	2.137	2.028	0	9.370
Gjorce Petrov	575	223	670	287	128	1.564	2.458	1.788	128	7.822
Karpos	303	358	578	165	193	1.184	1.047	881	83	4.792
Cair	214	107	235	43	43	514	535	557	21	2.269
Saraj	127	36	73	0	36	73	127	218	18	707
Gazi Baba	12	12	0	36	0	48	24	109	12	254
Suto Orizari	32	0	16	16	0	32	49	81	0	227
Total	5.371	956	3.440	823	894	7.213	10.029	8.233	262	37.221

GRAPHIC 55, TYPE OF EMPLOYMENT SARAJ, SOURCE: IDOM

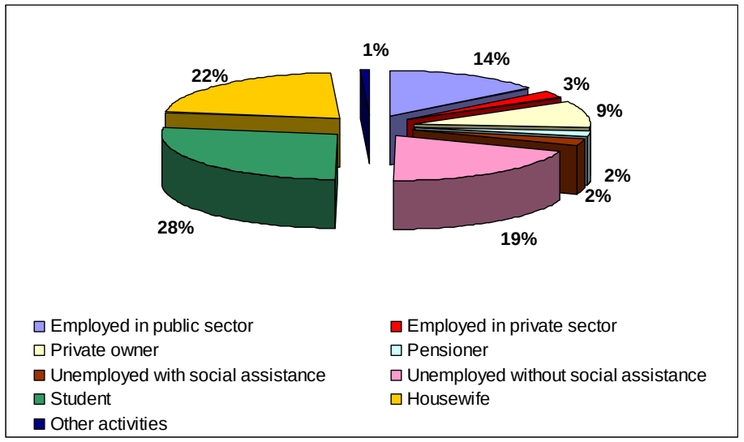


TABLE 81, TYPE OF EMPLOYMENT GAZI BABA, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	298	0	4.466	298	893	0	298	0	6.252
Kisela Voda	979	3.549	245	5.997	490	1.346	1.346	857	122	14.932
Aerodrom	1.801	4.977	379	2.133	142	2.560	2.370	521	190	15.074
Butel	2.613	6.111	753	1.284	266	4.030	6.244	487	177	21.964
Gjorce Petrov	863	2.354	392	1.072	235	1.334	2.197	314	105	8.866
Karpos	206	1.443	180	876	77	902	1.108	386	0	5.179
Cair	223	318	0	271	0	446	350	111	48	1.767
Saraj	226	151	38	75	0	75	75	75	0	716
Gazi Baba	22	22	22	45	0	89	67	22	0	291
Suto Orizari	0	101	0	51	0	51	51	101	0	354
Total	6.933	19.324	2.009	16.270	1.508	11.726	13.808	3.174	641	75.394

GRAPHIC 56, TYPE OF EMPLOYMENT GAZI BABA, SOURCE: IDOM

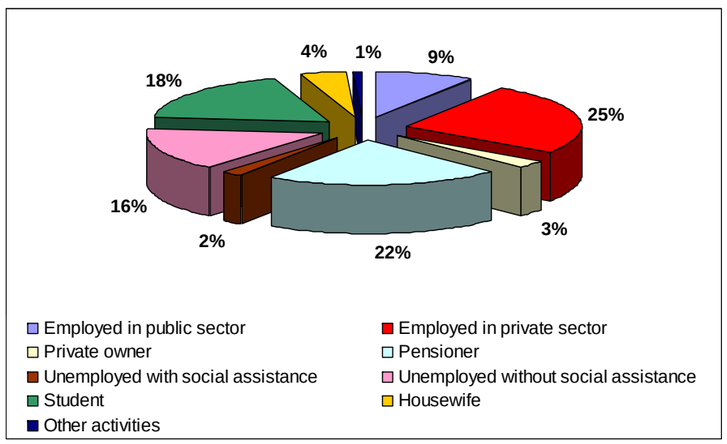


TABLE 82, TYPE OF EMPLOYMENT SUTO ORIZARI, SOURCE: IDOM

	Employed in public sector	Employed in private sector	Private owner	Pensioner	Unemployed with social assistance	Unemployed without social assistance	Student	Housewife	Other activities	Total general
Centar	0	0	0	831	0	415	0	0	0	1.246
Kisela Voda	301	0	0	402	1.305	1.004	0	201	0	3.213
Aerodrom	286	429	0	143	787	1.216	358	143	0	3.363
Butel	325	139	186	0	1.439	1.624	1.485	0	0	5.197
Gjorce Petrov	236	197	39	0	906	1.496	1.339	79	0	4.292
Karpos	198	119	0	238	911	911	792	40	0	3.207
Cair	88	29	29	88	292	526	350	0	29	1.431
Saraj	23	0	0	47	256	186	116	0	0	629
Gazi Baba	24	24	0	0	24	171	73	0	0	317
Suto Orizari	0	0	0	0	0	246	19	0	0	265
Total	1.482	938	254	1.747	5.920	7.796	4.532	462	29	23.161

GRAPHIC 57, TYPE OF EMPLOYMENT SUTO ORIZARI, SOURCE: IDOM

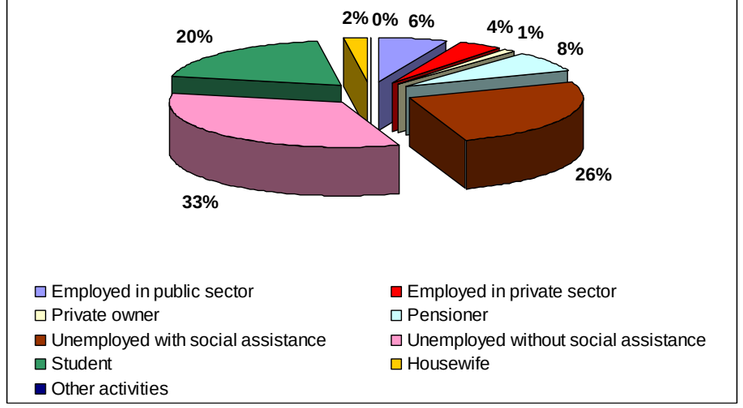


TABLE 83, SECTOR OF EMPLOYMENT (ACTIVITY) CENTAR, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	207	414	0	414	0	0	207	5.388	6.631
2,0	409	460	511	664	51	102	102	306	357	6.741	9.703
3,0	568	446	933	1.055	284	162	162	325	690	4.788	9.413
4,0	917	306	802	1.222	573	344	306	879	649	5.806	11.804
5,0	336	126	336	673	168	210	126	84	505	3.195	5.760
6,0	211	53	263	474	53	0	0	0	53	1.632	2.737
7,0	0	0	45	91	45	0	0	45	136	500	864
8,0	0	0	41	82	0	20	0	41	20	184	388
9,0	0	12	0	46	0	0	12	0	0	93	162
10,0	0	0	0	0	0	0	0	0	0	0	0
Total	2.440	1.402	3.139	4.721	1.174	1.253	708	1.680	2.618	28.326	47.462

* Student, unemployed, pensioner, housewife

GRAPHIC 58, SECTOR OF EMPLOYMENT (ACTIVITY) CENTAR, SOURCE: IDOM

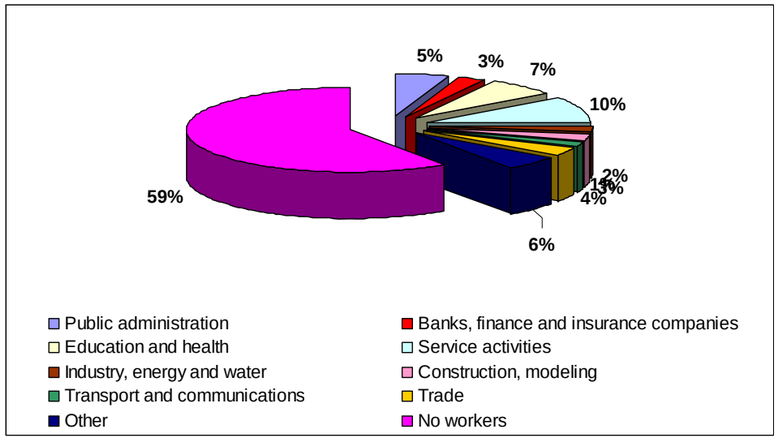


TABLE 84, SECTOR OF EMPLOYMENT (ACTIVITY) KISELA VODA, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	535	0	803	268	0	0	0	0	4.816	6.421
2,0	433	779	865	1.384	1.211	87	87	606	173	6.315	11.938
3,0	852	341	1.136	1.250	1.648	284	511	625	455	5.967	13.070
4,0	775	474	1.766	2.584	1.507	732	345	1.249	603	9.518	19.552
5,0	271	197	221	615	295	98	246	492	74	3.025	5.533
6,0	115	14	158	301	100	29	57	86	29	1.865	2.755
7,0	33	11	11	66	33	11	0	55	0	382	601
8,0	0	0	0	0	30	0	60	0	0	60	149
9,0	0	0	0	0	0	0	0	0	0	0	0
10,0	0	0	0	10	10	0	0	0	0	48	67
Total	2.478	2.350	4.157	7.012	5.101	1.241	1.305	3.112	1.333	31.994	60.084

* Student, unemployed, pensioner, housewife

GRAPHIC 59, SECTOR OF EMPLOYMENT (ACTIVITY) KISELA VODA, SOURCE: IDOM

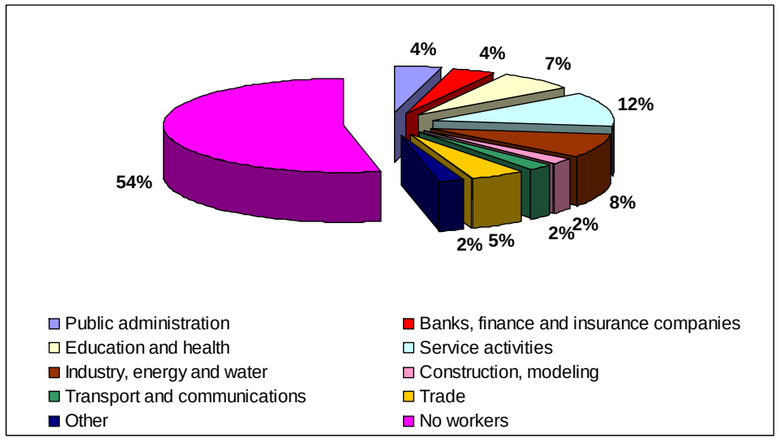
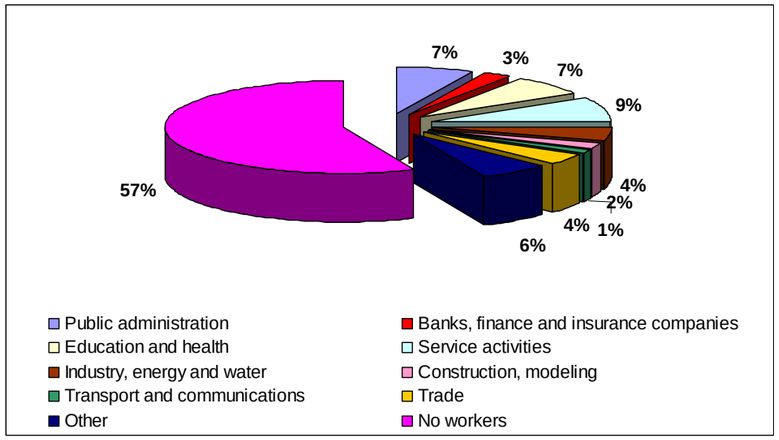


TABLE 85, SECTOR OF EMPLOYMENT (ACTIVITY) AERODROM, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	426	426	426	851	0	0	0	0	426	5.532	8.086
2,0	1.522	190	1.237	1.047	285	476	95	190	571	9.420	15.034
3,0	1.069	604	1.069	1.581	976	604	186	1.069	1.162	8.136	16.459
4,0	1.576	601	1.839	2.552	1.389	488	488	1.126	1.914	12.649	24.622
5,0	375	31	406	562	375	62	187	250	375	4.343	6.968
6,0	135	101	168	168	101	101	135	168	269	2.122	3.469
7,0	30	15	61	61	30	0	0	121	61	378	756
8,0	43	0	0	43	0	14	0	0	0	87	188
9,0	0	0	0	12	12	0	0	12	0	48	84
10,0	0	0	0	0	0	0	0	0	0	0	0
Total	5.177	1.968	5.206	6.877	3.169	1.746	1.091	2.937	4.778	42.715	75.665

* Student, unemployed, pensioner, housewife

GRAPHIC 60, SECTOR OF EMPLOYMENT (ACTIVITY) AERODROM, SOURCE: IDOM



GRAPHIC 61, SECTOR OF EMPLOYMENT (ACTIVITY) BUTEL, SOURCE: IDOM

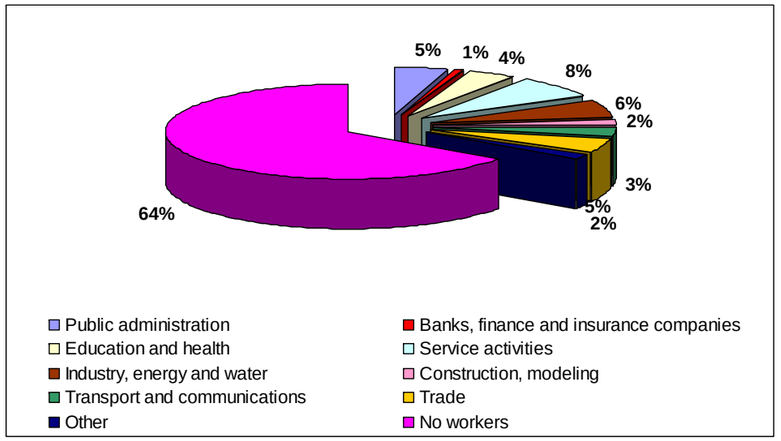


TABLE 86, SECTOR OF EMPLOYMENT (ACTIVITY) BUTEL, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	0	291	0	0	0	0	0	2.909	3.200
2,0	195	65	325	130	325	0	260	325	0	5.401	7.028
3,0	363	60	363	665	604	181	302	423	181	4.290	7.431
4,0	809	180	449	1.033	584	404	359	539	225	6.155	10.738
5,0	165	0	331	579	413	165	165	372	165	3.141	5.497
6,0	165	41	124	83	41	0	41	124	41	2.024	2.684
7,0	36	36	0	36	107	36	36	36	36	569	925
8,0	0	0	0	0	0	0	0	0	0	0	0
9,0	0	0	0	0	58	0	0	0	0	78	136
10,0	0	0	0	16	0	0	0	16	0	63	94
Total	1.733	382	1.592	2.832	2.133	786	1.164	1.835	648	24.630	37.734

* Student, unemployed, pensioner, housewife

TABLE 87, SECTOR OF EMPLOYMENT (ACTIVITY) GORCE PETROV, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	291	291	0	0	0	0	0	291	0	1.455	2.327
2,0	130	65	260	325	0	130	325	260	65	2.863	4.425
3,0	363	363	544	1.752	544	483	544	665	544	4.290	10.090
4,0	854	314	1.887	1.797	899	314	539	899	494	7.458	15.455
5,0	124	124	207	661	372	413	289	248	41	3.968	6.448
6,0	289	83	372	743	372	289	206	330	124	3.345	6.153
7,0	107	71	0	178	36	0	71	36	0	605	1.103
8,0	0	0	0	0	0	0	0	0	0	0	0
9,0	0	0	0	0	0	0	0	0	0	0	0
10,0	0	0	0	0	0	0	0	0	0		0
Total	2.157	1.311	3.269	5.457	2.222	1.630	1.975	2.728	1.268	23.983	46.001

* Student, unemployed, pensioner, housewife

GRAPHIC 62, SECTOR OF EMPLOYMENT (ACTIVITY) GORCE PETROV, SOURCE: IDOM

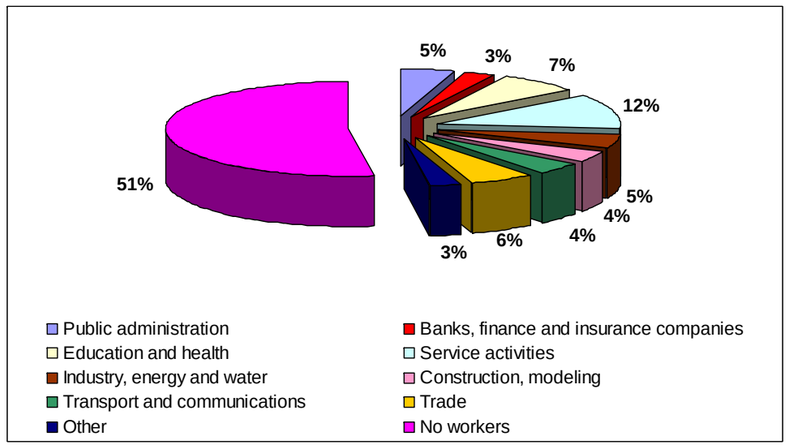


TABLE 88, SECTOR OF EMPLOYMENT (ACTIVITY), KARPOS, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	675	337	1.012	675	337	0	0	0	337	5.735	9.108
2,0	835	0	1.063	1.443	76	0	380	380	531	9.871	14.578
3,0	933	533	1.421	2.221	178	222	89	622	755	6.173	13.146
4,0	1.356	678	1.130	2.325	517	420	355	581	678	8.428	16.469
5,0	463	242	302	503	81	161	101	201	262	2.154	4.468
6,0	16	65	49	211	32	32	0	114	146	1.152	1.817
7,0	0	0	19	19	19	0	19	19	0	307	403
8,0	25	0	8	0	0	0	0	0	8	68	110
9,0	0	0	0	0	0	0	0	0	0	0	0
10,0	0	0	0	0	0	0	0	0	0	0	0
Total	4.303	1.855	5.005	7.396	1.240	835	944	1.917	2.718	33.887	60.100

* Student, unemployed, pensioner, housewife

GRAPHIC 63, SECTOR OF EMPLOYMENT (ACTIVITY) KARPOS, SOURCE: IDOM

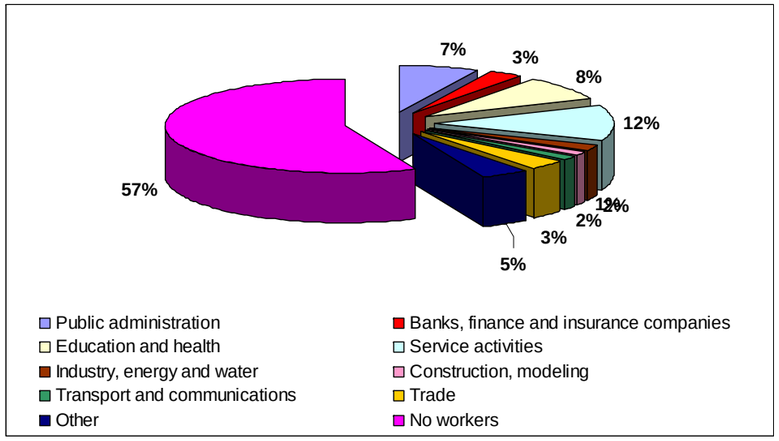


TABLE 89, SECTOR OF EMPLOYMENT (ACTIVITY) CAIR, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	0	0	0	0	0	0	0	5.733	5.733
2,0	296	148	1.037	741	296	148	0	296	296	9.333	12.591
3,0	809	368	441	1.618	662	74	294	662	368	8.018	13.314
4,0	1.190	95	571	2.571	905	238	190	905	857	11.714	19.238
5,0	202	29	317	778	115	86	58	547	115	7.603	9.849
6,0	165	33	82	395	115	33	49	214	115	3.607	4.809
7,0	12	0	0	106	24	12	0	59	24	1.422	1.657
8,0	113	0	19	56	0	19	0	0	0	300	507
9,0	0	0	0	0	0	17	0	0	0	227	244
10,0	0	0	0	0	8	0	0	16	0	145	169
Total	2.787	673	2.468	6.265	2.125	627	592	2.699	1.775	48.101	68.112

* Student, unemployed, pensioner, housewife

GRAPHIC 64, SECTOR OF EMPLOYMENT (ACTIVITY) CAIR, SOURCE: IDOM

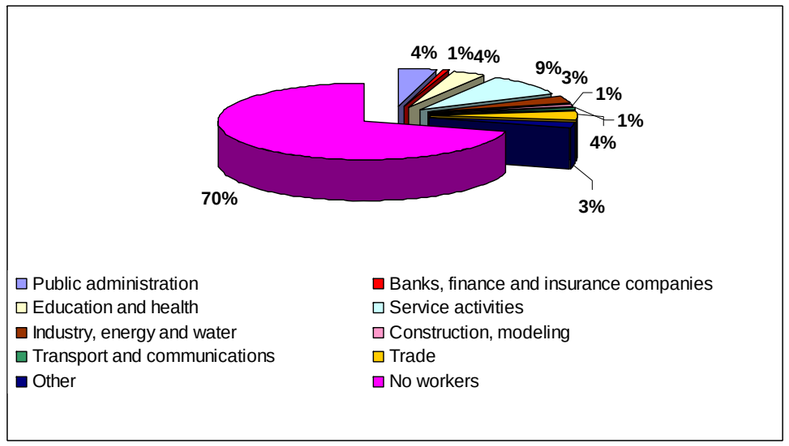


TABLE 90, SECTOR OF EMPLOYMENT (ACTIVITY) SARAJ, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	0	0	0	0	0	0	0	0	0
2,0	0	0	1.412	0	0	0	0	0	0	4.235	5.646
3,0	995	0	0	166	0	0	0	166	497	4.310	6.133
4,0	603	0	548	329	274	384	0	493	384	6.357	9.370
5,0	96	0	287	96	160	287	32	319	351	6.194	7.822
6,0	165	0	110	193	83	275	55	193	193	3.525	4.792
7,0	150	0	43	21	43	86	21	43	171	1.691	2.269
8,0	54	0	73	0	0	54	0	36	36	453	707
9,0	12	0	0	0	0	12	0	0	0	229	254
10,0	16	0	16	0	0	16	0	0	0	178	227
Total	2.091	0	2.489	805	559	1.115	108	1.250	1.632	27.173	37.221

* Student, unemployed, pensioner, housewife

GRAPHIC 65, SECTOR OF EMPLOYMENT (ACTIVITY) SARAJ, SOURCE: IDOM

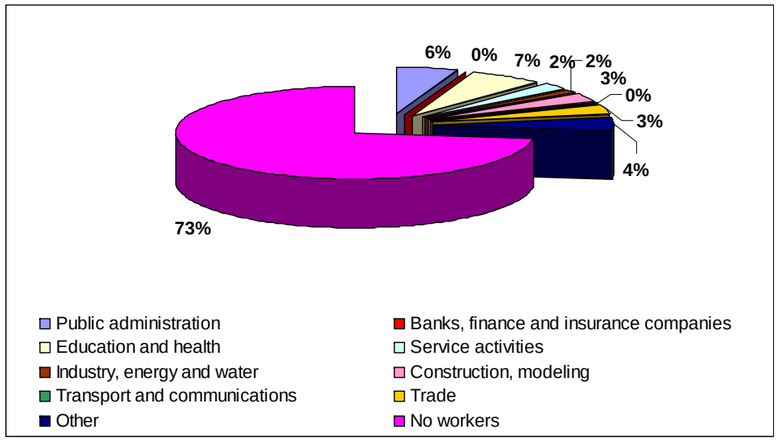


TABLE 91, SECTOR OF EMPLOYMENT (ACTIVITY) GAZI BABA, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	0	298	0	0	0	0	0	5.955	6.252
2,0	122	0	612	1.102	1.469	122	612	490	245	10.159	14.932
3,0	427	379	1.090	2.133	995	332	427	806	616	7.869	15.074
4,0	886	89	1.151	2.214	1.816	620	487	1.506	841	12.354	21.964
5,0	209	131	549	863	392	157	288	549	523	5.204	8.866
6,0	103	0	103	541	206	129	103	593	103	3.298	5.179
7,0	127	0	96	127	96	32	0	48	32	1.210	1.767
8,0	38	0	151	38	75	0	75	38	38	264	716
9,0	0	0	22	22	0	0	0	22	0	224	291
10,0	0	0	0	51	51	0	0	0	0	253	354
Total	1.912	599	3.774	7.389	5.100	1.392	1.992	4.051	2.398	46.789	75.394

* Student, unemployed, pensioner, housewife

GRAPHIC 66, SECTOR OF EMPLOYMENT (ACTIVITY) GAZI BABA, SOURCE: IDOM

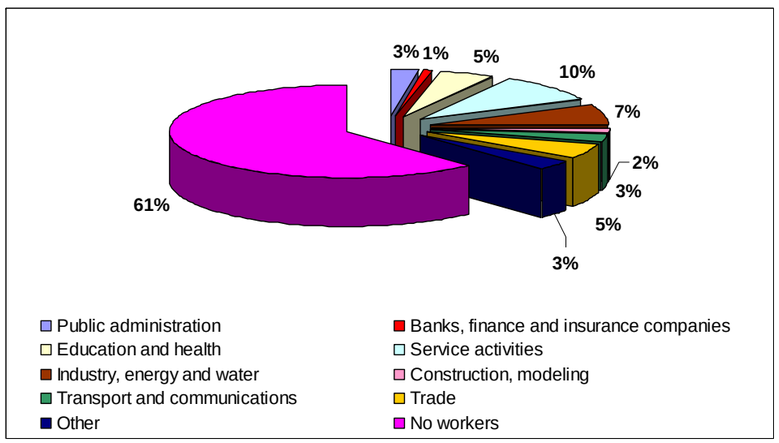


TABLE 92, SECTOR OF EMPLOYMENT (ACTIVITY) SUTO ORIZARI, SOURCE: IDOM

	Public administration	Banks, finance and insurance companies	Education and health	Service activities	Industry, energy and water (factories, industries etc.)	Construction, modeling	Transport and communications	Trade	Other	No workers*	Total general
1,0	0	0	0	0	0	0	0	0	0	1.246	1.246
2,0	0	0	0	201	100	0	0	0	0	2.912	3.213
3,0	72	0	72	286	72	143	0	72	0	2.647	3.363
4,0	46	0	0	371	0	93	46	93	0	4.548	5.197
5,0	39	0	0	157	79	79	0	79	39	3.819	4.292
6,0	119	0	0	119	40	0	79	0	0	2.851	3.207
7,0	0	0	0	58	29	0	29	29	0	1.285	1.431
8,0	0	0	0	23	0	0	0	0	0	605	629
9,0	0	0	0	24	0	0	0	24	0	268	317
10,0	0	0	0	0	0	0	0	0	0	265	265
Total	276	0	72	1.241	320	315	155	297	39	20.447	23.161

* Student, unemployed, pensioner, housewife

GRAPHIC 67, SECTOR OF EMPLOYMENT (ACTIVITY) SUTO ORIZARI, SOURCE: IDOM

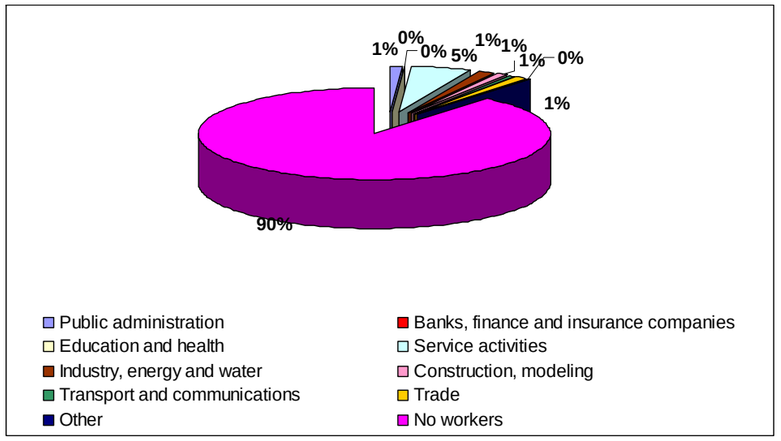


TABLE 93, NUMBER OF CARS IN MUNICIPALITY OF CENTAR, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	2.044	0	0	0	4.498	**2.044**
2,0	2.329	304	0	0	2.177	**2.633**
3,0	1.578	308	77	0	1.193	**1.963**
4,0	1.081	865	72	36	937	**2.055**
5,0	401	642	0	0	120	**1.043**
6,0	233	47	47	0	140	**326**
7,0	83	0	0	0	42	**83**
8,0	0	17	17	0	17	**33**
9,0	9	0	0	0	9	**9**
10,0	0	0	0	0	0	**0**
Total	**7.759**	**2.182**	**212**	**36**	**9.133**	**10.189**

TABLE 94, NUMBER OF CARS IN MUNICIPALITY OF KISELA VODA, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	1.568	0	0	0	4.705	1.568
2,0	2.580	688	0	0	2.666	3.267
3,0	2.645	918	0	0	810	3.563
4,0	3.176	794	42	0	919	4.011
5,0	640	332	47	0	95	1.019
6,0	225	93	40	0	106	357
7,0	29	48	0	0	10	77
8,0	0	19	0	0	0	19
9,0	0	0	0	0	0	0
10,0	0	0	7	0	0	7
Total	10.862	2.891	136	0	9.309	13.889

TABLE 95, NUMBER OF CARS IN MUNICIPALITY OF AERODROM, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	2.103	0	0	0	5.889	7.992
2,0	3.695	569	0	0	3.222	7.486
3,0	2.947	1.384	89	0	1.071	5.491
4,0	3.206	1.530	73	0	1.384	6.193
5,0	658	401	0	0	343	1.402
6,0	337	215	0	0	31	583
7,0	54	27	0	14	14	109
8,0	12	0	12	0	0	24
9,0	0	9	0	0	0	9
10,0	0	0	0	0	0	0
Total	13.012	4.134	174	14	11.954	29.288

TABLE 96, NUMBER OF CARS IN MUNICIPALITY OF BUTEL, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	Five Cars	No Cars	Total
1,0	287	0	0	0	0	2.870	3.157
2,0	1.628	65	0	0	0	1.823	3.516
3,0	1.688	175	0	0	0	640	2.503
4,0	1.710	438	44	0	0	526	2.718
5,0	652	230	38	38	0	153	1.112
6,0	302	75	0	0	0	75	453
7,0	0	67	33	0	33	0	134
8,0	0	0	0	0	0	0	0
9,0	0	15	0	0	0	0	15
10,0	10	0	0	0	0	0	10
Total	6.276	1.066	116	38	33	6.088	13.618

TABLE 97, NUMBER OF CARS IN MUNICIPALITY OF GJORCE PETROV, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	1.322	0	0	0	2.203	3.524
2,0	1.467	339	0	0	2.144	3.950
3,0	1.722	287	48	0	813	2.869
4,0	2.039	742	37	0	556	3.374
5,0	509	214	0	0	187	911
6,0	269	111	16	0	32	428
7,0	57	38	0	0	0	95
8,0	16	0	16	0	0	32
9,0	0	0	0	0	0	0
10,0	0	0	0	0	0	0
Total	7.401	1.730	117	0	5.936	15.183

TABLE 98, NUMBER OF CARS IN MUNICIPALITY OF KARPOS, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	2.307	0	0	0	5.478	7.784
2,0	3.520	552	0	0	2.484	6.556
3,0	2.542	833	42	0	833	4.251
4,0	2.419	1.175	207	35	691	4.528
5,0	506	316	63	0	126	1.011
6,0	239	152	22	0	22	435
7,0	58	29	0	0	0	88
8,0	0	11	0	0	11	23
9,0	0	0	0	0	0	0
10,0	0	0	0	0	0	0
Total	11.591	3.070	334	35	9.647	24.676

TABLE 99, NUMBER OF CARS IN MUNICIPALITY OF CAIR, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	0	0	0	0	5.356	5.356
2,0	2.354	147	0	0	3.825	6.327
3,0	1.798	360	0	0	2.301	4.459
4,0	2.306	407	45	0	2.080	4.838
5,0	859	161	0	0	966	1.986
6,0	361	101	0	0	346	808
7,0	80	20	10	0	129	239
8,0	0	0	0	0	64	64
9,0	14	0	0	0	14	27
10,0	0	0	0	0	17	17
Total	7.771	1.196	55	0	15.099	24.120

TABLE 100, NUMBER OF CARS IN MUNICIPALITY OF SARAJ, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	0	0	0	0	0	0
2,0	1.424	0	0	0	1.424	2.849
3,0	956	159	0	0	956	2.071
4,0	1.587	0	50	0	744	2.381
5,0	951	61	0	0	583	1.596
6,0	509	102	0	0	204	814
7,0	214	19	39	0	58	331
8,0	75	0	0	0	15	90
9,0	10	0	0	0	19	29
10,0	23	0	0	0	0	23
Total	5.749	342	89	0	4.003	10.183

TABLE 101, NUMBER OF CARS IN MUNICIPALITY OF GAZI BABA, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	Five Cars	Six Cars	No Cars	Total
1,0	875	0	0	0	0	0	5.250	6.125
2,0	2.912	243	0	0	0	0	4.247	7.401
3,0	3.204	366	92	0	0	0	1.373	5.036
4,0	3.363	949	0	0	0	0	1.207	5.519
5,0	1.002	318	73	24	0	24	342	1.785
6,0	549	183	23	0	0	0	114	869
7,0	134	60	0	0	0	0	60	254
8,0	30	30	30	0	0	0	0	90
9,0	0	0	0	16	0	0	16	32
10,0	36	0	0	0	0	0	0	36
Total	12.106	2.148	218	41	0	24	12.610	27.147

TABLE 102, NUMBER OF CARS IN MUNICIPALITY OF SUTO ORIZARI, SOURCE: IDOM

	One car	Two Cars	Three car	Four Cars	No Cars	Total
1,0	0	0	0	0	1.284	1.284
2,0	0	0	0	0	1.622	1.622
3,0	281	0	0	0	842	1.122
4,0	172	0	0	0	1.118	1.290
5,0	68	0	0	0	784	853
6,0	36	36	0	0	463	534
7,0	26	0	0	0	179	205
8,0	0	0	0	0	79	79
9,0	18	0	0	0	18	35
10,0	13	0	0	0	13	27
Total	613	36	0	0	6.401	7.049

TABLE 103, TYPE OF PARKING IN RESIDENCE CENTAR, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	rented garage	no car	Total
1,0	204	818	2.044	0	10.018	13.085
2,0	759	1.823	1.013	51	5.974	9.619
3,0	616	1.193	1.154	0	3.348	6.311
4,0	1.226	1.298	1.009	72	2.379	5.984
5,0	682	682	521	0	441	2.327
6,0	233	47	326	0	326	931
7,0	83	42	83	0	42	250
8,0	33	33	0	0	33	99
9,0	9	0	0	0	28	37
10,0	0	0	0	0	0	0
Total	3.846	5.934	6.152	123	22.589	38.643

GRAPHIC 68, TYPE OF RESIDENTIAL PARKING, MUNIPALITY OF CENTAR 2009, SOURCE: IDOM

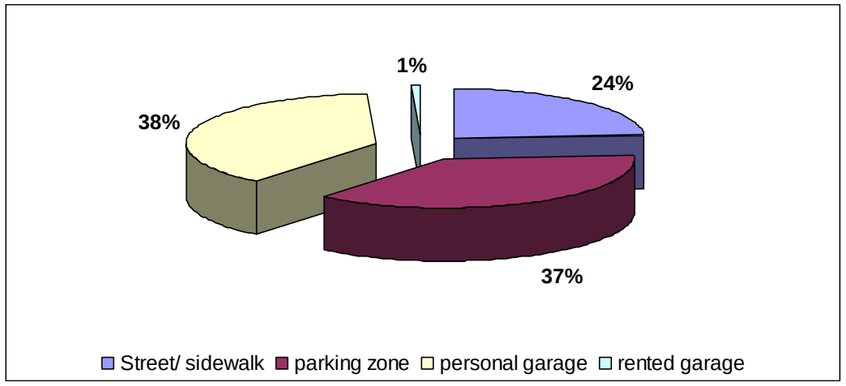
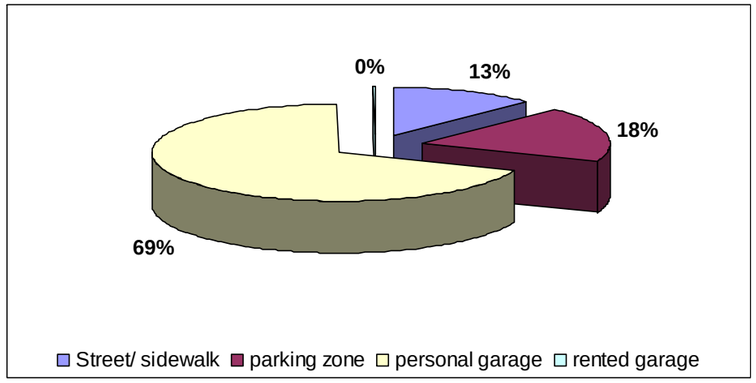


TABLE 104, TYPE OF RESIDENTIAL PARKING KISELA VODA, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	523	1.307	261	2.091
2,0	688	516	3.439	4.729
3,0	594	1.404	3.779	5.776
4,0	836	794	5.432	7.062
5,0	118	47	1.635	1.801
6,0	26	0	648	674
7,0	10	19	96	125
8,0	0	0	37	37
9,0	0	0	0	0
10,0	0	7	7	13
Total	2.795	4.094	15.336	22.310

GRAPHIC 69, TYPE OF RESIDENTIAL PARKING IN KISELA VODA 2009, SOURCE: IDOM



GRAPHIC 70, TYPE OF RESIDENTIAL PARKING IN AERODROM 2009, SOURCE: IDOM

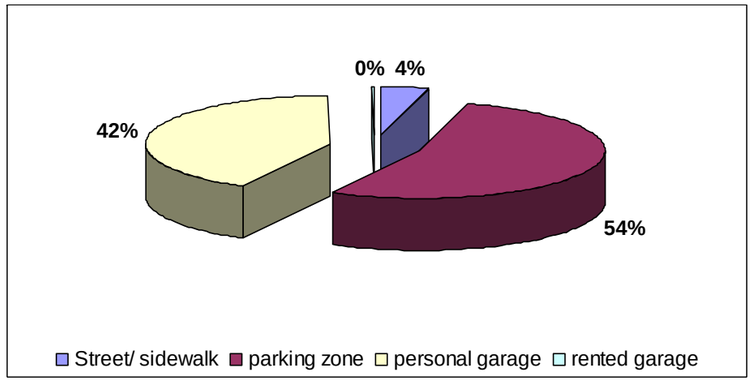


TABLE 105, TYPE OF RESIDENTIAL PARKING AERODROM, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	2.103	841	2.944
2,0	474	3.222	2.274	5.969
3,0	0	4.643	2.947	7.590
4,0	546	4.043	3.788	8.451
5,0	143	515	1.145	1.803
6,0	0	399	613	1.012
7,0	14	82	95	190
8,0	0	24	24	47
9,0	0	19	0	19
10,0	0	0	0	0
Total	1.177	15.049	11.727	28.026

TABLE 106, TYPE OF RESIDENTIAL PARKING BUTEL, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	287	0	287
2,0	260	195	2.344	2.800
3,0	175	291	2.561	3.027
4,0	351	219	3.069	3.639
5,0	153	192	1.188	1.533
6,0	38	75	528	641
7,0	0	33	234	268
8,0	0	0	0	0
9,0	0	0	15	15
10,0	10	0	10	19
Total	986	1.293	9.950	12.230

GRAPHIC 71, TYPE OF RESIDENTIAL PARKING IN BUTEL 2009, SOURCE: IDOM

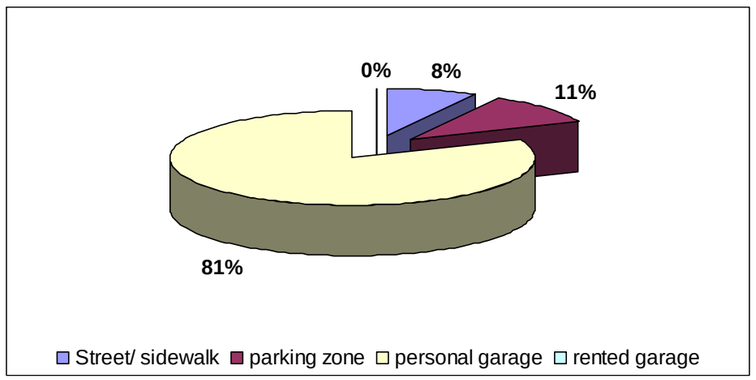


TABLE 107, TYPE OF RESIDENTIAL PARKING GJORCE PETROV, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	0	3.084	3.084
2,0	226	339	2.257	2.822
3,0	143	478	3.252	3.874
4,0	482	853	3.745	5.080
5,0	161	27	1.259	1.446
6,0	79	63	634	776
7,0	38	0	133	171
8,0	0	0	63	63
9,0	0	0	0	0
10,0	0	0	0	0
Total	1.129	1.760	14.427	17.316

GRAPHIC 72, TYPE OF RESIDENTIAL PARKING IN GORCE PETROV 2009, SOURCE: IDOM

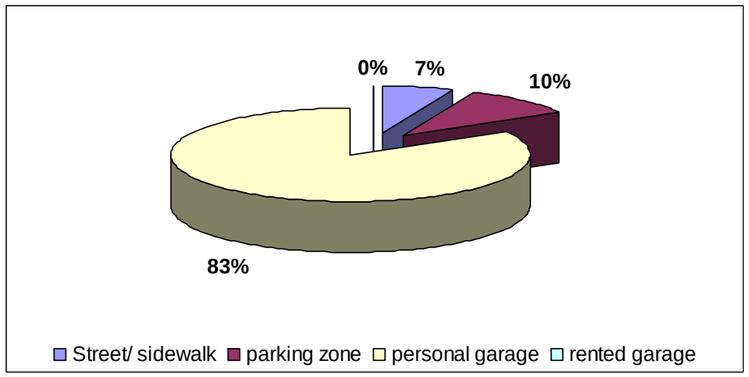


TABLE 108, TYPE OF RESIDENTIAL PARKING KARPOS, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	288	288	2.883	3.460
2,0	1.863	1.104	2.967	5.935
3,0	1.542	1.334	3.084	6.001
4,0	1.970	1.279	4.009	7.258
5,0	442	190	1.054	1.686
6,0	239	22	522	783
7,0	0	0	175	175
8,0	0	0	23	23
9,0	0	0	0	0
10,0	0	0	0	0
Total	6.345	4.216	14.717	25.320

GRAPHIC 73, TYPE OF RESIDENTIAL PARKING IN KARPOS 2009, SOURCE: IDOM

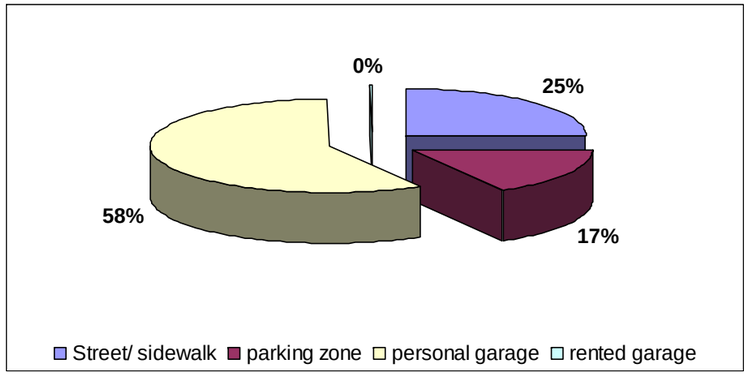


TABLE 109, TYPE OF RESIDENTIAL PARKING CAIR, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	0	0	0
2,0	589	1.030	1.177	2.796
3,0	1.079	791	863	2.733
4,0	1.944	723	1.763	4.476
5,0	617	322	590	1.529
6,0	303	144	317	765
7,0	89	20	99	209
8,0	0	0	0	0
9,0	14	0	14	27
10,0	0	0	0	0
Total	4.635	3.031	4.824	12.535

GRAPHIC 74, TYPE OF RESIDENTIAL PARKING IN CAIR 2009, SOURCE: IDOM

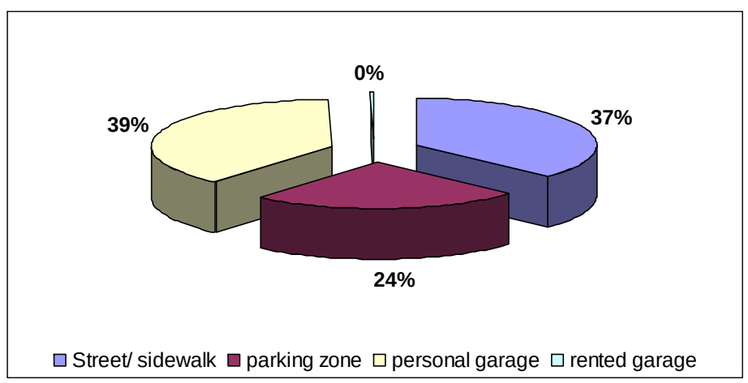


TABLE 110, TYPE OF RESIDENTIAL PARKING SARAJ, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	0	0	0
2,0	0	0	1.424	1.424
3,0	0	0	1.434	1.434
4,0	50	50	1.736	1.835
5,0	61	0	1.105	1.197
6,0	25	0	712	738
7,0	19	0	370	409
8,0	0	0	90	90
9,0	0	0	10	10
10,0	0	0	23	23
Total	156	50	6.903	7.159

GRAPHIC 75, TYPE OF RESIDENTIAL PARKING IN SARAJ 2009, SOURCE: IDOM

TABLE 111, TYPE OF RESIDENTIAL PARKING GAZI BABA, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	875	292	1.167
2,0	485	243	3.640	4.368
3,0	595	916	4.349	5.860
4,0	733	776	5.950	7.460
5,0	49	342	2.396	2.787
6,0	137	69	1.235	1.441
7,0	60	15	329	403
8,0	60	0	120	180
9,0	0	16	49	65
10,0	0	0	36	36
Total	2.119	3.251	18.395	23.765

GRAPHIC 76, TYPE OF RESIDENTIAL PARKING IN GAZI BABA 2009, SOURCE: IDOM

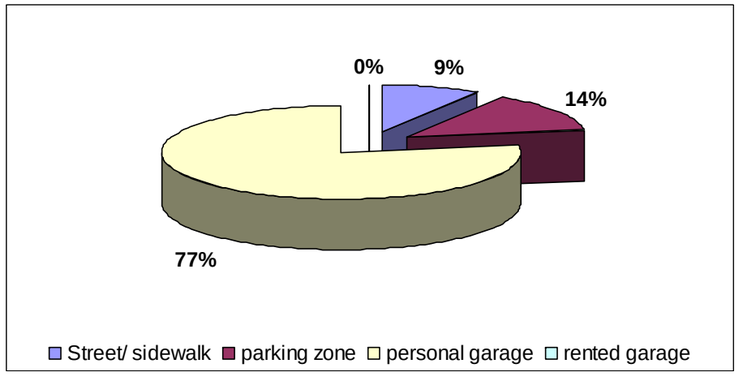
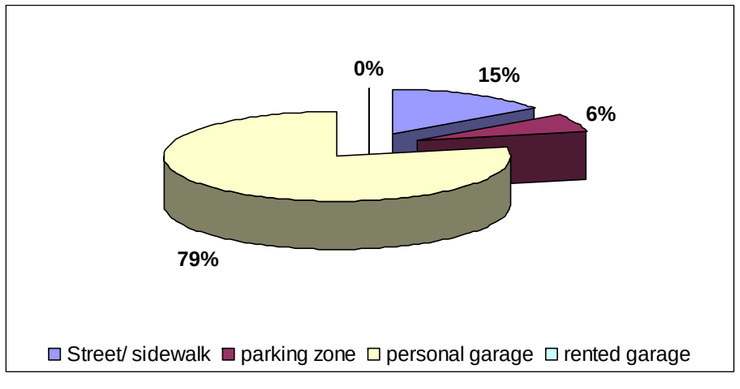


TABLE 112, TYPE OF RESIDENTIAL PARKING SUTO ORIZARI, SOURCE: IDOM

	Street/ sidewalk	parking zone	personal garage	Total
1,0	0	0	0	0
2,0	0	0	304	304
3,0	70	0	351	421
4,0	86	43	43	172
5,0	0	34	68	102
6,0	0	0	142	142
7,0	26	0	0	26
8,0	0	0	0	0
9,0	0	0	18	18
10,0	0	0	13	13
Total	182	77	939	1.198

GRAPHIC 77, TYPE OF RESIDENTIAL PARKING IN SUTO ORIZARI 2009, SOURCE: IDOM



10.ANNEX. HOUSEHOLD QUESTIONNAIRE

GRAPHIC 78, HOUSEHOLD SURVEY QUESTIONNAIRE, SOURCE: IDOM

SURVEY QUESTIONNAIRE FOR THE MOBILITY MOVEMENT OF THE HOUSEHOLDS IN SKOPJE

2009 ГОДИНА

POLLSTER [1]

TRANSPORT ZONE [2] ADDRESS OF THE LIVING QUARTER [3] MUNICIPALITY [4]

NOTE:MARK YOUR ANSWER IN THE EMPTY FIELDS OR ☐ SIGN THE APPROPRIATE ANSWER

Mark X / write a response in the empty fields or sign the appropriate answer

Telephone:

I NUMBER OF MEMBERS IN THE LIVING QUARTER AND VEHICLES USED BY THEM

Number of people living in the same living quarter (present + absent) [5]

Number of people on age over 5 (present + temporary residence) [6]

NUMBER OF VEHICLES

Number of cars used by them [7]

Motorcycles, mopeds [8]

Trucks, taxis, buses, van, pickup, official - business vehicles (for official - business use) [9]

Taxis, official - business vehicles (for double use) [10]

II DATA FOR THE LIVING QUARTER

11. Type of construction

1. Separate house (in complex of houses)
2. Open complex of buildings
3. Complex of houses and buildings
4. Other type

12. Mode of possession of the living quarter

1. Ownership
2. Under lease without furniture
3. Under lease with furniture
4. Other

13. Number of years of living in the living quarter

1. Less than one year
2. From 1 to 2 years
3. From 2 to 5 years
4. More than 5 years

III TYPE OF PARKING IN FRONT OF THE LIVING QUARTER

14.. First vehicle

1. On the street
2. Parking zone (in front of the l. quarter)
3. In your own garage (parking/yard)
4. In garage rental (under lease)
99. Do not own first vehicle

15. Second vehicle

1. On the street
2. Parking zone (in front of the l. quarter)
3. In your own garage (parking/yard)
4. In garage rental (under lease)
99. Do not own second vehicle

IV AMOUNT OF ANNUAL INCOME IN THE LIVING QUARTER [16]

1. Low
2. Relatively low
3. Average
4. Relatively high
5. High
99. Don't know /Refused

GRAPHIC 79, DATA FORM FOR THE POPULATION, SOURCE: IDOM

DATA FOR THE POPULATION IN THE CITY OF SKOPJE

17. RELATIVE'S RELATINONS (OTHER RELATIONSHIPS) IN THE LIVING QUARTER	18. GENDER	19. MARITAL STATUS	20. Age (full years)	21. DRIVING LICENSE AND AVAILABILITY OF VEHICLES	22. EXECUTION OF THE MAIN ACTIVITY /EMPLOYMENT STATUS	23. SECTOR OF EMPLOYMENT (only for those who answered with 1, 2 и 3 on the question no.22)	24. LEVEL OF COMPLETED EDUCATION	25. CORRECT ADDRESS OF EMPLOYMENT OR EDUCATIONAL INSTITUTION
1. Head of the living quarter 2.Spouse 3. Son/daughter 4. Son/daughter - in- law 5. Grandchild 6. Parents/father and mother - in - law 7. Other relatives 8. Home servants 9. Friends/roommates 10. Something else	1. Male 2. Female	1. Single/ unmarried 2. Married 3. Widower/ widow 4. Divorced or separated		1. Possess a driving license and has a vehicle available 2. Possess a driving license and has no vehicle available 3. Don't possess a driving license	1. Employed in public sector 2. Employed in private sector 3. Private owner (businessman, craftsman, farmer) 4. Pensioner 5. Unemployed 6. Student 7. Housewife 8. Other activities	1. Public administration 2. Banks, finance and insurance companies 3. Education and health 4. Service activities 5. Industry, energy and water (factories, industries etc.) 6. Construction, modeling 7. Transport and communications 8. Trade 9. Other 99. Student, unemployed, pensioner, housewife	1. No education 2. Elementary school 3. High school 4. College, University 5. Postgraduate and doctoral studies (M-r, Phd.)	Enter exact street number and municipality, or in your case the name and location of the building that you named, factory, faculty, etc.. 26. MUNICIPALITY 99. Unemployed, pensioner, housewife

1	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
2	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
3	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
4	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
5	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
6	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality
7	17	18	19	20	21	22	23	24	25. Street		Number		25. T. Zone	26. Municipality

GRAPHIC 80, DATA FORM FOR THE REALISED DAILY TRIPS, SOURCE: IDOM

DATA FOR THE REALISED DAILY TRIPS

Reference number of the respondent – member of the living quarter ☐

POINT OF DEPARTURE

Enter exact street number and municipality, or in your case the name and location of the building that you named, factory, faculty, etc..

1. Home
2. Work place
3. For business purposes
4. For education purposes
5. Shopping
6. For medical purposes
7. For personal purposes
8. For hobby
9. Due to accompaniment of other person
10. Other

TIME OF DEPARTURE:
Enter hour from 0 to 23
Minutes from 0 to 59

TRIP EXPENCES:
Enter the cost of travel in denars in case of using bus tickets

STAGES OF THE TRIP: Each stage refers to a change made to the type of transport

TYPE OF TRANSPORT:
1. Car
2. City public bus (JCTI)
3. City private bus
4. Walking
5. Taxi
6. Motorcycle, moped
7. Bicycle
8. Other

A
1. On the street
2. Parking zone
3. In your own garage
4. In garage rental
5. In parking garage
6. Illegal parking
98. I didn't use my own vehicle

B
1. Doesn't own a vehicle
2. Doesn't have a vehicle available
3. Parking problems
4. With vehicle there are higher expences
5. Crowded traffic
6. Public transport is faster
7. No need /short trip /walking
8. Other reason
98. I used vehicle

POINT OF ARRIVAL

Enter exact street number and municipality, or in your case the name and location of the building that you named, factory, faculty, etc..

REASON:
1. Home
2. Work place
3. Fo business purposes
4. For education purposes
5. Shopping
6. For medical purposes
7. For personal purposes
8. For hobby
9. Due to accompaniment of other person
10. Other

DURATION OF TRIP: Enter the duration of travel in minutes

BUS LINE: Assign the number of bus line

TYPE OF TICKET:
1. Ticket in one direction
2. Ticket for more trips (10 trips)
3. Monthly / Annual ticket (free ticket)
4. Electronic ticket (My ticket)
5. Free transport (students)

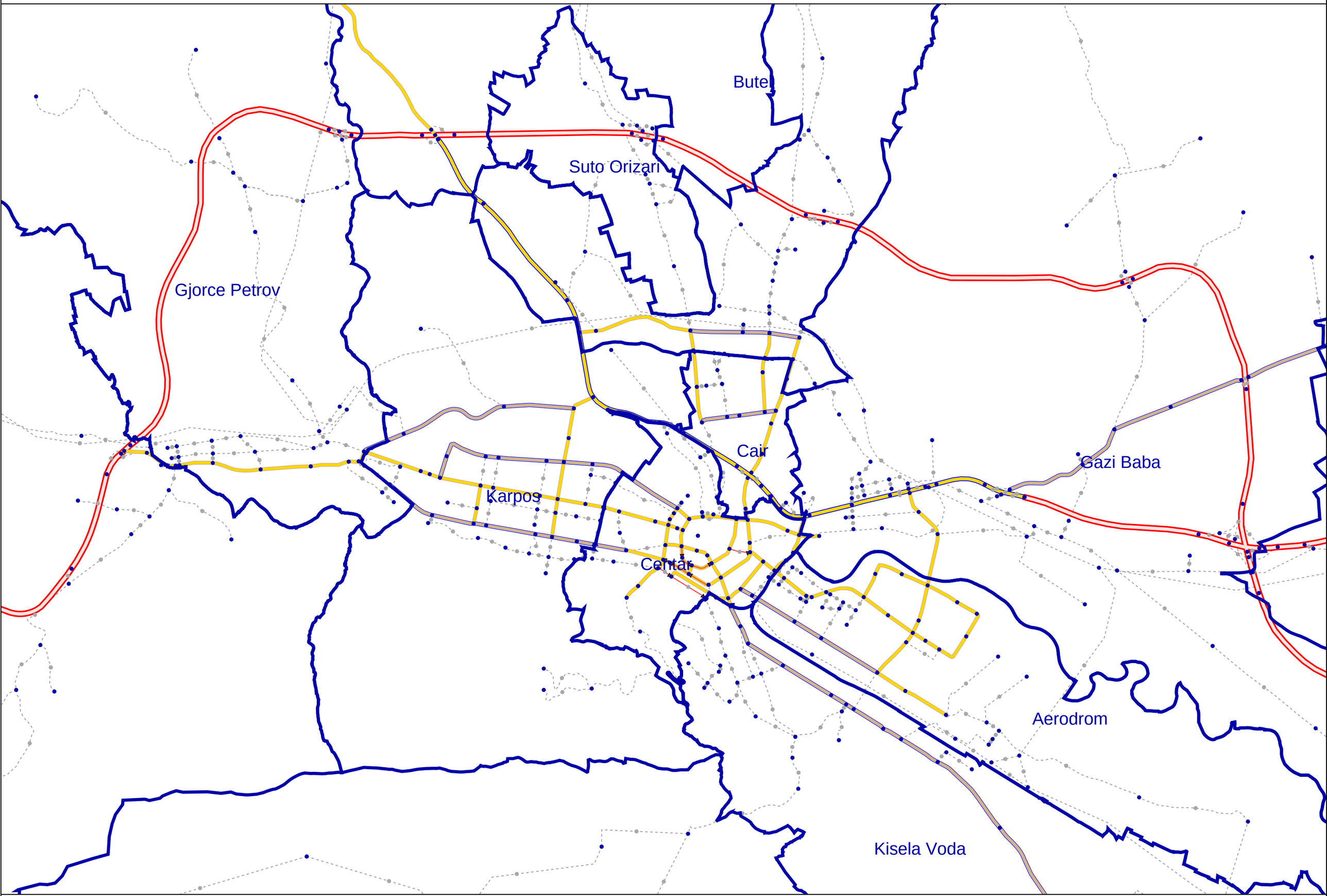
C
1. Lack of appropriate bus schedule line)
2. Lack of knowledge of the bus schedule
3. Inconvenient bus schedule
4. Delay of public transport
5. Public transport is financially unfavorable
6. Old buses and bad hygienic conditions
7. Crowded buses
8. No need /short trip/ walking
9. Other reason
98. I used public transport

1 Departure Street [29] P. of departure [27] Municipality [28] T. Zone
Arriva Street [32] Reason [30] Municipality [31] T. Zone
[33] Time of departure
[34] Expenses of this trip denars.
[35] Duration of the trip min.
Stages of the trip | type | number of line (only for bus) | type of ticket
1 stage: [36] [37] [38]
2 stage: [39] [41] [40]
3 stage: [42] [43] [44]
A Mode of parking of the own vehicle after arrival [45]
B Reason why you didn't use vehicle for this trip? [46]
C Reason why you didn't use public transport for this trip? [47]

2 Departure Street [50] P. of departure [48] Municipality [49] T. zone
Arriva Street [53] Reason [51] Municipality [52] T. Zone
[54] Time of departure
[55] Expenses of this trip denars.
[56] Duration of the trip min.
Stages of the trip | type | number of line (only for bus) | type of ticket
1 stage: [57] [58] [59]
2 stage: [60] [61] [62]
3 stage: [63] [64] [65]
A Mode of parking of the own vehicle after arrival [66]
B Reason why you didn't use vehicle for this trip? [67]
C Reason why you didn't use public transport for this trip? [68]

3 Departure Street [71] P. of departure [69] Municipality [70] T. Zone
Arriva Street [74] Reason [72] Municipality [73] T. zone
[75] Time of departure
[76] Expenses of this trip denars.
[77] Duration of the trip min.
Stages of the trip | type | number of line (only for bus) | type of ticket
1 stage: [78] [79] [80]
2 stage: [81] [82] [83]
3 stage: [84] [85] [86]
A Mode of parking of the own vehicle after arrival [87]
B Reason why you didn't use vehicle for this trip? [88]
C Reason why you didn't use public transport for this trip? [89]

4 Departure Street [92] P. of departure [90] Onamium [91] T. Zone
Arriva Street [95] Reason [93] Municipality [94] T. Zone
[96] Time of departure
[97] Expenses of this trip denars.
[98] Duration of the trip min.
Stages of the trip | type | number of line (only for bus) | type of ticket
1 stage: [99] [100] [101]
2 stage: [102] [103] [104]
3 stage: [105] [106] [107]
A Mode of parking of the own vehicle after arrival [108]
B Reason why you didn't use vehicle for this trip? [109]
C Reason why you didn't use public transport for this trip? [110]



STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE, WITH PRELIMINARY DESIGNS FOR THE FOLLOWING ROADS: "ST.KLIMENT OHRIDSKI" BOULEVARD AND THE UNDERGROUND ROAD FROM THE SYNODAL CHURCH TO "KOMPLEKS BANKI" BUILDING BY IDOM

Ministry of Transport and Communications of Macedonia	Transport Masterplan for the City of Skopje	Main Urban Highways in 2009

Roads Network

Lanes

2

3

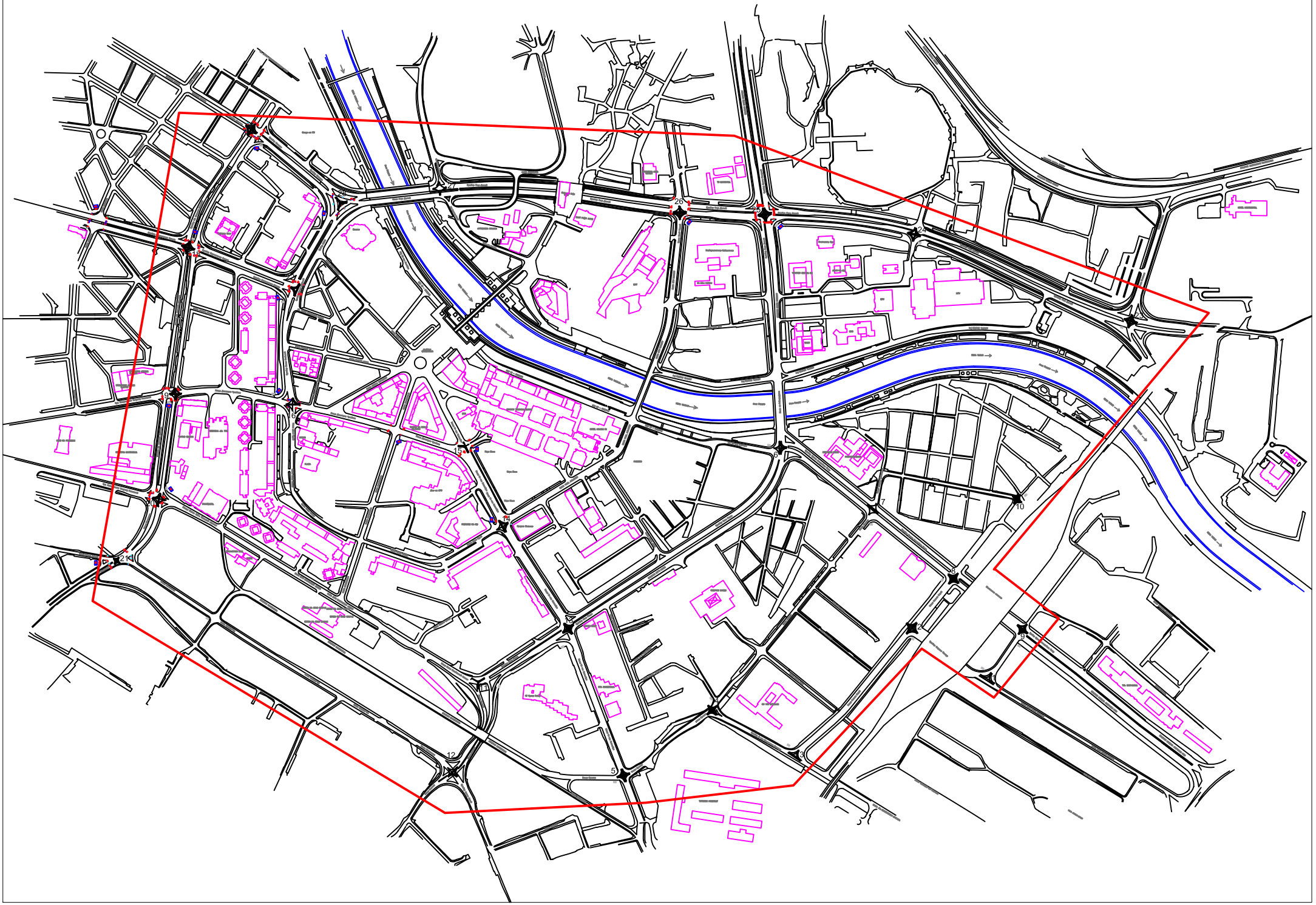
4

6

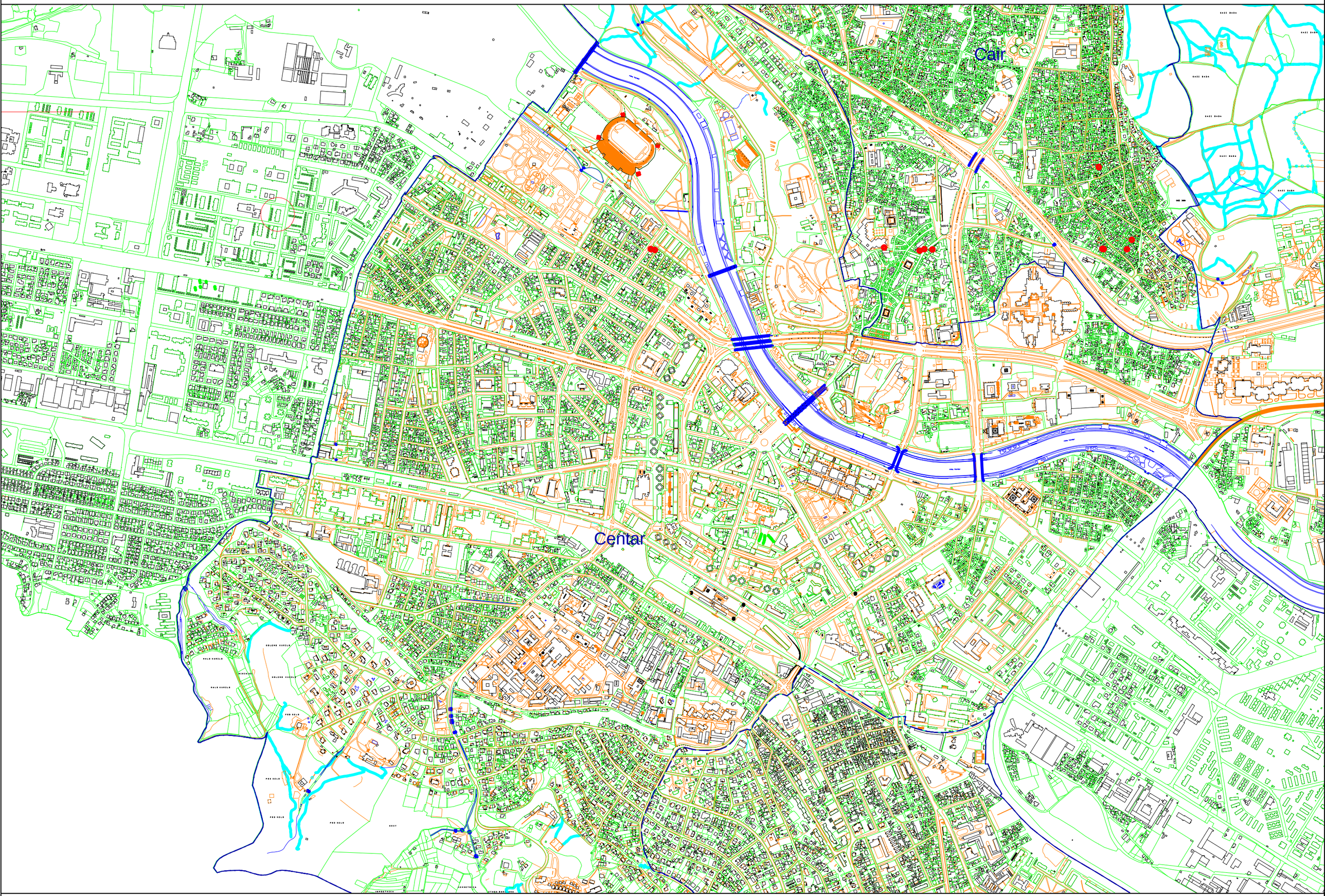
MOBILITY HOUSEHOLDS SURVEYS 2009

STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE, WITH PRELIMINARY DESIGNS FOR THE FOLLOWING ROADS: “ST.KLIMENT OHRIDSKI” BOULEVARD AND THE UNDERGROUND ROAD FROM THE SYNODAL CHURCH TO “KOMPLEKS BANKI” BUILDING

Ingeniería IDOM Internacional S.A.



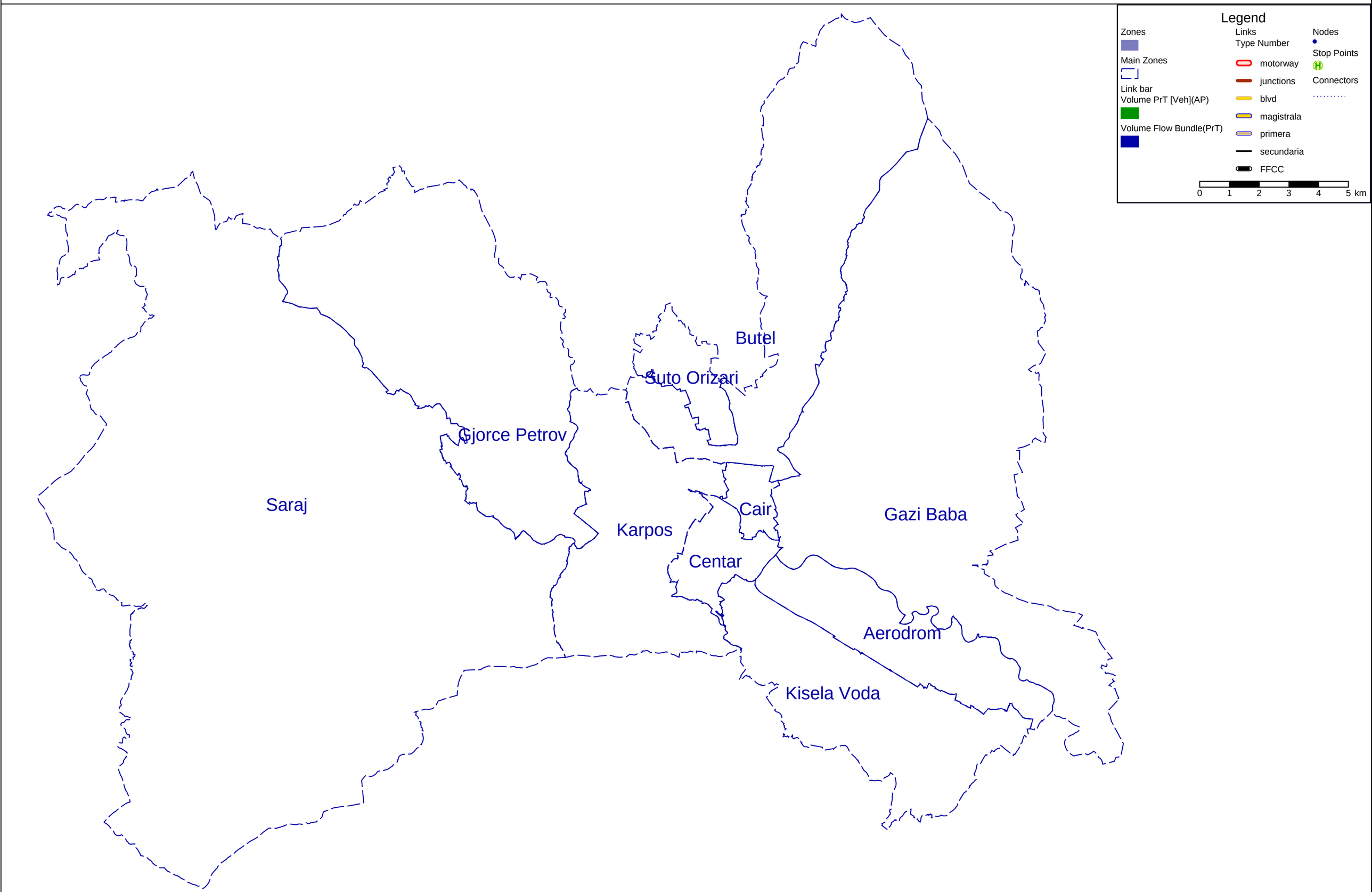
Created on: 08.04.2010



STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE, WITH PRELIMINARY DESIGNS FOR THE FOLLOWING ROADS: “ST.KLIMENT OHRIDSKI” BOULEVARD AND THE UNDERGROUND ROAD FROM THE SYNODAL CHURCH TO “KOMPLEKS BANKI” BUILDING

Ministry of Transport and Communications of Macedonia	Transport Masterplan for the City of Skopje	IDOM

Created on: 08.04.2010



STUDY FOR THE TRAFFIC SYSTEM OF THE CITY OF SKOPJE, WITH PRELIMINARY DESIGNS FOR THE FOLLOWING ROADS: “ST.KLIMENT OHRIDSKI” BOULEVARD AND THE UNDERGROUND ROAD FROM THE SYNODAL CHURCH TO “KOMPLEKS BANKI” BUILDING

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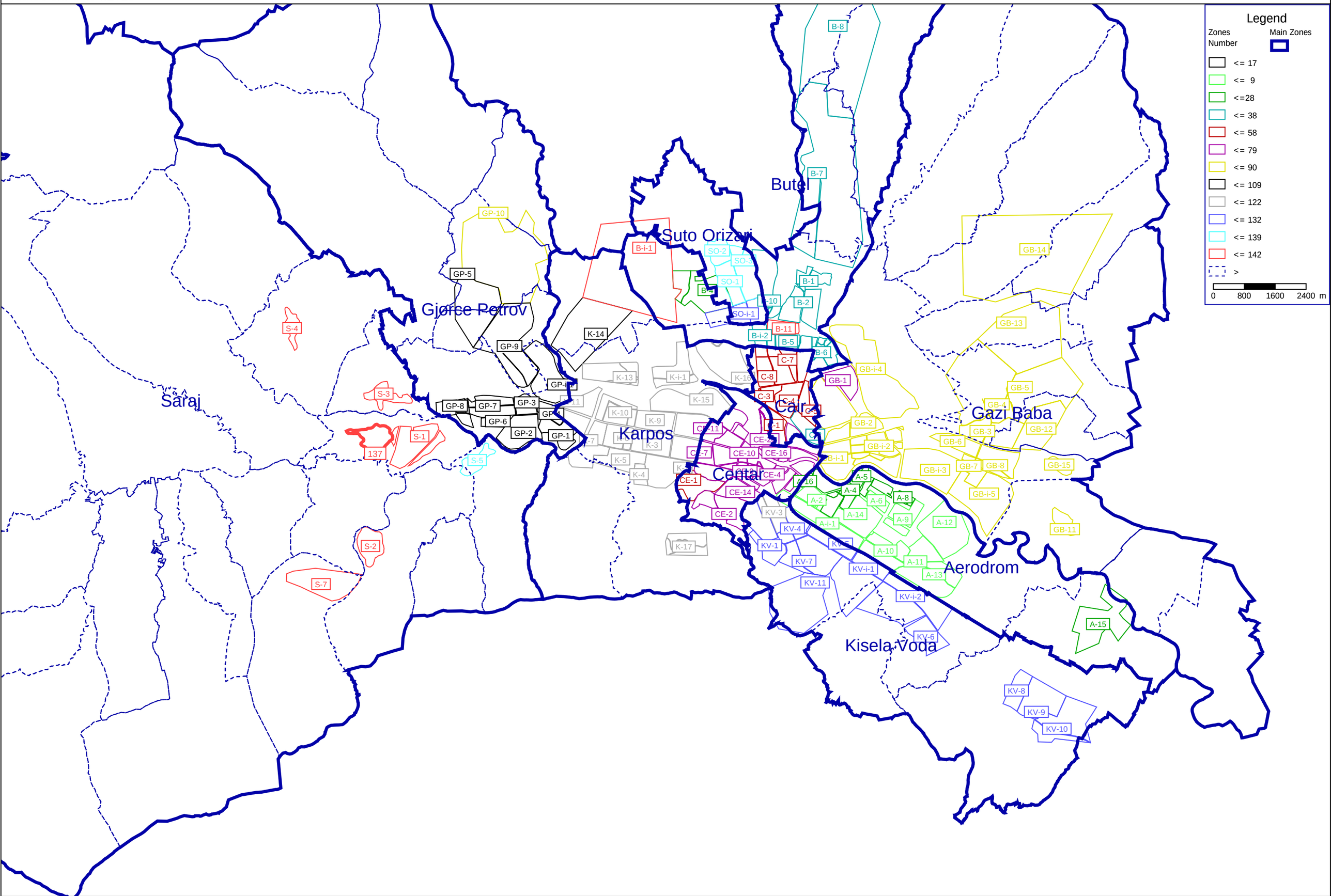

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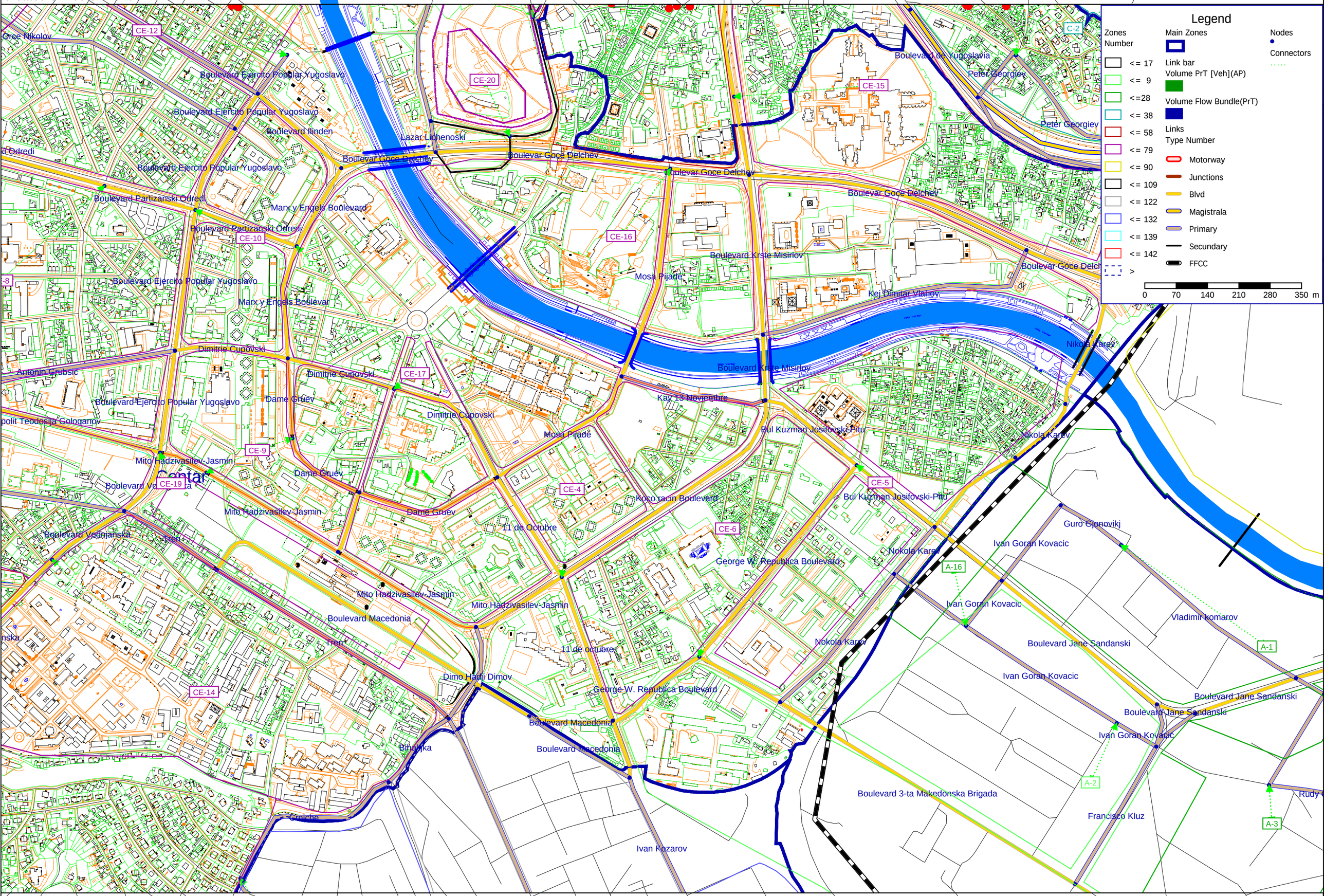

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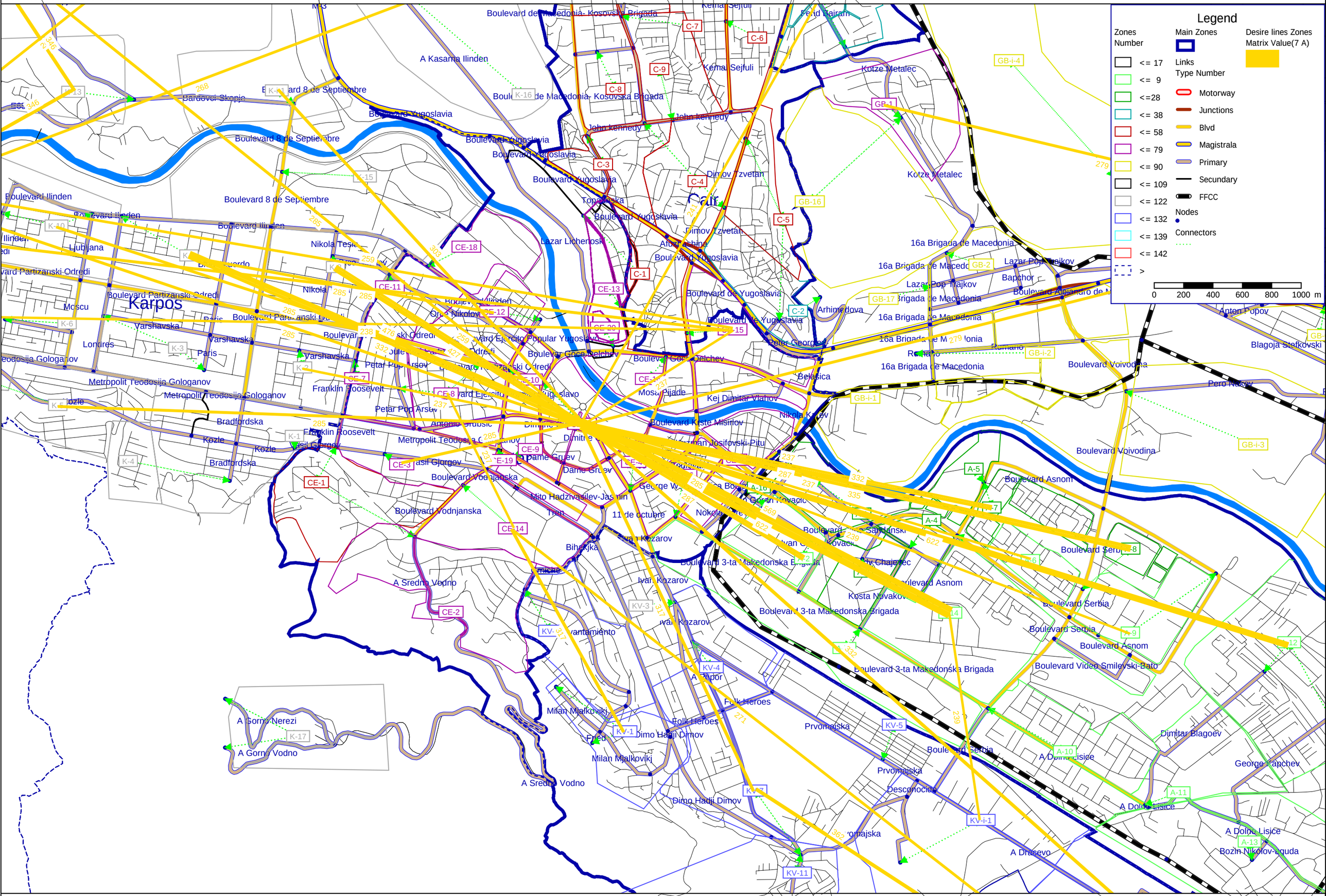

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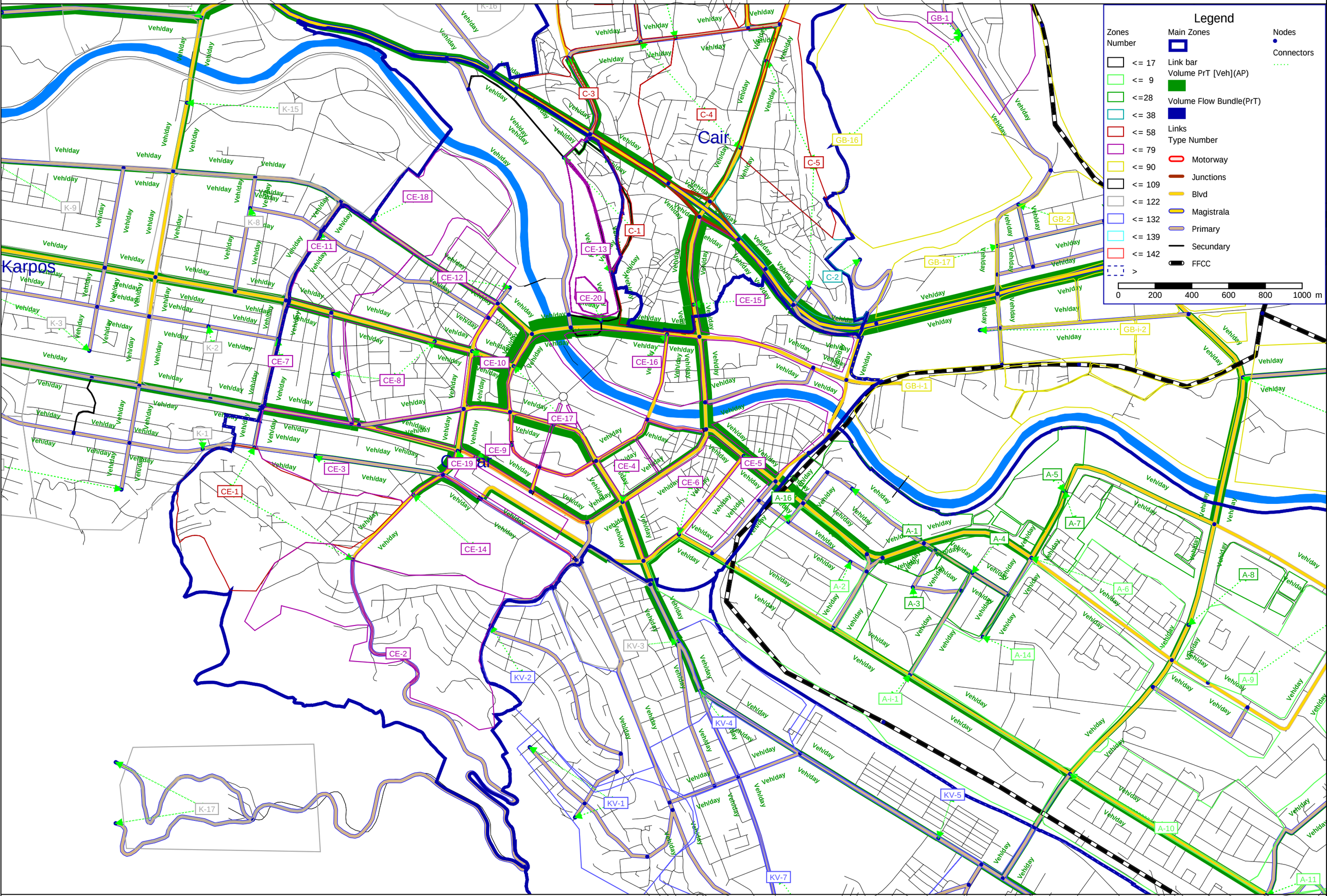

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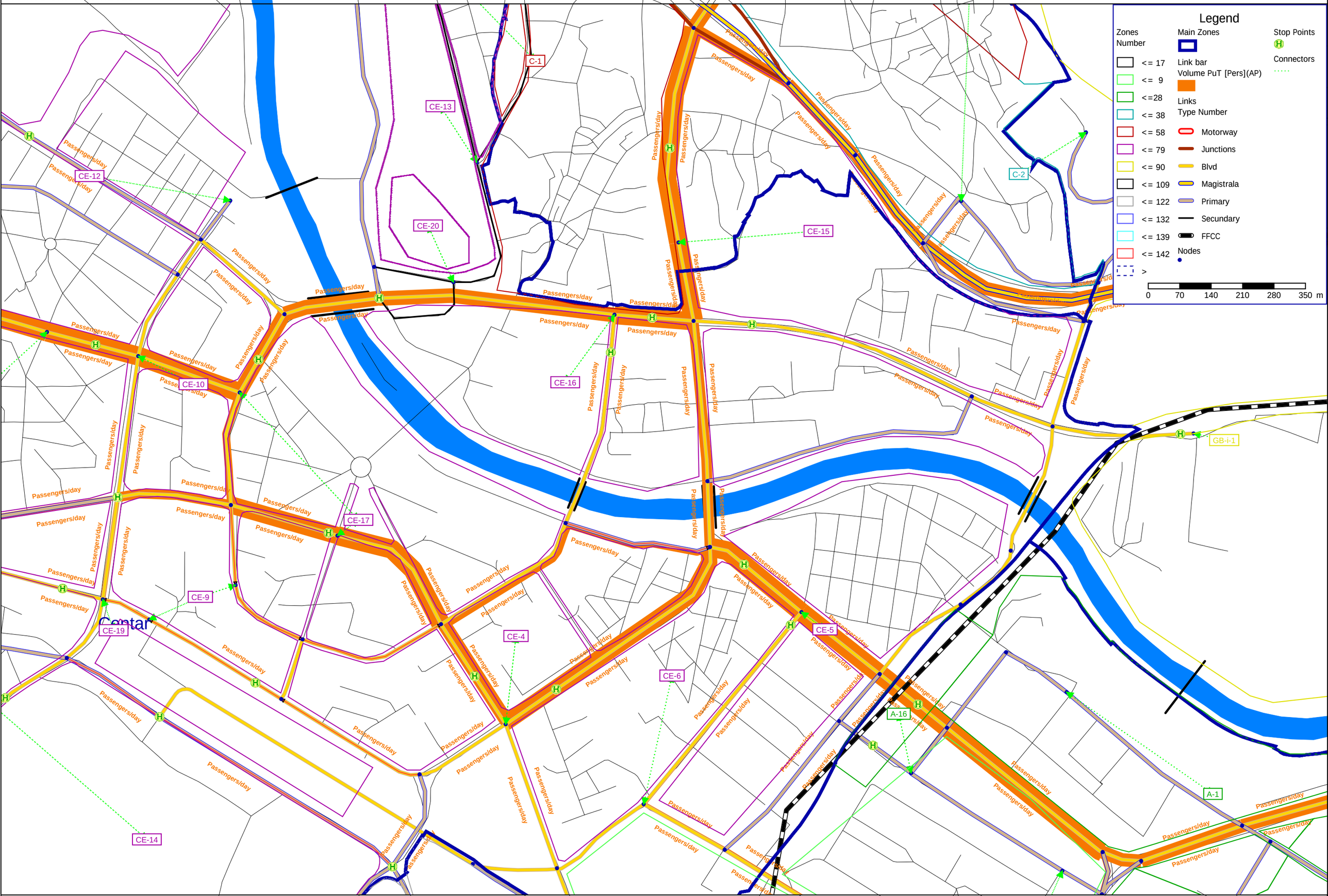

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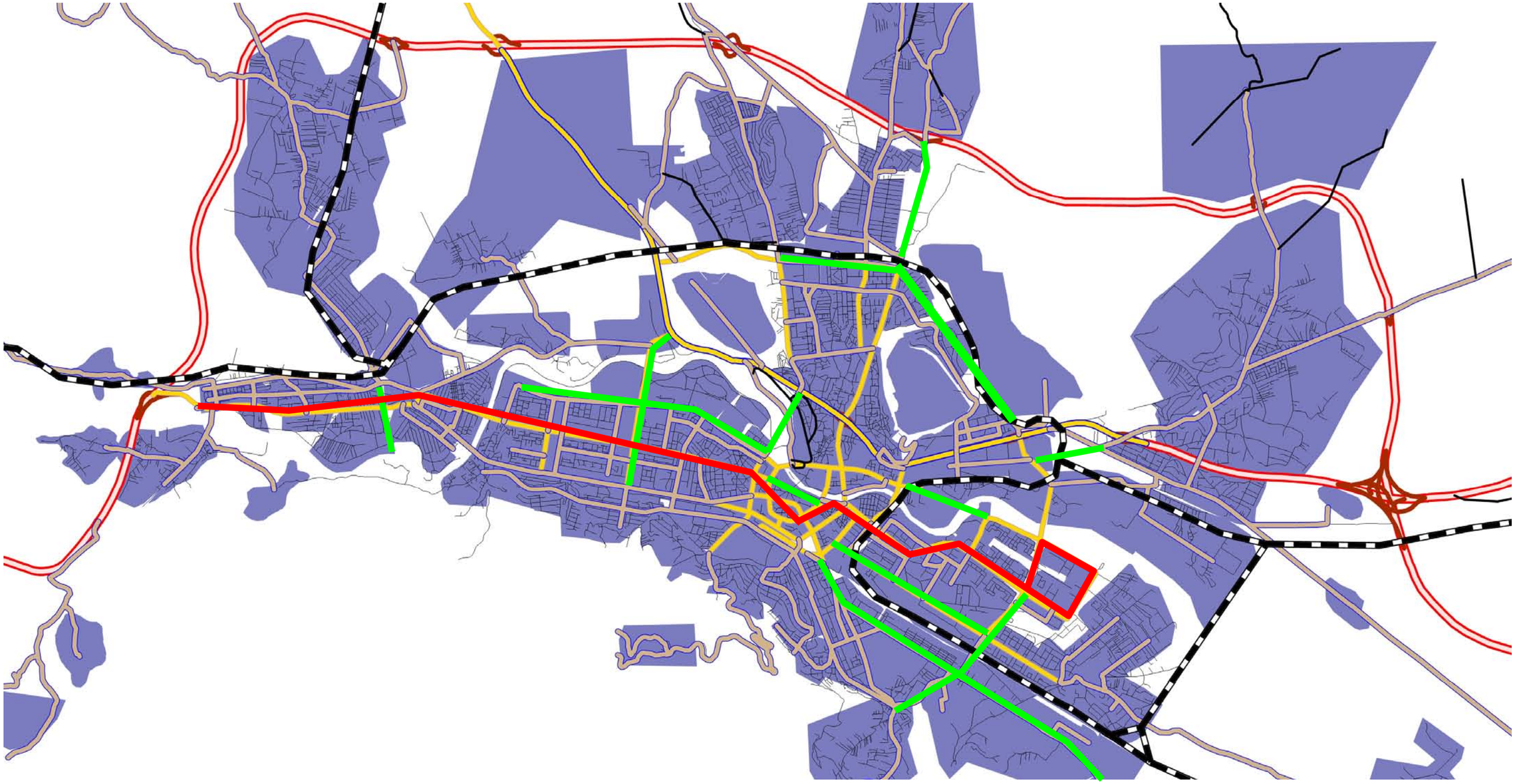
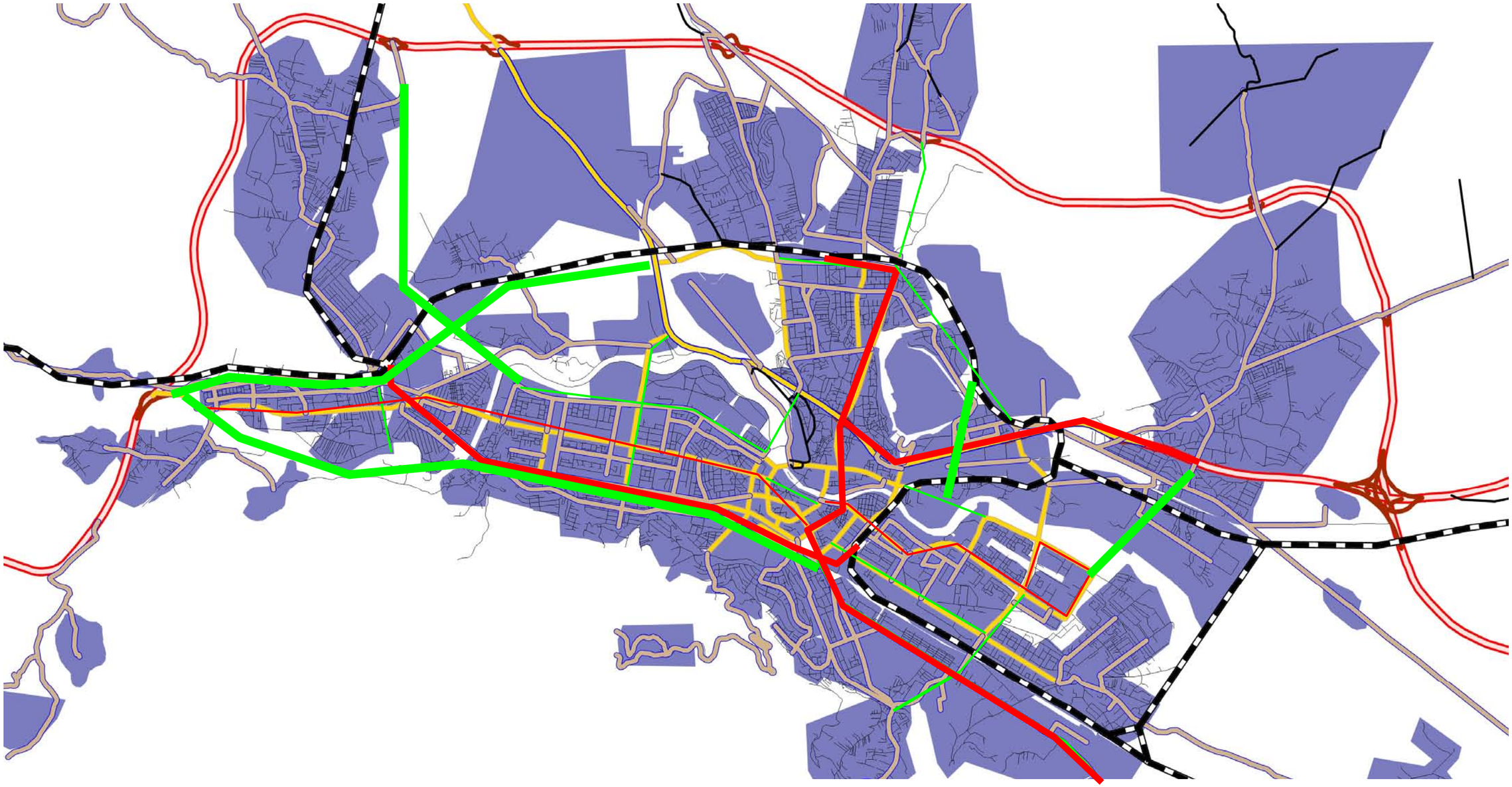
SCENARIO 2015

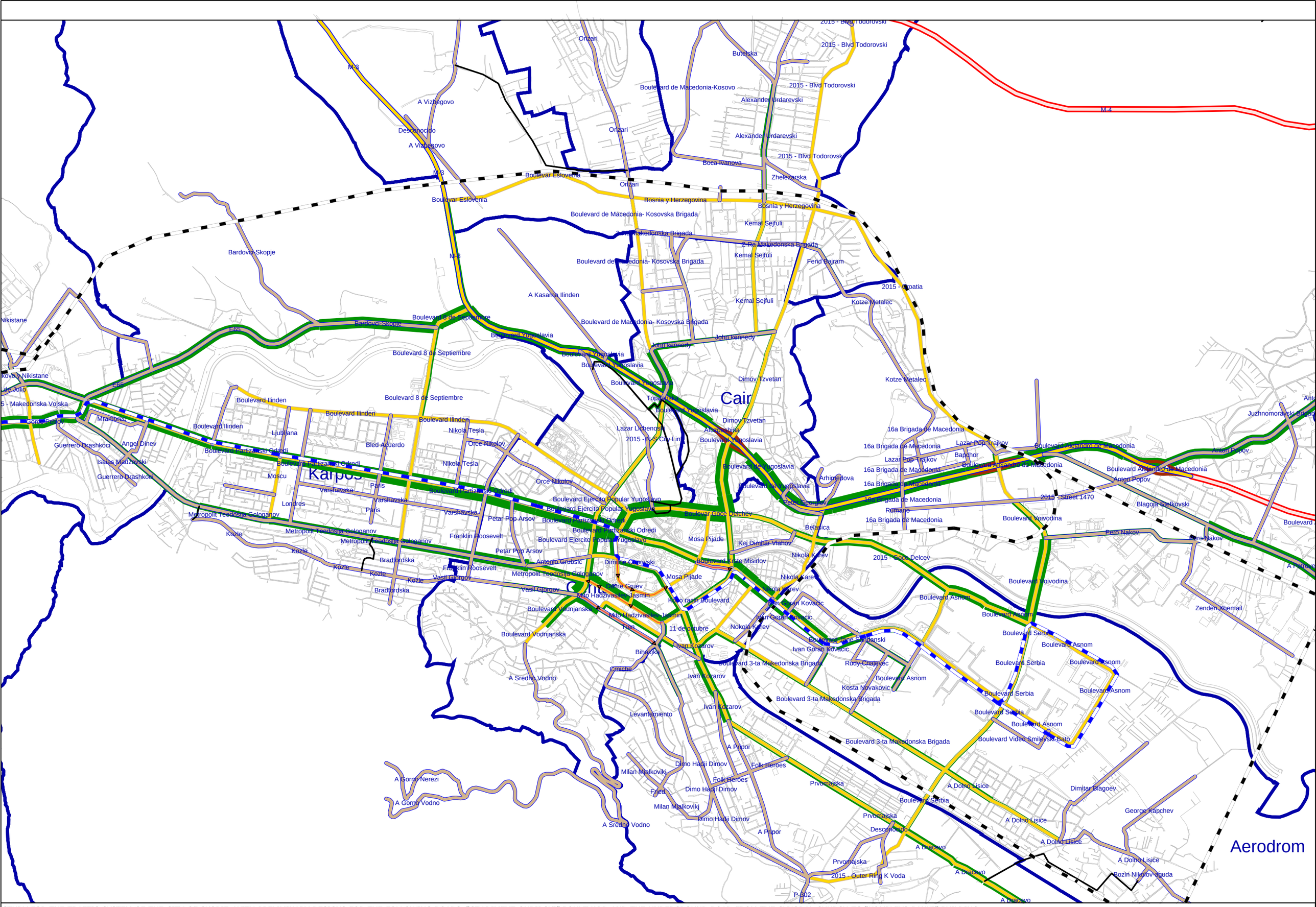
TRAM T1 Novo Lisice - Centar – Saraj Bridge, **Gazi Baba:** Andonov extension, **Butel – Zelesara – Avtokomanda:** Blvd Croatia **-** outer ring northeast 2+2, **Centar**: two underground city links Macedonia Square, Kliment Ohridski – Kale, **Naselba Lisice**: Blvd Serbia 3+3 (one side finished already), **Kisela Voda/ Pintija**: 11 Octomvri and Prvmosaska 1+1 to 2+2, **Gorce Petrov**: widening Makedonska Vojska to 2+2, **Butel**: widening Blvd Bosnia 1+1 to 2+2, **Karpos – Centar**: widening Blvd Ilinden 1+1 to 2+2, **Aerodrom**: Makedonska Brigada widening 1+1 to 2+2, **Pripor**: Blvd Serbia South (outer ring southeast) 2+2, **Goce Delcev** Extension with Blvd Asnom (Aerodrom): new river crossing 2+2, **Butel**: Blvd Todorovski Extension to motorway 2+2 (starting at Blvd Bosnia),



SCENARIO 2030

TRAM Network (T2, T3. T4), **South Blvd** Saraj – Kisela Voda, **North Blvd**: Blvd Slovenia – M4 Junction Gorce Petrov, **Cento – Madzari – Nove Lisice:** new river crossing 2+2**,**
Zelesara – Goce Delcev Extension (before projected new bridge): 2+2**, Karpos – Volkovo**: Extension Blvd Ilinden to motorway with new river crossing





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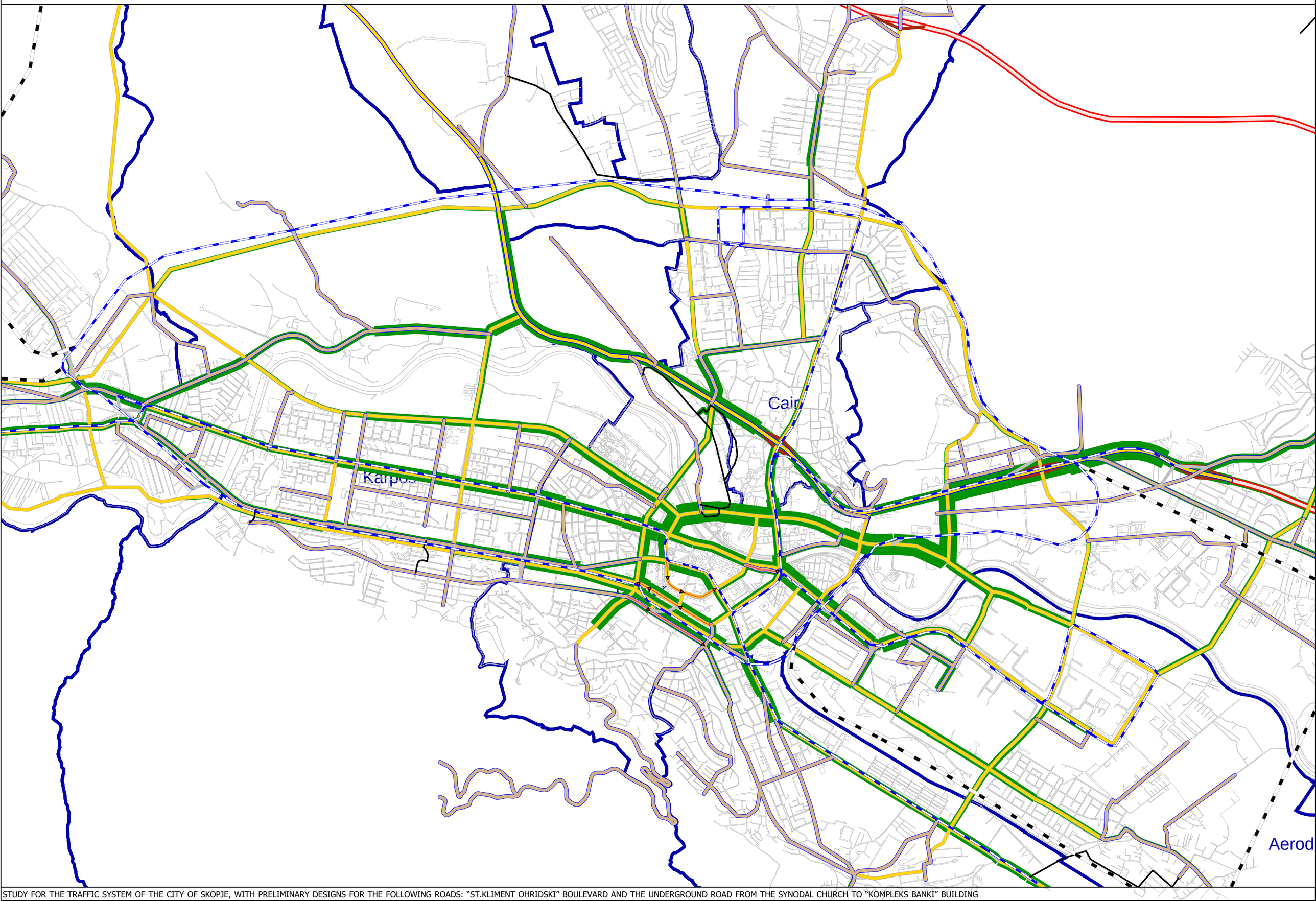

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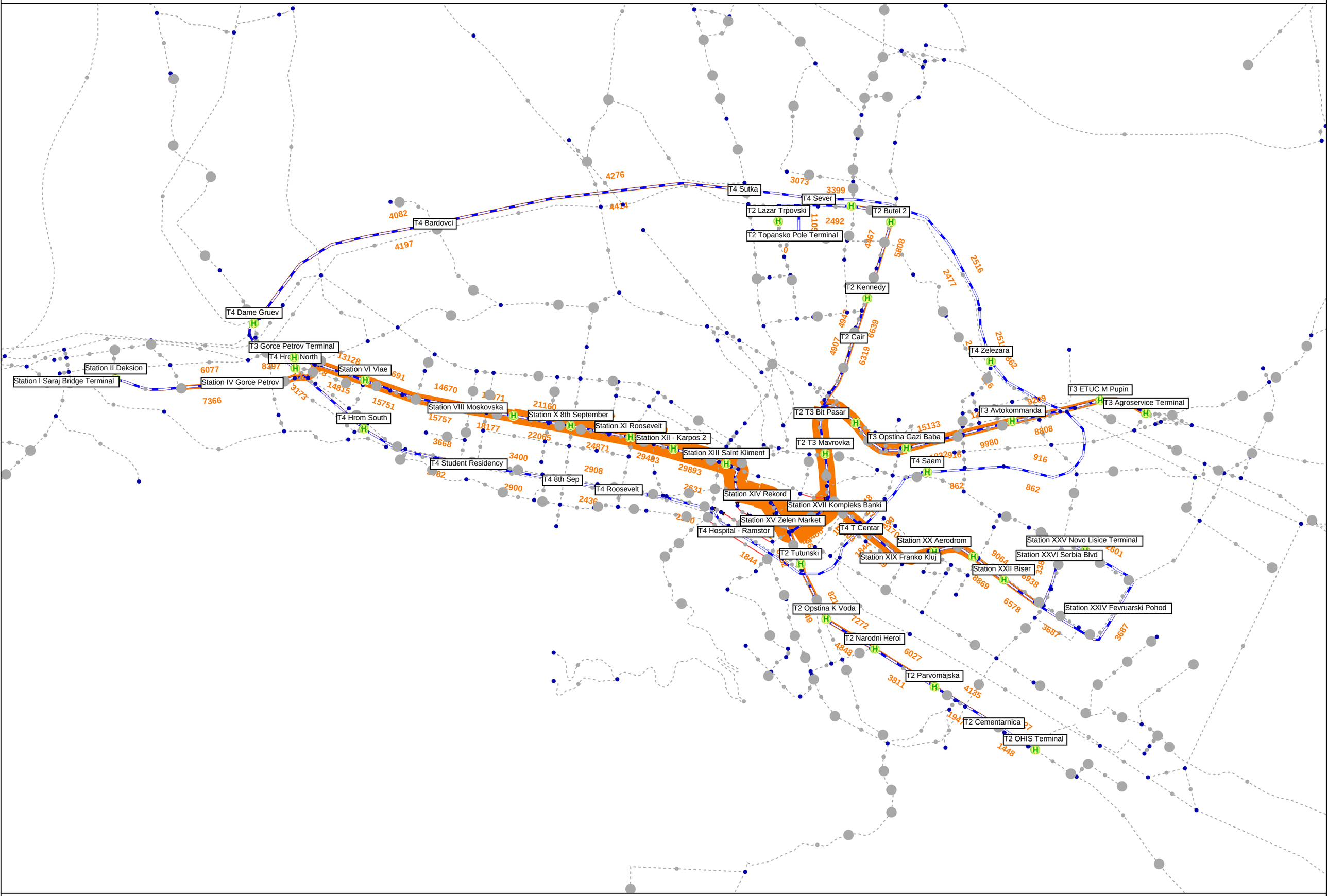

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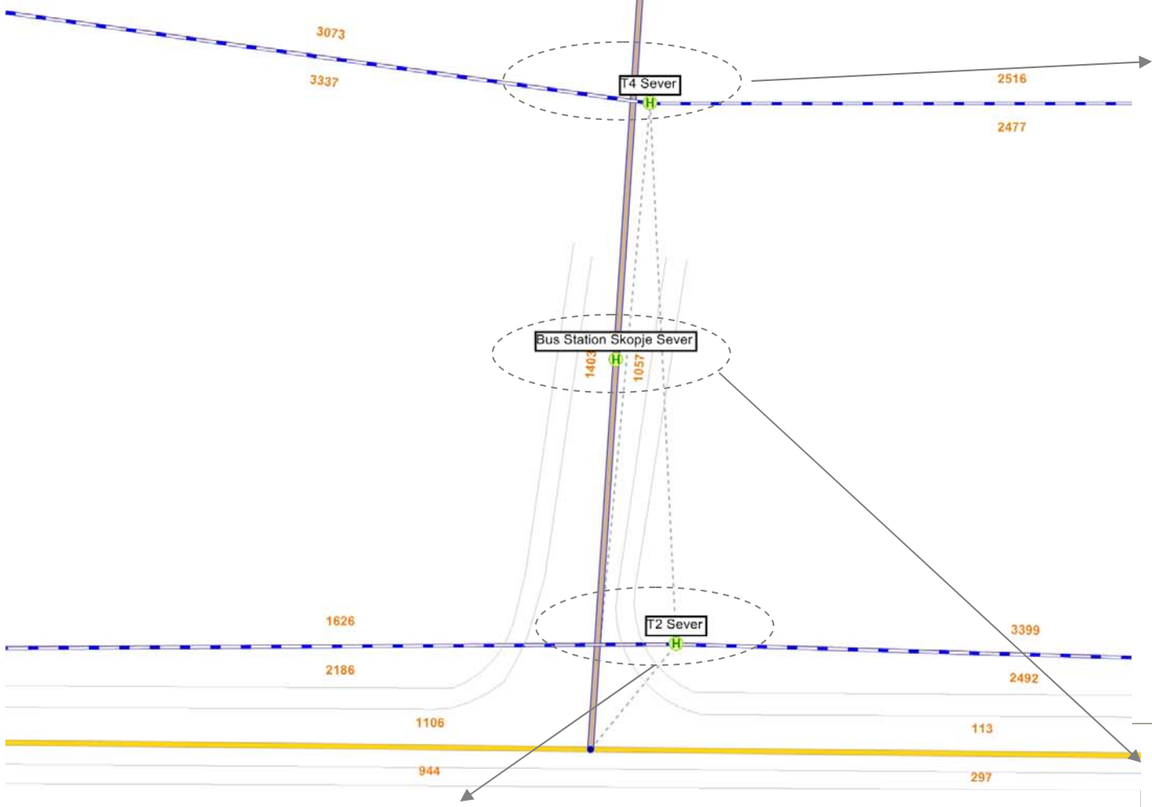
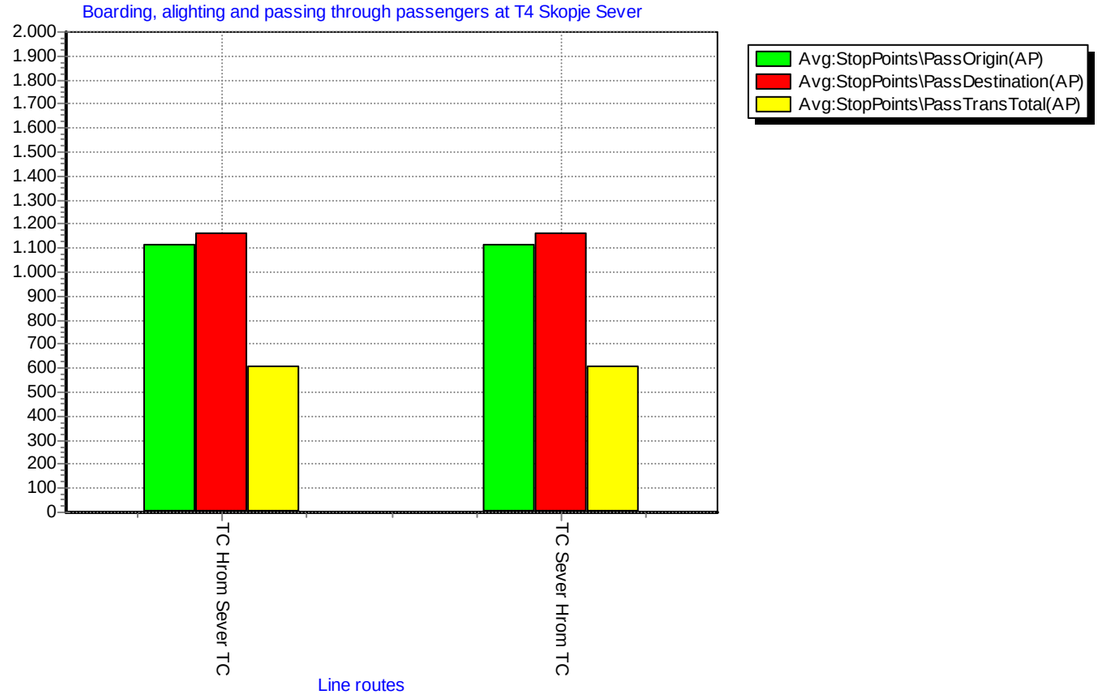
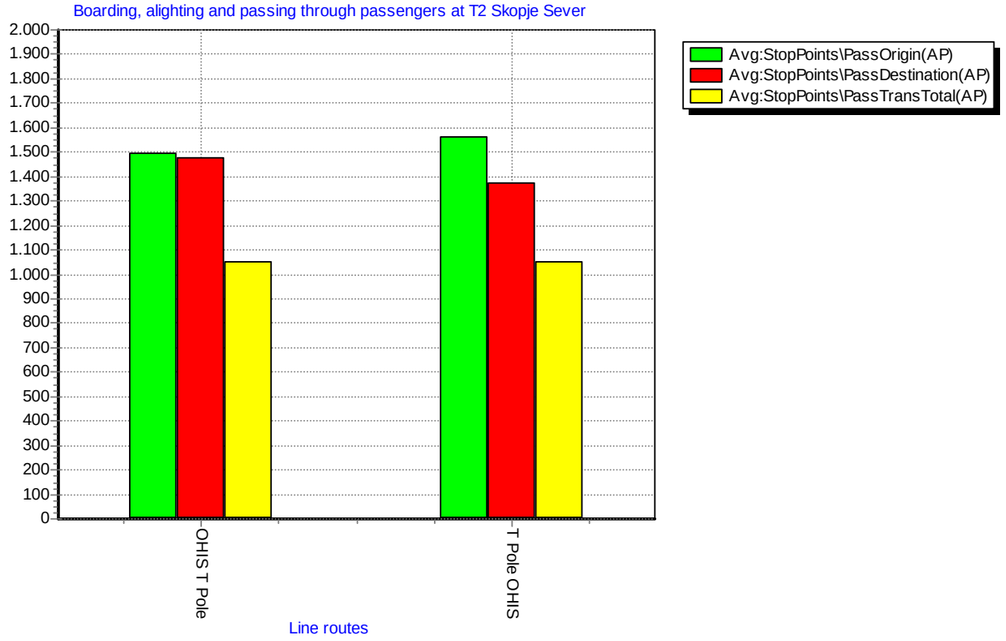
Boarding, Alighting and Passing-Through-Passengers at Skopje Sever in 2030



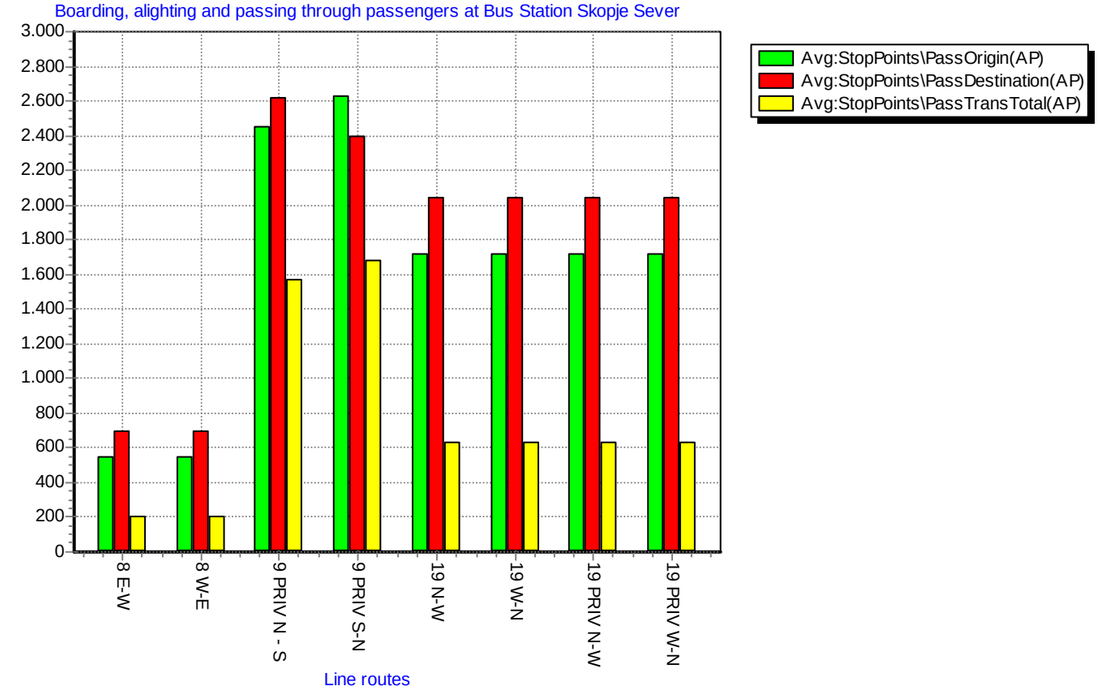
Boarding, alighting and passing through passengers at T4 Skopje Sever

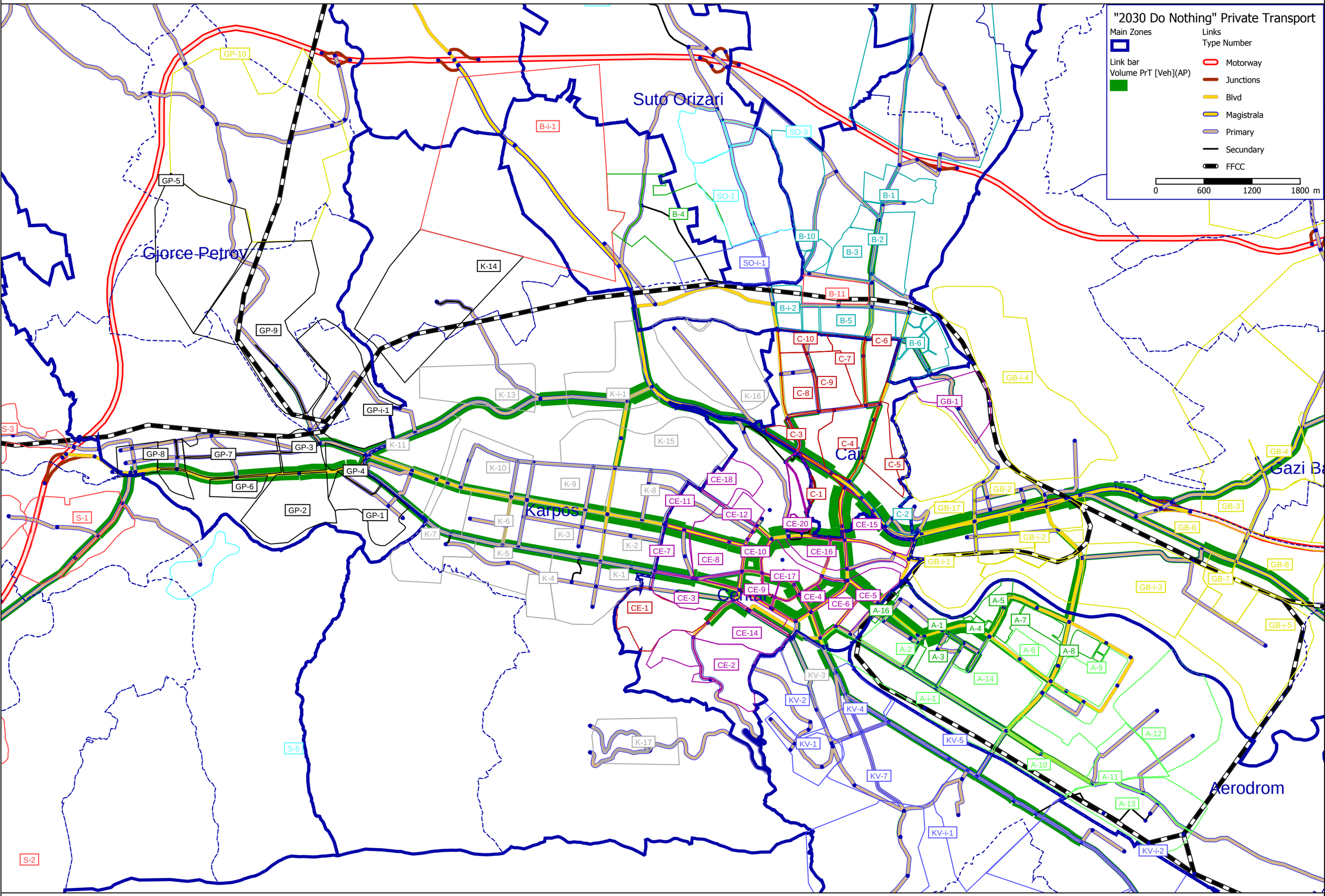


Boarding, alighting and passing through passengers at T2 Skopje Sever



Boarding, alighting and passing through passengers at Bus Station Skopje Sever





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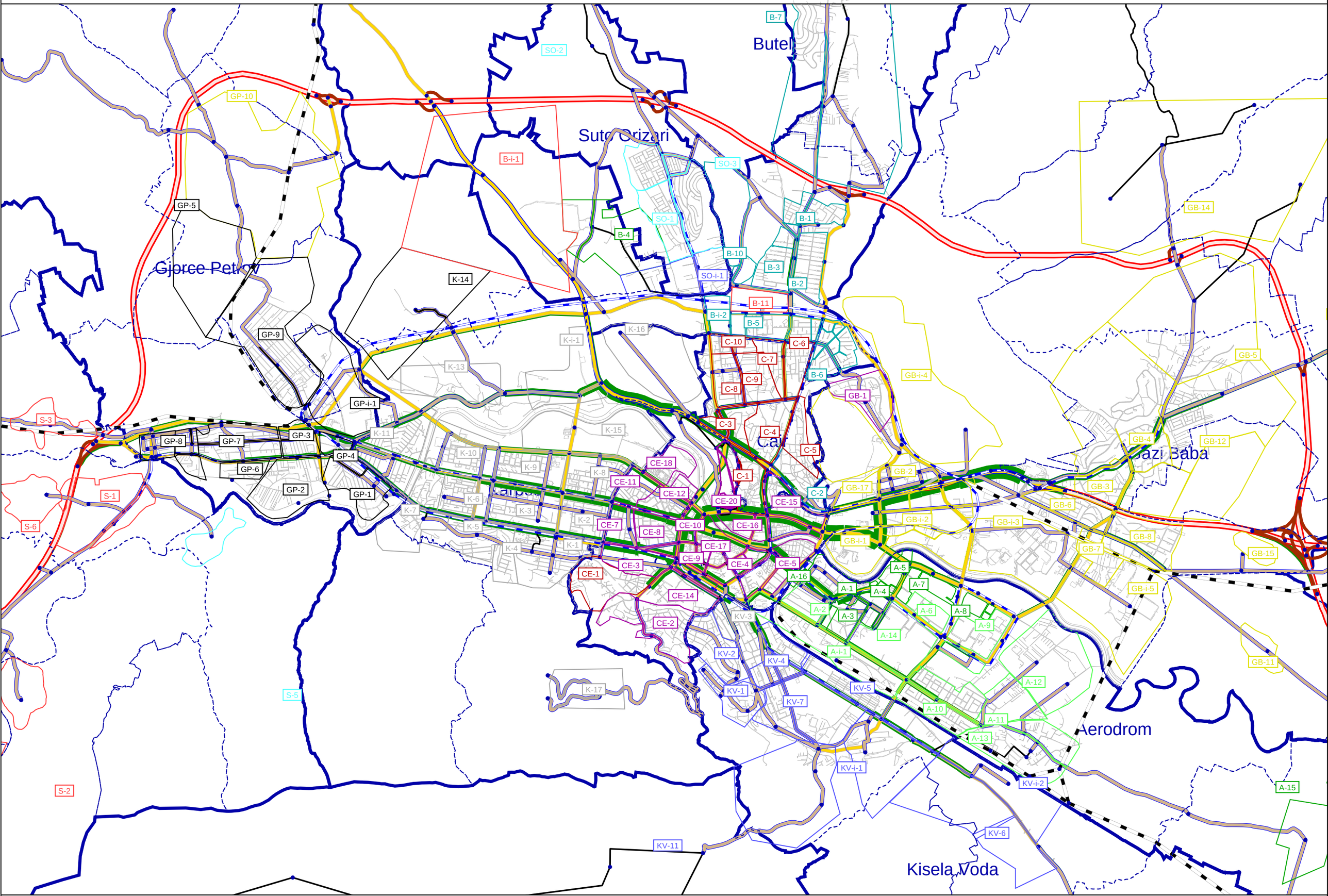

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Ministry of Transport and Communications of Macedonia	Transport Masterplan for the City of Skopje	Scenario "2030 PLUS"