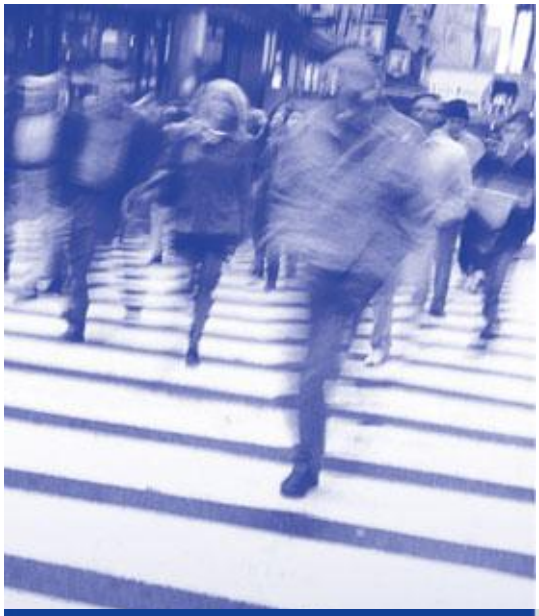

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Implementation status report on the high-quality mobility corridor

ELAN Deliverable No. 2.1-D1

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Work package:	**WP2 Collective transport & inter-modal integration**
Measure:	**2.1-LJU Integrated high quality corridor**
Author:	**Sabina Popit**

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General

x	CIVITAS		
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Work package links

	WP1 Alternative fuels & clean vehicles		WP7 Energy-efficient freight logistics
x	WP2 Collective transport & intermodal integration		WP8 Transport telematics
	WP3 Demand management		WP9 Project coordination
	WP4 Influencing travel behaviour		WP10 Project management
	WP5 Safety, security & health		WP11 Research and Technological Development
	WP6 Innovative mobility services		WP12 Impact and process evaluation
			WP13 Dissemination, citizens' engagement, training and knowledge transfer

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CONTENT

1. Summary

Ljubljana is the capital of Slovenia and its largest city. Since there is a lot of commuting to the city via motor vehicles, it is necessary to redirect daily migration (110.000 daily commuters) to use public transportation as much as possible. Personal car use has reached a critically high level in Slovenia and it has been increasing for the last 15 years. Because of the traffic congestion, public transport is slow and unpunctual, and hence unattractive to many people.

Therefore, within the CIVITAS ELAN project a high quality corridor was planned and designed to cross the city from South to North with beginning and/ or ending on both sides of the motorway ring as a part of a regional scheme of intermodal interchange systems.

Beside some bureaucratic obstacles, the biggest challenge for the implementation of the corridor was that some stakeholders, including some traffic experts, haven't been ready for innovative solutions as envisaged in the ELAN project yet.

With all the efforts that were put into the project and measure, the terms "sustainable mobility" and "mobility of the people not cars" made a great breakthrough and the path that was built through the process of the implementation of the corridor will certainly be followed.

2. Measure 2.1-LJU Integrated high-quality mobility corridor

Measure 2.1-LJU of the CIVITAS ELAN project was planned as the development of a high quality mobility North-South corridor going through Ljubljana's city centre and towards neighbouring municipalities, integrating a variety of measures and transport modes. It would introduce public transport lanes ("yellow lanes") through the entire length of the corridor with Park-and-Ride (P+R) service at each end of the corridor. It begins at the northern part of the town where Dunajska road crosses the motorway ring and where nearby P&R Stožice is located. Further in southbound direction the corridor crosses the northern part of the city's inner road ring and runs along Slovenska road through the city centre towards the end of Barjanska road.

Since the measure implementation was facing severe barriers, it was decided (in the 4th amendment of the project) to replace the physical implementation of the corridor with a traffic model, in order to confirm the impacts of the model implementation. The traffic modelling research served as a professional tool for decision-making process within COL and at the same time also as an evaluation tool although the implementation of the dedicated bus lanes will only take place after the end of the CIVITAS ELAN project. For the evaluation purpose two additional variants of the traffic regime were modelled in addition to the existing regime model, as explained below, and the results were used for comparison and evaluation of main traffic characteristics of the (especially) peak hours traffic situations.

The measure was implemented in the following stages:

Stage 1: Preparation phase *(September 2008 – March 2011)* – A new spatial plan was adopted in Ljubljana in July 2010. The preparation phase for the mobility corridor implemen-

tation includes the adaptation to the new requirements of the spatial plan for Ljubljana, promotion of the corridor in public presentations, citizen engagement plan preparation, mobility management plan preparation, P&R projects preparation, establishment of data management requirements, outreach campaign preparation and execution.

Stage 2: Implementation phase – development of technical documentation for corridor (plan) *(April 2011 – September 2012)* – This stage included the following steps towards a modern city public transport: a detailed design and all required technical documentation for the construction of P+R Barje in the south – as its implementation is a political condition for the implementation of additional yellow lanes it makes sense to accelerate the process of P+R construction; Traffic regime changes on Slovenska road (closing of the central section for private cars) and Dunajska road (additional yellow bus lanes).

Stage 3: Mobility management planning *(April 2009 – September 2010)* – A mobility management plan for the new administrative building of the Municipality of Ljubljana and a mobility management plan for the Ministry of Foreign Affairs have been prepared by UIRS. Presentations/ demonstrations of the efficiency of the mobility management plan have been organised for public and experts.

Stage 4: P+R North construction *(April 2009 – October 2010- June 2011)* – A Park & Ride (P+R) system was implemented at the northern end of the corridor. An intermodal point at the cross section of the inner road ring and the southern part of the corridor is set up.

Stage 5: 4th amendment – measure changed *(April 2011 – September 2011)* – In the stage of the 4th Amendment it was decided, that the corridor couldn't be established and put into operation during the lifetime of the ELAN project. A development of the traffic model for the discussed corridor design alternatives was proposed.

Stage 6: Traffic model *(September 2011 – September 2012)* – Modelling of different individual and comprehensive impacts of implementation of additional dedicated bus lanes at Dunajska Street and of traffic regime changes due to the closing of Slovenska road for private cars: An integrated traffic study on the process and effects of implementing additional dedicated bus lines on the corridor (installation of road signs, cycle track) has been conducted. An environmental model of emissions on the corridor was developed and serves also as a tool in the process of justifying the implementation of the yellow lanes on the existing road infrastructure.

3. Introduction

3.1. City of Ljubljana and Ljubljana Urban Region

Ljubljana is the capital of Slovenia and its largest city. It is the centre of the City Municipality of Ljubljana. It is located in the centre of the country in the Ljubljana Basin.

Ljubljana is the political and cultural heart of the Slovenian nation as well. It is an important European commercial, business, exhibition and congressional centre as well as the transport, science and education centre of Slovenia.

Covering an area of 275 km^2 it encompasses 1.36 % of Slovenian territory and has 280 140 inhabitants (in 2010), who make up for 13.7 % of population of Slovenia.

The City Municipality of Ljubljana is subdivided into 17 quarter communities that work with the municipality council to make known residents' suggestions and prepare activities in their territories.

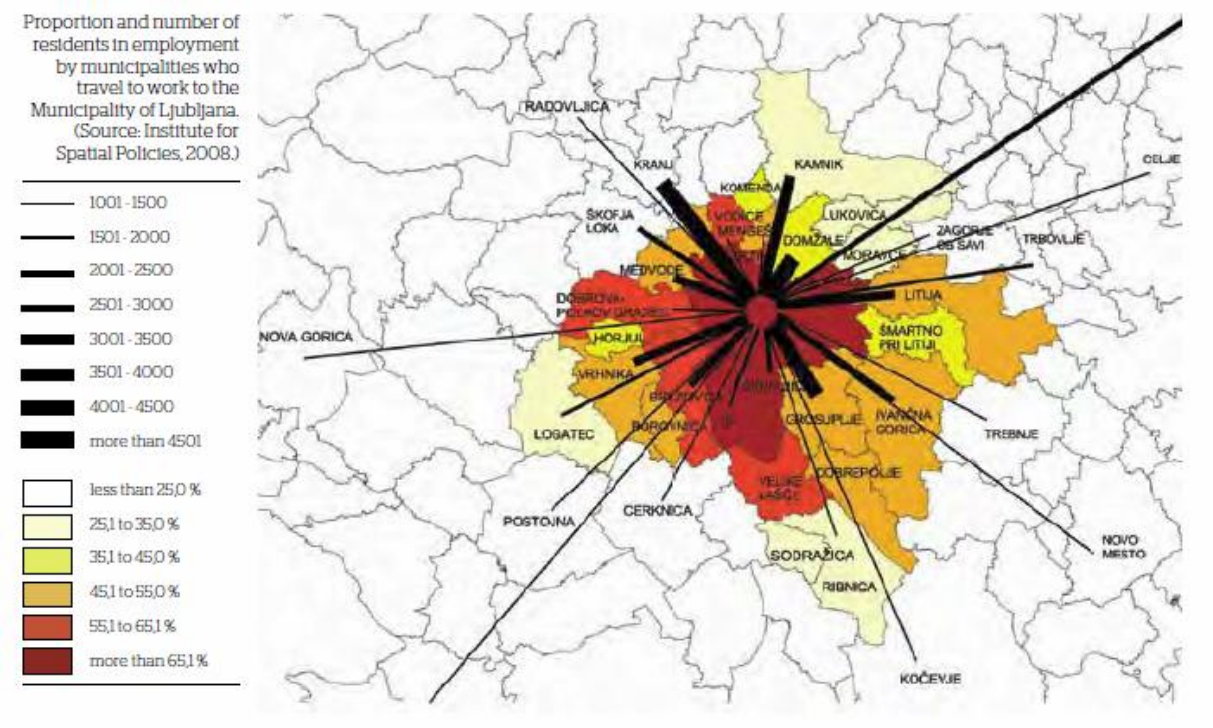
Ljubljana in figures: Demographic data	
• number of residents (1 January 2011)	280.140
• number of students (year 2009/ 10)	38.650

Ljubljana in figures: Transport	
• number of registered motor vehicles 2010	175.604
• number of registered private vehicles 2010	147.875
• number of taxis 2010	357
• number of city public transport buses 2010	213
• length of city public transport routes 2010	315 km
• passengers carried by city public transport 2010	81 million journeys
• passengers carried by air 2010	1.388.655
• freight transported by air 2010	17.310.000 kg

Ljubljana also plays an important role in implementation of local affairs of public interest in its wider area, which is why it cooperates with other municipalities in Ljubljana Urban Region (LUR) encompassing 26 municipalities with a total over 500.000 residents or 25 % of all population of Slovenia.

Ljubljana Urban Region (Source: Expert guidelines for the regulation of regional public transport, RDA LUR)

Since Ljubljana has a lot of migration to the city via motor vehicles, it is necessary to redirect daily migration (110.000 daily commuters) to use public transportation as much as possible.



Daily commuting

3.2. Situation before CIVITAS ELAN

The traffic situation in Ljubljana shows the following: the morning rush hour traffic is in the direction towards the city, the afternoon rush hour traffic heads the opposite direction. Both are consequences of high volume commuter streams from other places to Ljubljana. Besides this, inside the town the citizens who use their own cars instead of public transport or other alternative transport modes generate additional traffic too.

Personal car use has reached a critically high level in Slovenia and it has been increasing for the last 15 years in absolute numbers and compared to the other modes of transport.

At the same time, Ljubljana's city centre is crowded and there is a permanent deficiency of parking places. During the day employees, who arrive to their job by car, occupy most parking places. Because of the traffic congestion, public transport is slow and unpunctual, therefore unattractive to many people. This is a vicious circle where – without a major intervention – change is not possible.

3.3. Regional public transport plan

A study entitled "*Expert guidelines for the regulation of regional public transport*" was conducted by the Regional Development Agency (RDA LUR) in cooperation with the municipalities of the Ljubljana Urban Region, which also financially supported the project and enabled its implementation. The project provides professional and clear answers to the challenges of development and mobility in Ljubljana and the region.

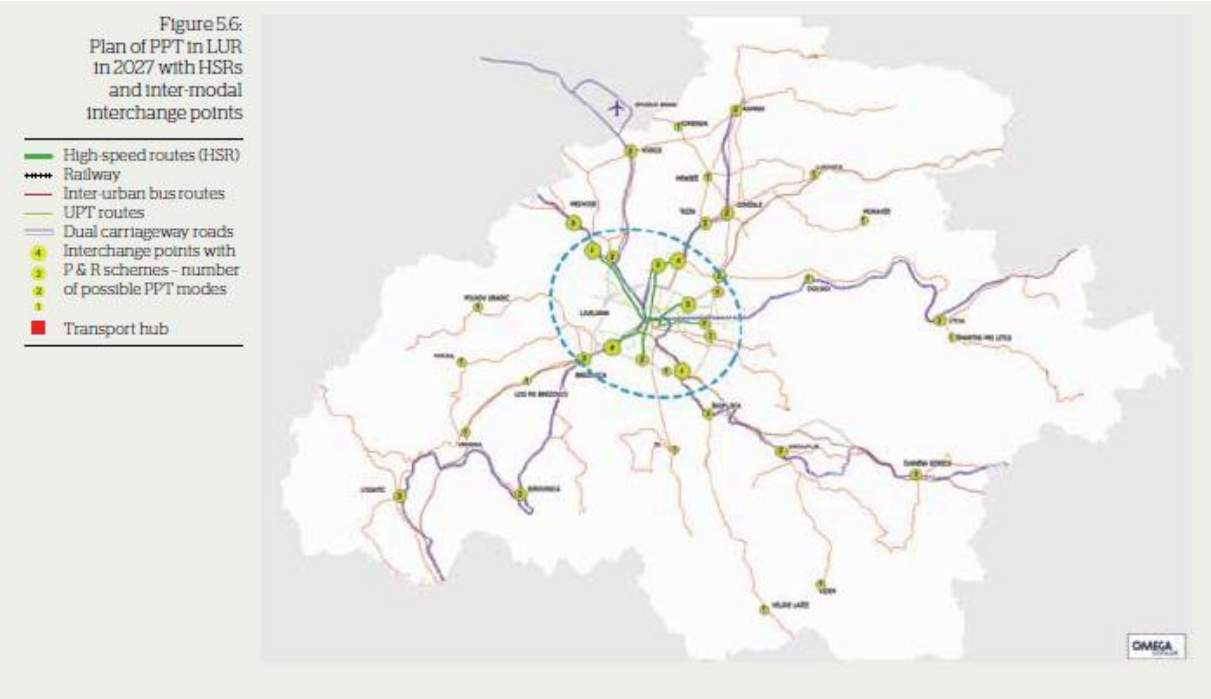
Six priority projects concerning public transport regulation in the region were proposed:

- *A **Park & Ride scheme** which foresees 38 sites for intermodal transfer points divided into three basic types: a transport centre (Passenger Centre in Ljubljana), intermodal hubs outside the region's centre, and P & R schemes alongside the arterial roads of urban centres.*
- ***Contemporary high-speed routes** (HSR) will run along the principal transport routes and converge on Ljubljana, linking all parts of the region as well as Slovenia. The purpose of the HSRs system is to connect public transport terminals capable of generating sufficient demand and thus ensuring the competitiveness of public transport vis-à-vis private transport. In this way, car traffic would be shifted to public transport ahead of the urban agglomeration. In the HSRs system the travel speed has to increase from the current average of 5km/h to 24km/h, and along with this increase, the public transport peak period frequency to 5 minutes.*
- *The project '**Modernisation of the railway infrastructure**' is an important national project helping to establish public transport in the region within the framework of ensuring normal long-term development and the achievement of objectives. Rail links to important regional centres are essential for effective public passenger traffic.*
- *The project '**Design and implementation of major cycling and walking paths** in urban centres and between centres in the region' is set to enable daily commuting for people who choose non-motorised forms of transport instead of motorised. A system of paths will con-*

*nect settlements and towns in the region, and also connect the Park & Ride schemes. In the fifth set, we offer '**Policies and soft measures to support the public transport**'.*

- *Following the example of European good practices, the envisaged independent **Regional Coordination Body** for steering the development of public transport will be responsible for the effective provision of public transport at the regional level.*

(Source: Expert guidelines for the regulation of regional public transport, RDA LUR)



Proposal for inter-modal interchange points (Source: Expert guidelines for the regulation of regional public transport, RDA LUR)

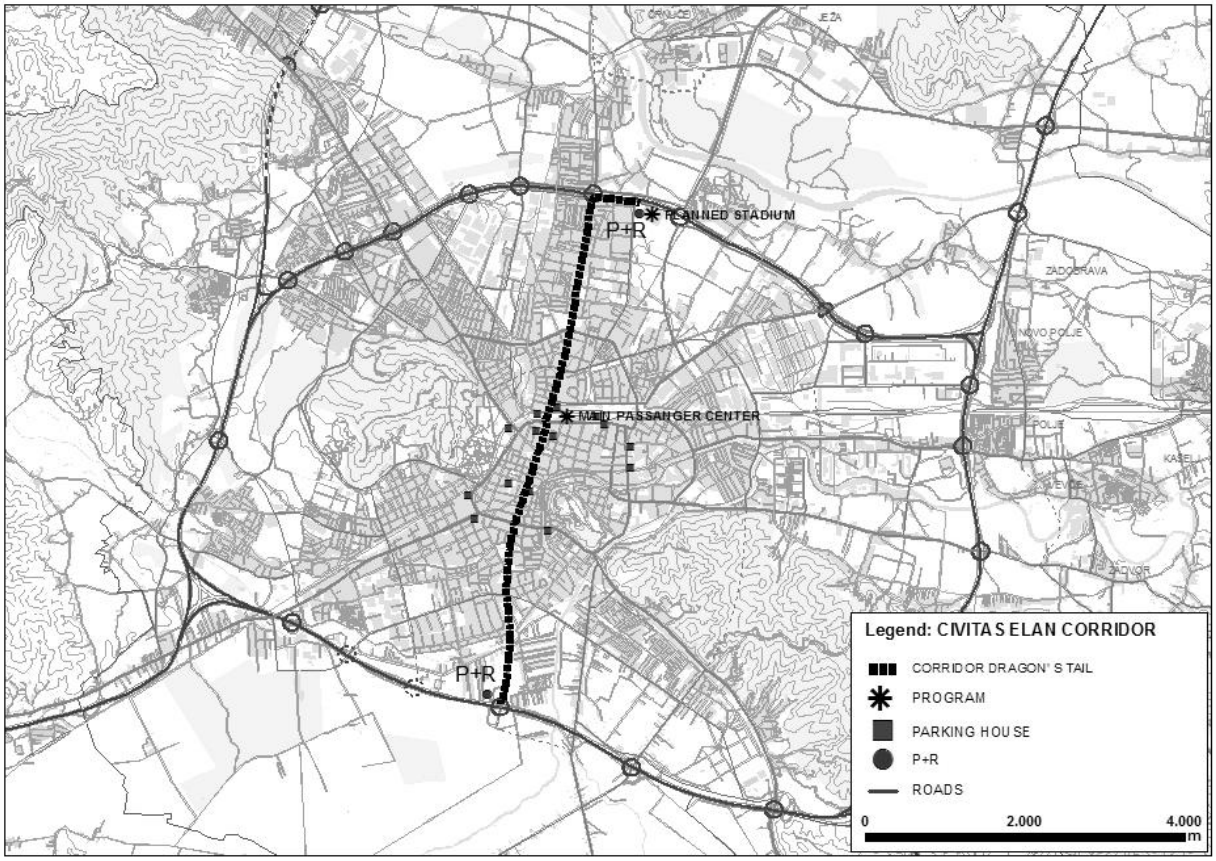
Inter-modal interchange points connecting PT with private motorised (P & R) and non-motorised traffic are to be set up in the municipal centres of LUR. These interchange points are linked with the central PPT services (bus and/ or railway station) and only as such do they form a network of PPT interchange points in the region. Inter-modal interchange points are also set up at P & R sites, as outlined in the ISP (Implementation Spatial Plan) of the Municipality of Ljubljana (MOL), and changes occur between different modes (high-speed routes, railway and bus services, P & R schemes). If these interchange points also act as links at intersections between traffic corridors and PPT, they become secondary inter-modal terminals.

4. Integrated high-quality mobility corridor “Dragon’s tail”

4.1. Planning phase (background)

The corridor was planned and designed to cross the city from South to North with beginning and/ or ending on both sides of the motorway ring as a part of a regional scheme of intermodal interchange system.

The corridor comprises the following major roads: Barjanska (southern part), Slovenska (central part) and Dunajska (northern part). In 2008 a very important bridge was constructed on Barjanska road. Thus Barjanska road is the shortest link from the motorway to the city centre.



Corridor “Dragon’s Tail”

Beside dedicated bus lanes along the corridor construction of a new P+R facility was proposed at the junction of the South ring and Barjanska road in the new City Urban Plan.

At the northern part of corridor construction of a P+R facility was constructed within the new Stadium Stožice. Dunajska road is connecting the city centre from the north. It is the most congested arterial road inside the motorway ring and extra priority is needed for a high quality bus corridor. Before Dunajska road enters the city centre a new main passenger interchange centre EMONIKA has been planned.

In the middle of the corridor around Slovenska road lays the city centre. In this section of the corridor there are the only dedicated lanes for public transport in the whole city road network. The City of Ljubljana has been planning to close this street for private vehicles in the last few

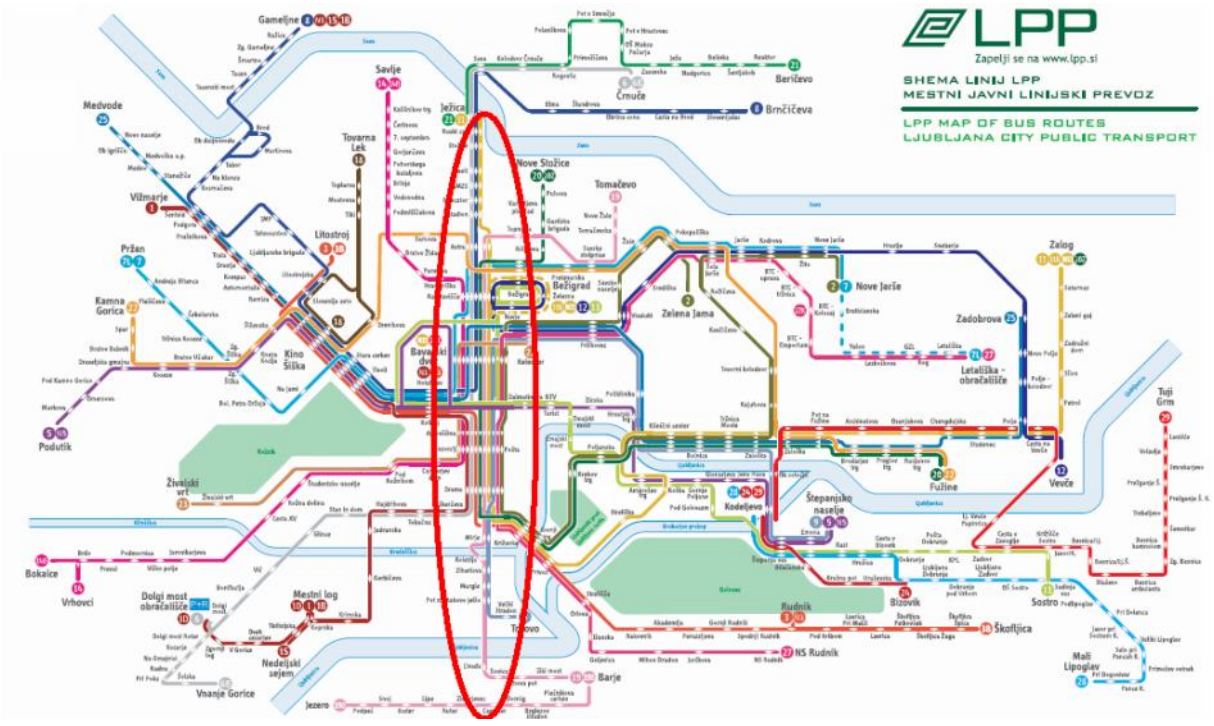
years, and this idea was included in the detailed design of the CIVITAS ELAN corridor, named "Dragon's tail". The closure of the central part of Slovenska Street for private vehicles is foreseen for September 2013.

4.2. Data base for traffic on the corridor

4.2.1. Public transport on corridor

The city bus network, run by the public company Ljubljanski potniški promet ("Ljubljana Passenger Transport Operator", LPP), is Ljubljana's most used means of public transportation. One can also rent bicycles in the city, and there are numerous taxi companies. The city bus rides may be paid with the Urbana electronic payment card (also used for the funicular, libraries, museums, etc.) or via mobile phone.

The corridor itself is already well covered with public transport, but since it runs within mix-traffic (except in the central part), rather unpunctual and thus unattractive to many people.



City public transport scheme and the corridor area

The dragon's tail corridor, to a lesser or greater extent, is connected with all PT lines. The main lines of public transport on the corridor are as follows:

- At section south at Barjanska street line 9 and 19. After the implementation of P+R Barje a new line will connect P+R Barje with the city centre.
- At the central section (Slovenska Street) lines 1 and 6 are entering the corridor from the west (line 6 connecting P+R Dolgi with the city centre), and lines 2, 3, 11, 20 and 27

from the eastern and south-eastern part. In the central part the most important line that enters from the west is line 8. Lines 1, 2, 3, 9 and 19 are out from the corridor after 300 or 600 meters. Along this central section of the corridor, dedicated bus lanes are set.

- At the northern section (Dunajska Road) the corridor is covered by lines 6, 8 and 11 and partially 20. The most important lines along the corridor are 6, 8, 9 and 11. The second most used line, number 20, partly runs through the corridor, and covers parallel Vojkova street with the final stop next to the P+R Stožice.
- Ride costs € 0.80 for 90 minutes with an unlimited number of transfers. Payment can be done with the Urbana e-card or by mobile phone system Moneta.

Passengers have to validate just when entering the bus; for transfer as well (even if not charged within 90 minutes). Validations therefore offer just approximation to the number of PT passengers on the corridor.

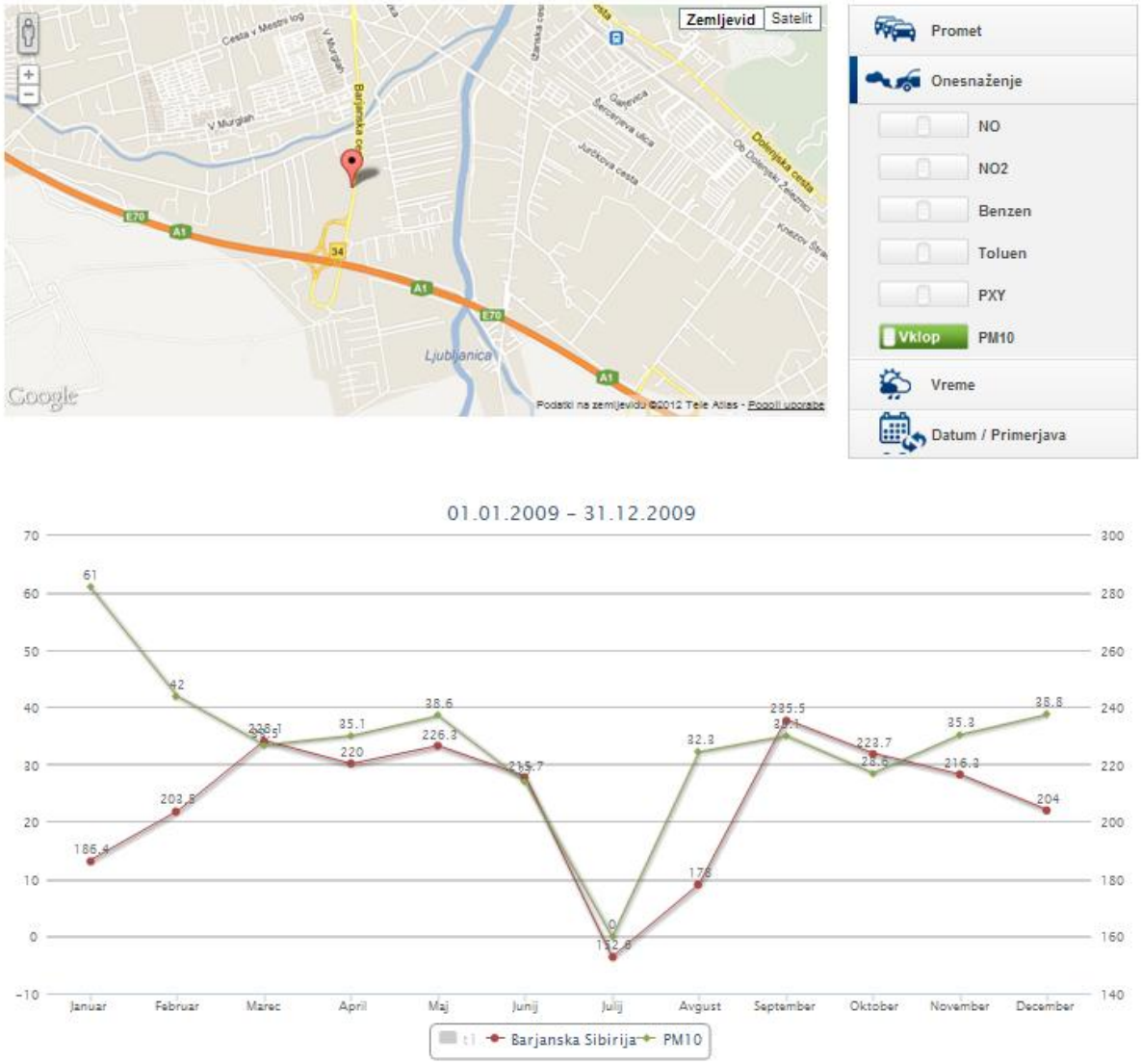
4.2.2. Private cars and transport vehicles in the corridor data base

Traffic data is collected by automatic counters along the corridor at three locations. Data is available on traffic into and outward the city centre at Barjanska Street just before the junction to the highway (southern part of the corridor). Counters at the central part near Drama on Slovenska Street are collecting data on northbound and southbound traffic. Traffic flows are recorded separately for both carriageways – for mixed traffic and the dedicated bus lanes. Counters at Dunajska Street are recording traffic on two lanes of mixed traffic towards the centre (south).

Counters record the number of vehicles every 10 (first half of 2007), or 15 minutes by transport type: engine, passenger car, bus, light trucks, medium and heavy trucks. In later analysis the category of light trucks was presumed as a proxy for the number of vans along the corridor.

Cyclists are counted separately.

Traffic counters on the corridor are part of the integrated data base for traffic and environmental analyses, available at *mol.sors.si* (not opened to the public yet).



Traffic flows and environmental impacts – database for analyses

5. Implementation of the corridor

5.1. Corridor design

The first solution for the design of the corridor was finished in December 2009. Before finalisation several workshops with stakeholders and citizens took place from September 2009 to December 2009:

Cyclist platform workshops (citizens' engagement and stakeholder's involvement phase II– focus group 1) on 17th of September, 13th of October and 5th of November 2009 were organised where some suggestions for the regulation of bicycle paths along the corridor were collected and some additional bicycle paths were proposed at the northern part of the corridor. Many of the proposals have been assessed as excellent solutions and adopted within the corridor design.

City Project Group for Traffic meetings took place (21st of September 2009, 26th of October 2009, 2nd of November and 16th of November 2009), where a general consensus on the corridor design was adopted (citizens' engagement phase and stakeholder's involvement II– focus group 2).

Workshop for **CIVITAS ELAN partners** – COL (City of Ljubljana), LPP and Telargo with designer PNG on bus lines and PT priority took place on 16th of October 2009 (citizens' engagement phase and stakeholder's involvement II– focus group 3).

Insert from the first corridor design, northern part – junction to the motorway, PNG, December 2009

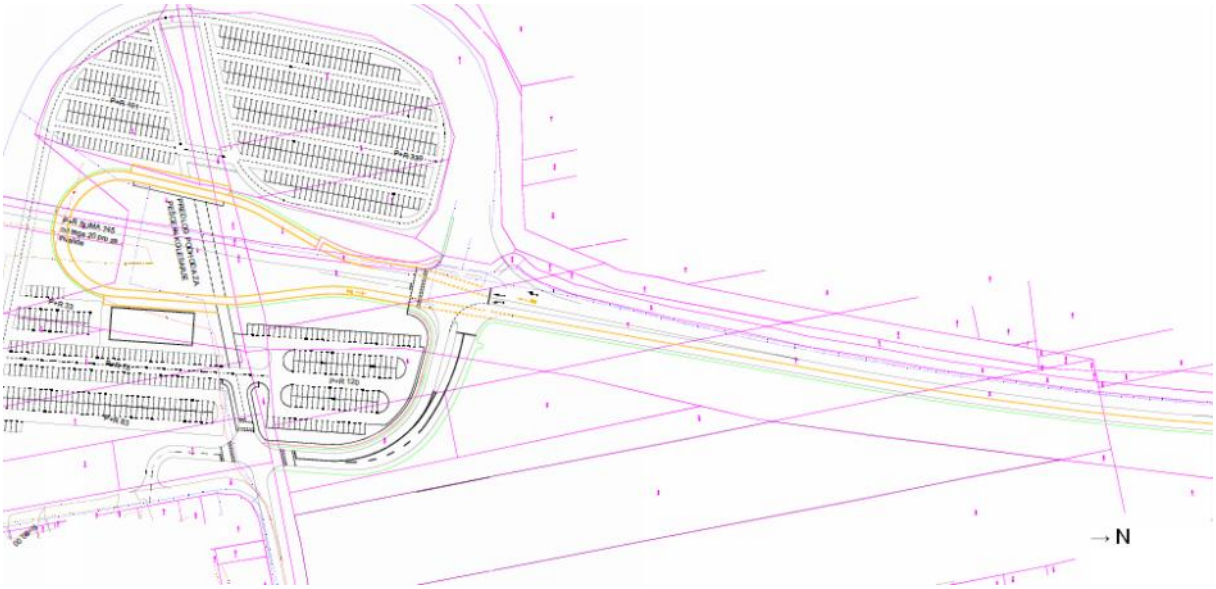
Insert from the first corridor design, central part – Slovenska street, PNG, December 2009

Insert from the first corridor design, southern part – Barjanska Street and P+R Barje, PNG, December 2009

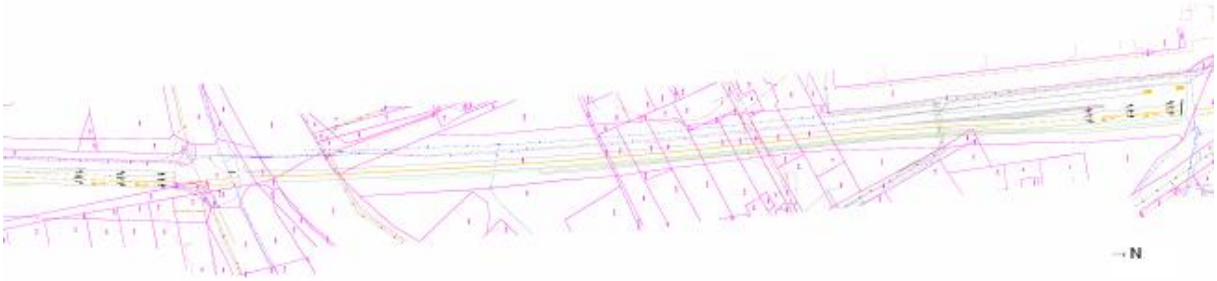
5.2. Corridor design adapting to the conditions and possibilities "outside" CIVITAS ELAN –southern part

5.2.1. Dedicated bus lane adjustment at the southern part

Due to shortcuts in public finances, problems with widening of the bridge at Barjanska street due to the national flood-hazard programme (southern part of the corridor) and with taking into account recent traffic data, a new reconstruction of the existing road was suggested and finished in August 2010. Only one dedicated bus lane was suggested in the northern direction (via the city centre).



First corridor re-design at the southern part – Barjanska street and P+R Barje, PNG, August 2010 due to narrow bridge at Barjanska street (part 1)



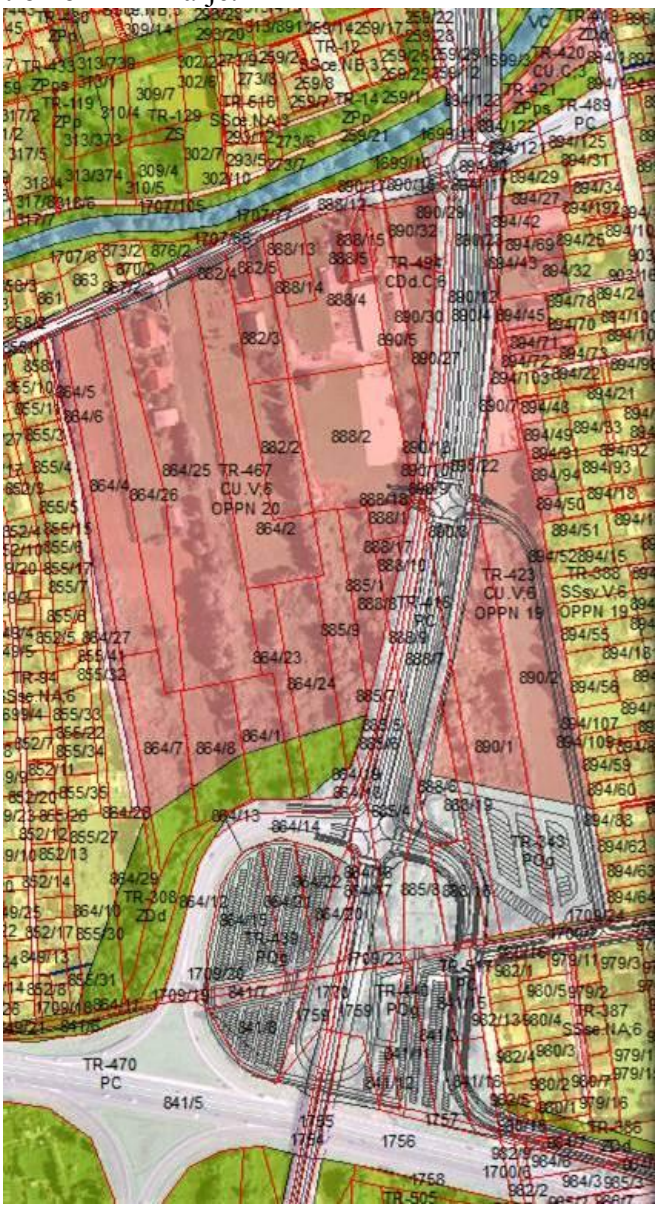
First corridor re-design at the southern part – Barjanska street and P+R Barje, PNG, August 2010 due to narrow bridge at Barjanska street (part 2)

5.2.2. P+R Barje adjustments

5.2.2.1. City Urban Plan

In October 2010, after many months of delay due to long lasting approval process at the stakeholder's level and referendum request, the City Urban Plan was finally approved by the

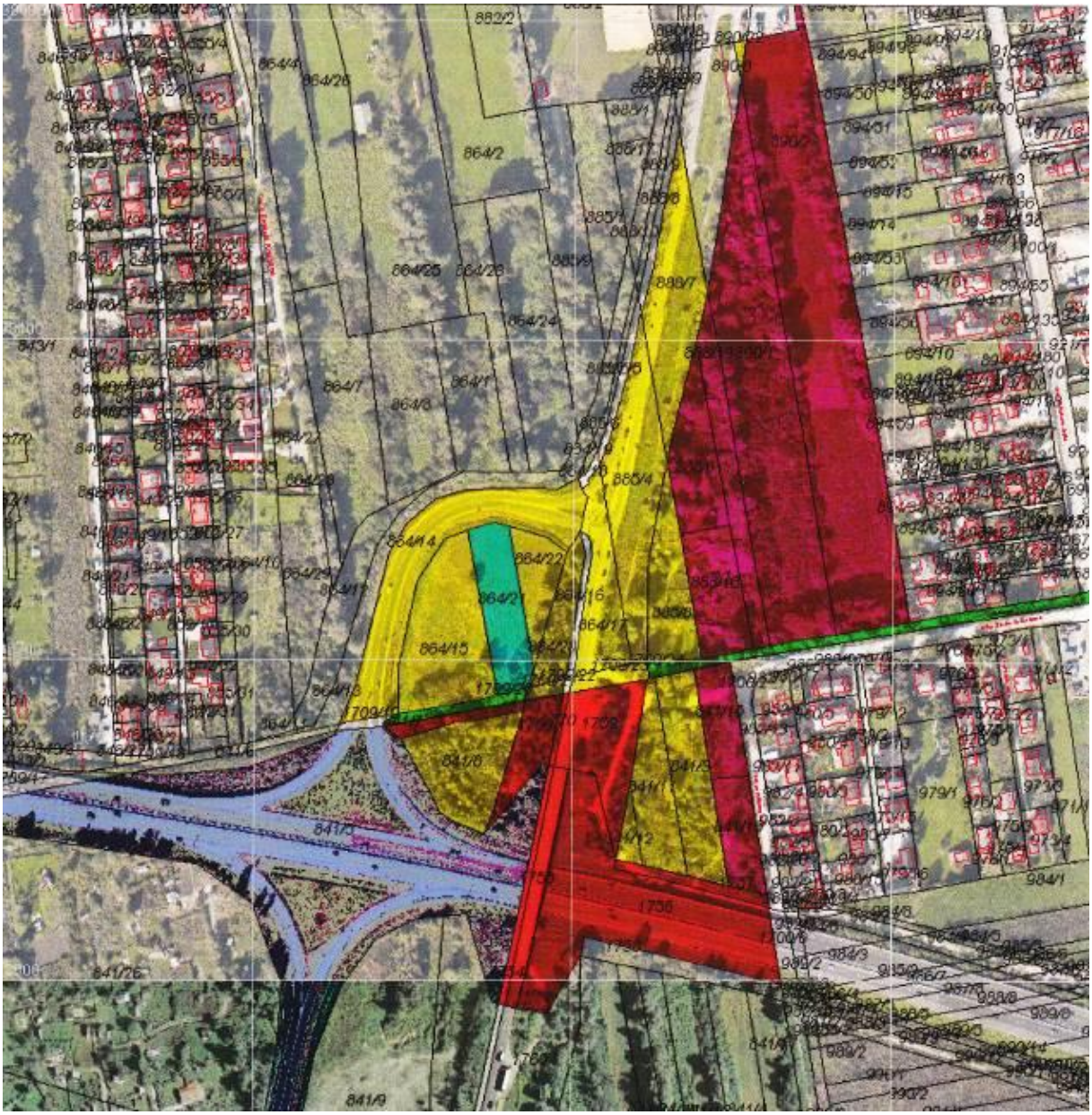
City Council. This Spatial Act put into place the most important legal basis for the construction of P+R Barje.



Implementation Spatial Plan with P+R Barje at sections TR 343, TR 439 and TR 440

5.2.2.2. Purchase of land

The City of Ljubljana has made efforts to purchase land at the southern access road since 2008, but since land (marked in magenta on the map) was undergoing a denationalisation process, it was removed from the first phase of the P+R Barje construction. The denationalisation process in Slovenia might last up to 10 years. Before it ends, the city cannot buy this plot of land, but in the City Urban Plan this land stays within P+R Barje for the next phase immediately after land purchase will be possible.

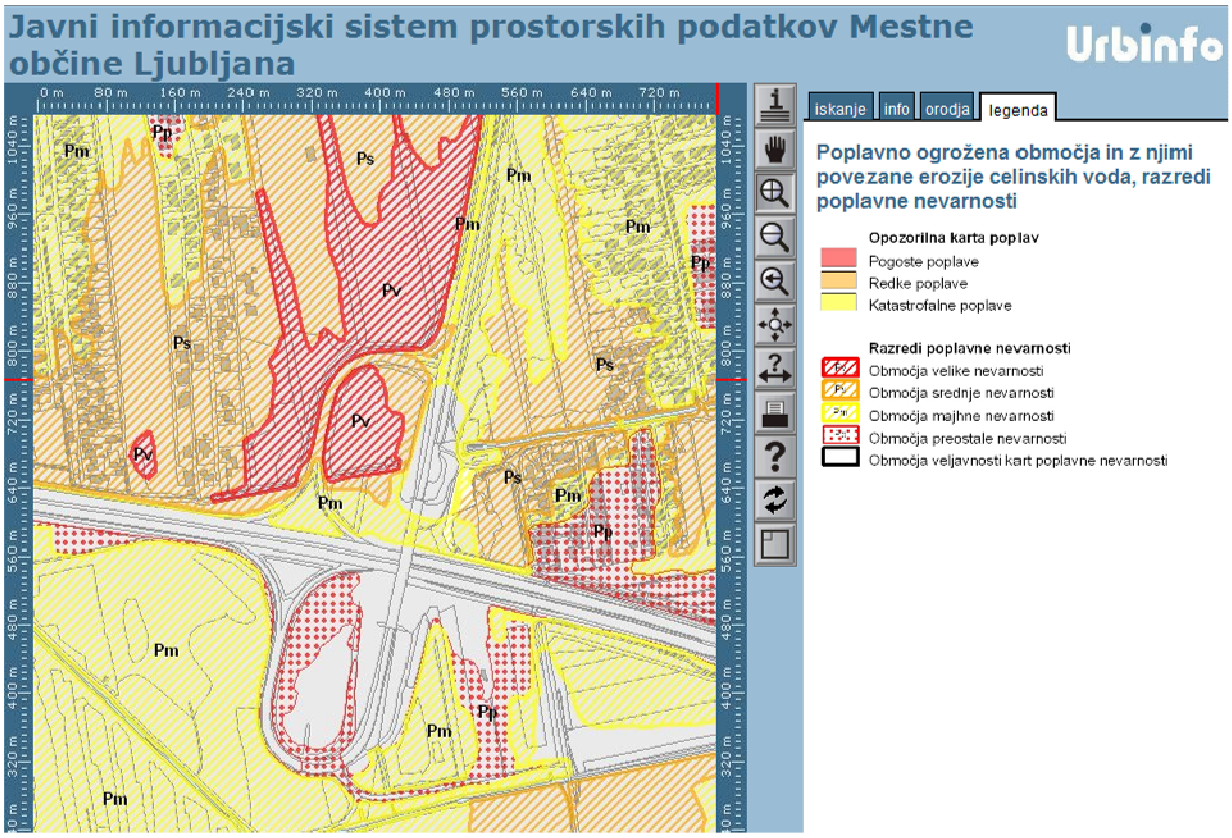


Land ownership – yellow, green, blue and red are available for P+R Barje, September 2010

5.2.2.3. National Flood hazard Program

After high floods in September 2010 when most of the southern part of the City of Ljubljana, including P+R Barje area was flooded, the Slovene National Environmental Agency even straightened conditions for any construction works.

Another redesigned plan for P+R Barje was prepared and two meetings with the Environmental Agency were held in February and March 2011. A flood protection expertise was conducted in June 2011 as requested by the Environmental Agency (as a prerequisite to be able to request a building permit).

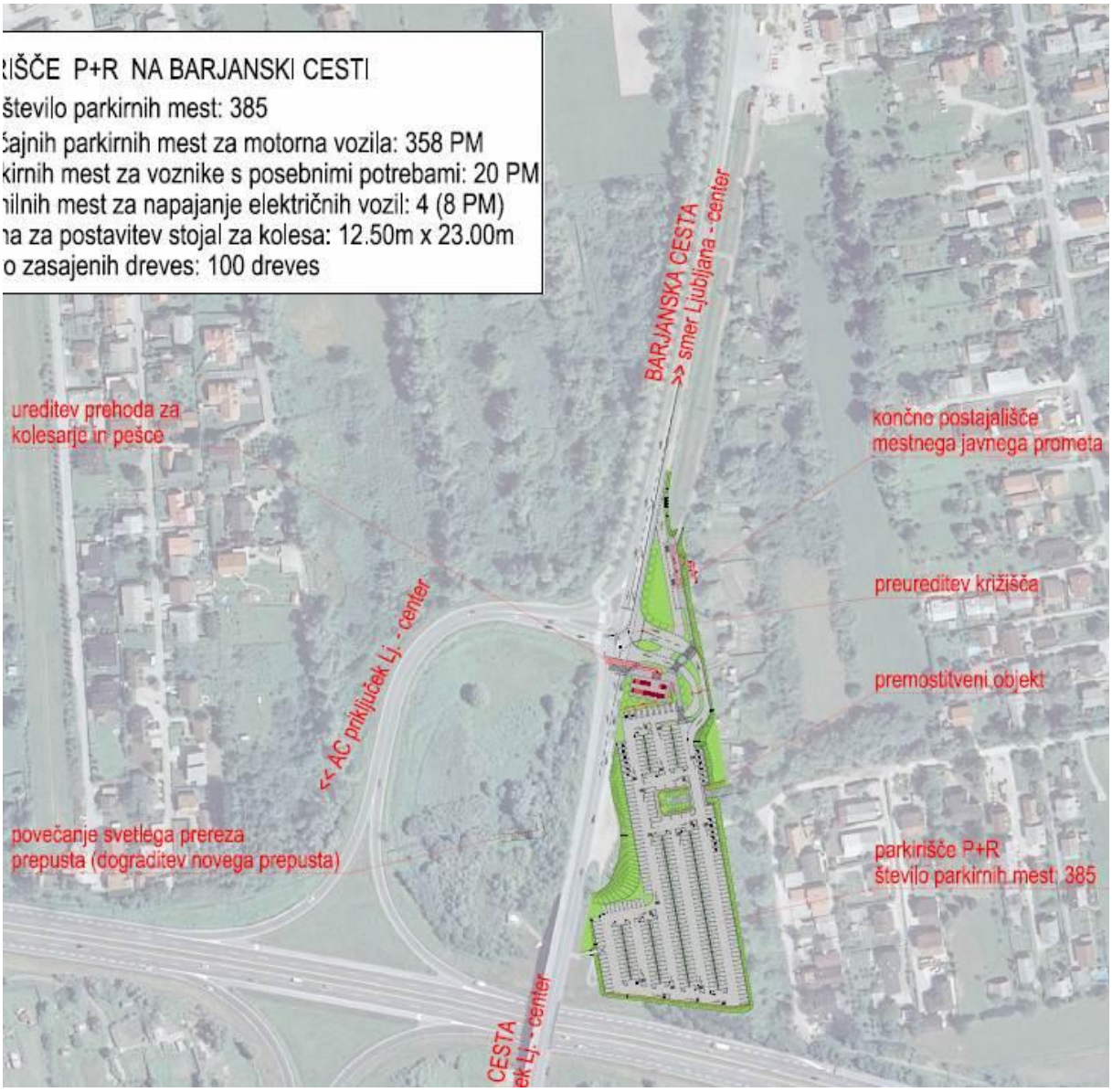


Flood hazard map, October 2011 Red (Pv) marking high flood hazard

Also several other actions took place to overcome this challenge: A last meeting with the Environmental Agency took place on 26th of January 2012. After that the City of Ljubljana administration started to get involved in the process of preparing *the National Spatial Plan for Flood Hazard Prevention at the South-Eastern part of Ljubljana* and managed to implement an amendment which allows phases in flood hazard measures. This amendment means that constructions would be possible if the measures that are implemented through P+R Barje constructions are recognised as a part of a holistic solution for flood protection at the South-Eastern part of Ljubljana.

Since the construction of P+R Barje faced several problems due to delay of the approval of the City's Spatial Master Plan, a delay in the purchasing of the land and due to the disagreement of The National Environmental Agency, its construction was taken out of the City budget 2011 and 2012 just like all other city projects that face any risk or delay possibility (as one of the criteria for financial cuts in the City budget due to the overall economic crisis in Slovenia). CIVITAS ELAN wants to enforce the process of the implementation. Therefore, COL would like to be ready with all technical documentation (which was planned for these goals before the financial cuts within COL's budget) as soon as possible. Budget foreseen for the implementation of the dedicated yellow lanes for PT would now be used for the preparation of all required technical documentation.

The final adjustments of the technical documentation for the P+R Barje according to the hydrological expertise and project conditions from the Environmental Agency were prepared in September 2012.



Final design (General situation map from Technical Documentation File for Building permit) P+R Barje, September 2012

5.2.2.4. Shortening of the corridor and substitute parking lots

The corridor is crossing the city from North to South. It begins at the northern part of the town where Dunajska road crosses the motorway ring and where nearby P+R Stožice is located. Further to the south the corridor crosses the northern part of the city's inner road ring and runs along Slovenska road through the city centre to Barjanska road. Since the start of the construction of P+R Barje was increasingly not in line with the planned schedule, a temporary P+R was proposed to be established along Barjanska road. The idea was not accepted, since a cost-benefit analysis clearly revealed that this P+R should operate five year at least to be economically viable. However, within five years P+R Barje is going to be constructed at the original location.

All observations and analyses of the corridor therefore end at the southern part of the corridor at the junction of the corridor with the inner road ring. At the end of Slovenska Street there is

a temporary parking lot NUK 2 with 188 parking places, a city bike terminal with 20 bike racks and 3 bus stops that are located very close to the parking lot (between 5 and 50 meters) with PT connections in all directions of the city – becoming an interesting intermodal inter-change point.

5.3. P+R Stožice

P+R Stožice was planned within the construction of the new City Stadium at the northern part of the corridor next to the highway that is connecting Ljubljana with the northern and eastern parts of Slovenia.

As part of the public private partnership project Stadium Stožice, P+R Stožice was finished within the planned schedule. Operating of the P+R started immediately after approval of the city ordinance at the City Council (Approval on P+R pricing and regime, City Council, 27th of September 2010).

The number of daily users was slowly increasing (from 20 at the beginning up to 60 daily users in January 2011), but stayed rather low, probably due to the construction of Štajerska road (former Titova road) that was still going on and therefore causing traffic jams at the northern part of the road network. The bus connection from P+R Stožice to the city centre was using a short section of this road system, so PT was therefore still less attractive than driving with a private car to the city centre using other roads.

P+R Stožice, October 2010

Price for parking: 2 Euros per day with two bus rides included. Bus line 13 and line 20 are connecting P+R Stožice and the city centre every 6 to 10 minutes.

5.4. Dedicated bus lanes at northern part (Dunajska road)

5.4.1. Conditions for the implementation of the dedicated bus lanes

The City's political leadership wanted to act responsible to its voters and has to consider the overall interests of citizens. Therefore, the implementation of the corridor as foreseen in measure 2.1-LJU was linked to the implementation of mainly four other projects in the city:

(1) P+R at the Southern and Northern part of the corridor,

(2) completion of the bridge Njegoševa-Roška on the inner city ring,

(3) completion of the new incoming Štajerska (before: Titova) road,

(4) traffic modelling by taking into account the new infrastructures.

In the lifetime of the CIVITAS ELAN project the P+R on the Northern part of the corridor was implemented and operational on time, on the other hand the Southern P+R Barje was facing many difficulties. The completion of the bridge Njegoševa-Roška on the inner city ring that should have taken place in October 2011 was heavily delayed as well. The construction company that was building it faced serious financial problems and finally declared bankruptcy in June 2011. An alternative company to complete the works was chosen, a new deadline set and the bridge was opened on 11th of August 2012.

The completion of the new incoming Štajerska road should have taken place in May 2011, but was delayed for the same reason as the bridge Njegoševa-Roška. It was opened to traffic in August 2012 for a 30 day "testing" period until the official opening.

Traffic modelling by taking into account the new infrastructures was finished and presented to political and other decisions-makers within COL on 31st of May 2011. The general city model showed a significant deterioration of -35% reduction of traffic flow permeability in general if dedicated yellow lanes for PT would be implemented on the existing roads. Discussions between traffic and mobility management experts continued. Despite unfavourable interpretation of the transport model it was certain that the political will to implement the corridor – including closure of Slovenska road between Šubičeva street and Gosposvetska street for private cars – persists while its implementation is strongly linked to the implementation of the other three above mentioned issues.

Anyhow, it was clear that there will be no additional implementation of yellow/ dedicated bus lanes on Dunajska street within the lifetime of the ELAN project.

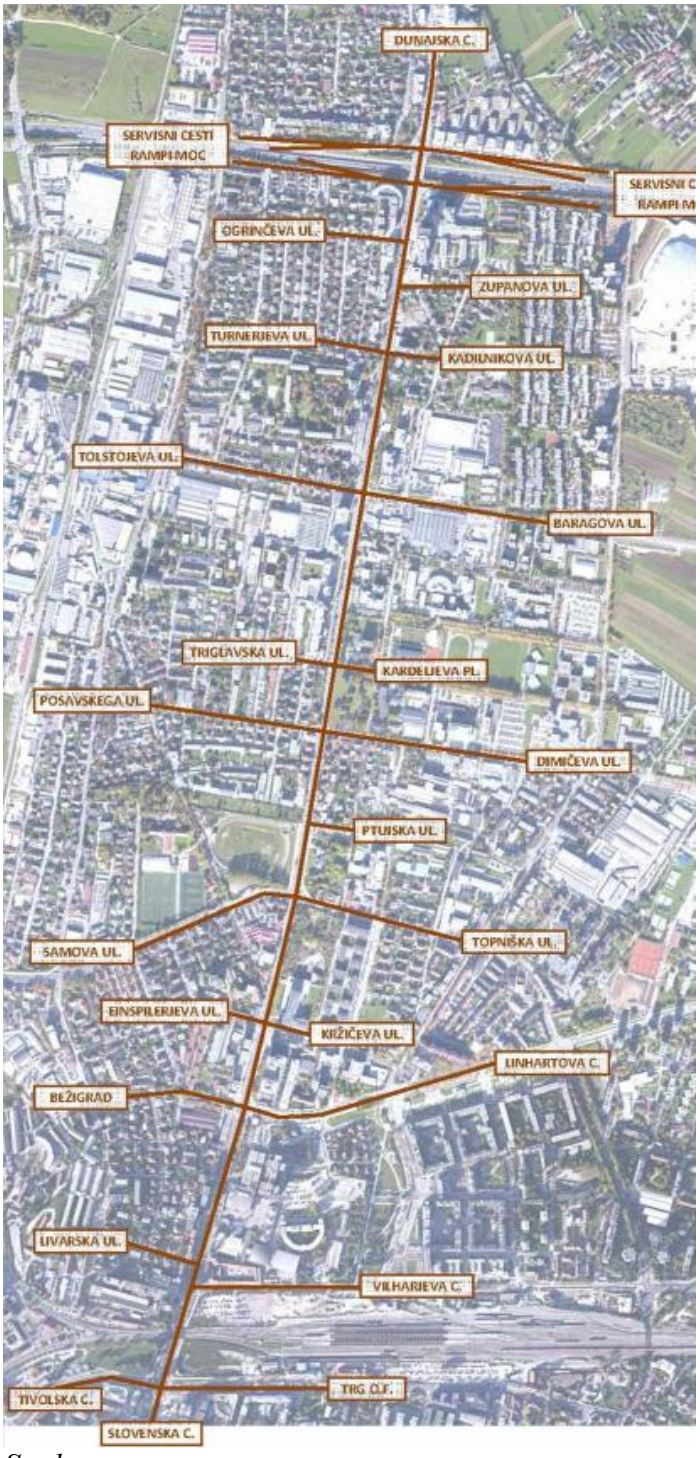
5.4.2. Traffic model

During the discussions between traffic and mobility management experts it became clear those arguments for the implementation of the dedicated lanes on the existing profile need to be stronger. A micro simulation for traffic flow on Dunajska street was done to show, what would possibly happen at Dunajska street as well as at its feeder streets. At the same time, a very important task for the traffic study was to come to an ideal modal split at the northern road system that best utilizes means of public transport and a fluid traffic flow.

For the traffic analysis, two software tools which are part of the Vision Traffic Suite software package were used. To model the transport network and to analyse expected traffic flows the software tool PTV Visum 11.5, which enables the modelling and calculation of traffic flows

on the macro level, was used. PTV Visum is the world's leading software for traffic analyses, forecasts and GIS-based data management.

To build a microscopic traffic network PTV Vissim was used, a microscopic simulation tool for modelling multimodal traffic flows. It provides ideal conditions for testing different traffic scenarios in a realistic and highly detailed manner before final implementation. A simulated network was built on the basis of digital orto-photos; situations anticipated traffic arrangements and other derived data like traffic lights programmes and bus routes & schedules.



Study area

The task of the study on implementing dedicated lanes for public transport at Dunajska Street in Ljubljana refers to the verification of the CIVITAS ELAN corridor in terms of capacity of the transport system for the movement of people in the corridor. The study is designed as a basis for the preparation of documents for the planning of lanes reserved for public transport. The studied area includes the road between the outer highway ring and the inner road ring and is taking into account all incoming and crossing road.

In this study three variants of traffic regulation were analysed and compared:

- Existing traffic arrangements;
- Option 1 (placement of reserved lanes for public transport without building work);
- Option 2 (a variant of optimization to improve traffic flow and traffic safety with minimal construction procedures).

The main difference between the regulations in Option 2 to Option 1 is the "expansion" at the short section between the inner road and Linhartova street (500 m). The expansion is not a classical construction of a new road, but mostly a transformation of the existing roadside parking places to yellow lanes with bus stops.

The traffic load for the micro simulations was determined on the basis of an integrated transport model of Ljubljana (PNZ Ltd.). The transport model was constructed in 2012, for periods of morning and afternoon peak hours. Among the three scenarios from the PNZ Study (Study for the evolution of the transport network of Ljubljana), it was chosen to analyse the version of DM or "Do Minimum". DM includes already adopted spatial plans and projects and project in the stage of implementation:

- Extension of the new radial motorway between Tomačevo and Žale rondo;
- Refurbishment of Njegoševa road;
- The new bridge connecting Roška and Njegoševa road (inner circle);
- The establishment of a one-way road (Trubarjeva and Ilirska road)
- The new line of LPP over the new bridge Roška – Njegoševa (partial redirection of existing bus lines).

Also the closure of the central part of the corridor was taken into account. Real time lines of the buses in the studied area were considered.

A traffic study with two different scenarios for the design for the yellow lanes to be implemented at Dunajska street were prepared and sent for review to all local ELAN partners in September 2011. The study was important for the evaluation and because no direct observations at the corridor were possible; hence the Measure Results Template (MRT) for measure 2.1-LJU includes data from the study. LPP checked the public transport data input and solutions (right turning, bus stops, etc.). All other partners were asked to review the study from their point of view: PT priority at crossroads, sustainable urban transport planning, etc.

5.4.3. Model results

Since the corridor was not implemented, impact is gathered from the modelling studies and sensitivity studies sessions. The results are not presented in relation to Before-BaU-After scenarios, but as a comparison of 2 different corridor implementation designs – the first design

alternative (Option 1) corresponds to the "After 1 status", while the second alternative (Option 2) corresponds to the After 2 status.

Average travel speed

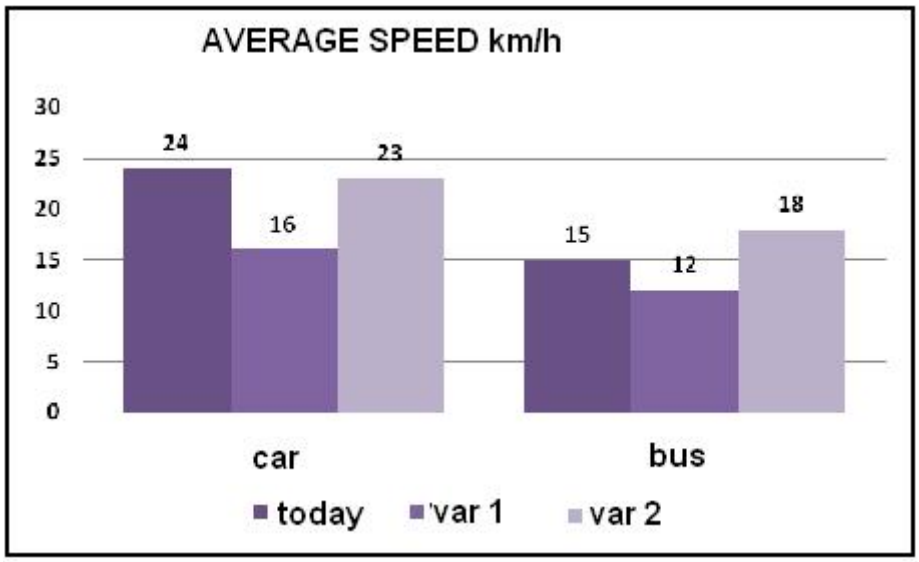
Indicator		Before – current situation	After 1– option 1 (Model)	After 2 – option 2 (Model)	Difference: After 1 – Before	Difference: After 2 – Before
Average travel speed (km/h) **Morning**	**CAR**	24	16	23	-8 (-33%)	-1 (-4%)
	BUS	15	12	18	-3 (-20%)	+3 (+20%)
	TRANSPORT VEHICLES	22	13	17	-9 (-41%)	+5 (-23%)
Average travel speed (km/h) **Afternoon**	**CAR**	19	10	21	-9 (-47%)	+2 (+10%)
	BUS	13	11	18	-2 (-15%)	+5 (+38%)
	TRANSPORT VEHICLES	17	8	18	-9 (-53%)	+1 (+6%)

Morning peak

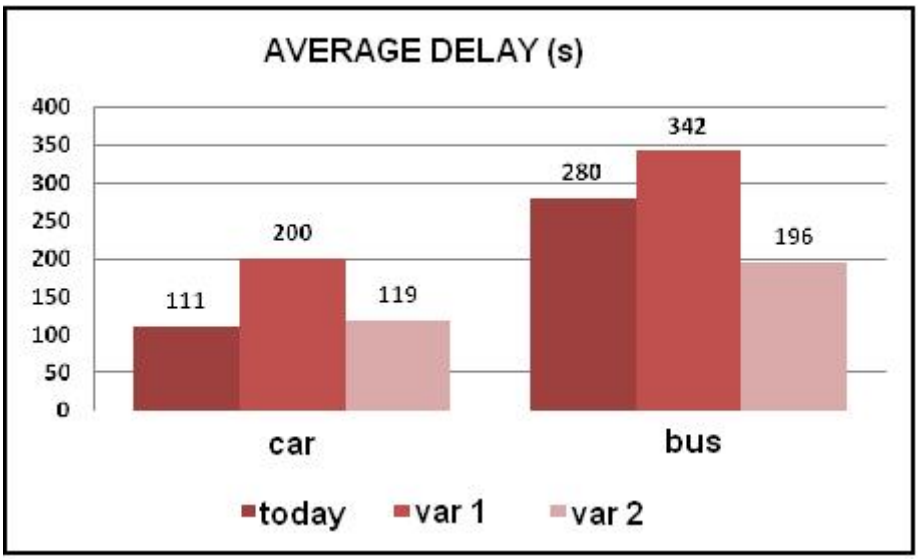
The highest average travel speed for cars is calculated on the existing network (24 km/h), with slightly lower speed for Option 2 (4% lower speed) and lowest in Option 1 (33% lower speed).

The highest average speed for buses is observed in Option 2 (18 km/h; 20% increase compared to the "Before situation"), slightly lower on the existing network and lowest in Option 1 (20% lower speed).

The highest average speed for transport vehicles is observed on the existing network (22 km/h), followed by Option 2 (23% lower speed) and Option 1 (41% lower speed).



Average speed at road network Dunajska Street, morning peak hour



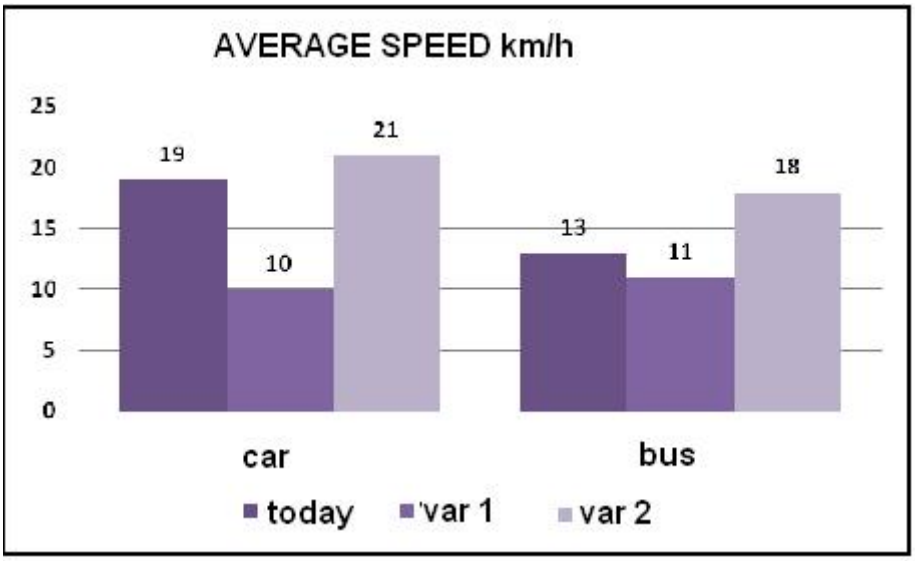
Average delay at road network Dunajska street, morning peak hour

Afternoon peak

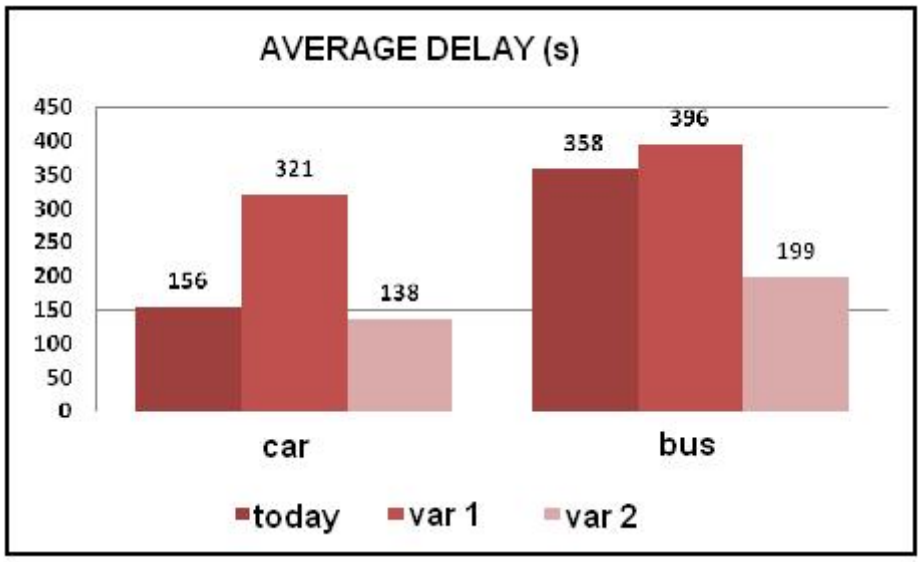
The highest average travel speed for cars is calculated in Option 2 (21 km/h; 20% increase compared to the "Before situation"), with slightly lower speed on the existing network and the lowest in Option 1 (47% lower speed).

Buses reach the highest average travel speed in Option 2 (18 km/h; 38% increase compared to the "Before situation"), slightly lower on the existing network and the lowest in Option 1 (15% lower speed).

The highest average speed for transport vehicles is observed in Option 2 (18 km/h; 6% increase compared to the "Before situation"), followed by the existing network and Option 1 (53% lower speed).



Average speed at road network Dunajska Street, afternoon peak hour



Average delay at road network Dunajska street, afternoon peak hour

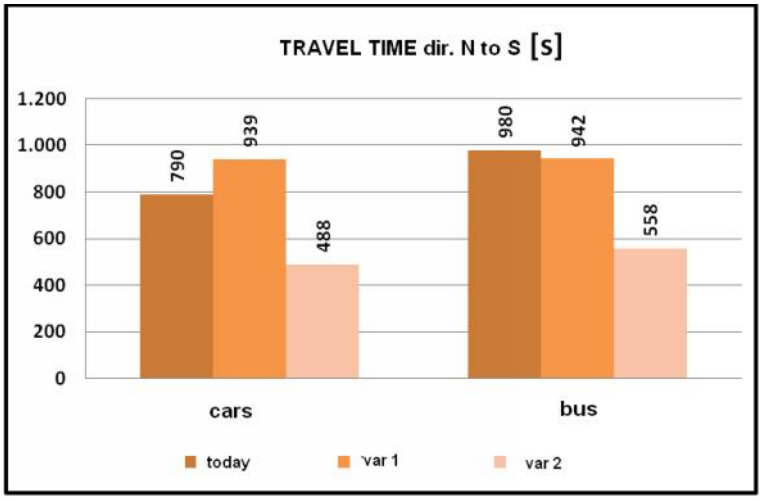
Average travel time

Indicator		Before - current situation	After 1– Option 1 (Model)	After 2– Option 2 (Model)	Difference: After 1 – Before	Difference: After 2 – Before
Average travel time (seconds) **N-S**	**Car**	790	939	488	+149 (+19%)	-302 (-39%)
	Bus	980	942	558	-38 (-4%)	-422 (-57%)
Average travel time (seconds) **S-N**	**Car**	269	680	480	+411 (+153%)	+211 (+78%)
	Bus	594	661	527	+133 (+11%)	-67 (-12%)

Section N-S (North-South)

Section in the direction of N→S: The shortest travel time of passenger cars on the section N→S is calculated for Option 2 and is 488 seconds (39% reduction compared to the "Before situation"), followed by the existing network, where calculated travel time is 790 seconds. The longest travel time is calculated for Option 1 and is 939 seconds (19% compared to the "Before situation").

For buses, the shortest travel time is calculated in Option 2 and is 558 seconds (57% reduction compared to the "Before situation"), followed by Option 1, where the calculated travel time is 942 seconds (4% reduction compared to the "Before situation"). The longest journey time is calculated on the existing network and is 980 seconds. The impact of the Option 2 is significant.

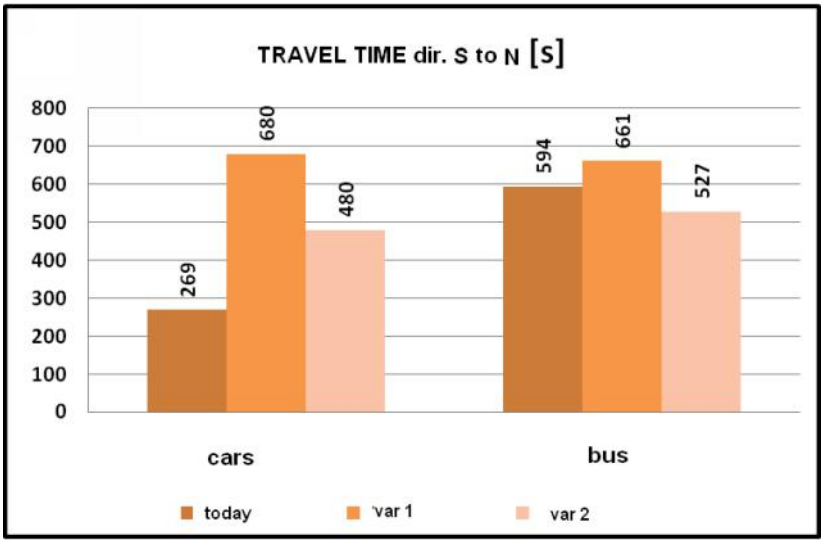


The results show that in the afternoon peak hour, the a average travel times in the direction from north to south in Option 2 for cars are reduced for approximately four minutes, mainly due to the six lane traffic arrangements between Linhartova and Tivolska street, as well as due to traffic light arrangement for adjacent pedestrian crossing. Travel times for public transport are reduced by more than 7 minutes if Option 2 is considered.

The worst results are for Option 1, with minimal reduction in travel times for public transport vehicles with simultaneous 1 minute increase of travel times for cars. It has to be noted, that in this case there are 10% less vehicles present in the network than in the other two options.

Section in the direction of S→N: The shortest travel time of passenger cars on the section S→N is calculated on the existing network and is 269 seconds, followed by the Option 2, where the calculated travel time is 480 seconds (78% longer travel time). The longest travel time is calculated for Option 1 and 680 seconds (153% longer travel time).

For buses, the shortest travel time is calculated in Option 2 and is 527 seconds (12% reduction compared to the "Before situation"), followed the existing network, where the calculated travel time is 594 seconds. The longest journey time is calculated for Option 1 and is 661 seconds (11% longer travel time compared to the "Before situation").

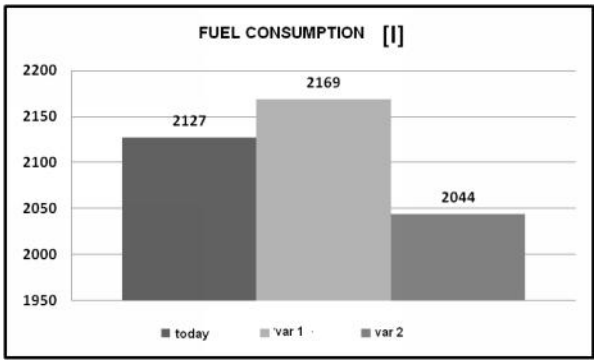


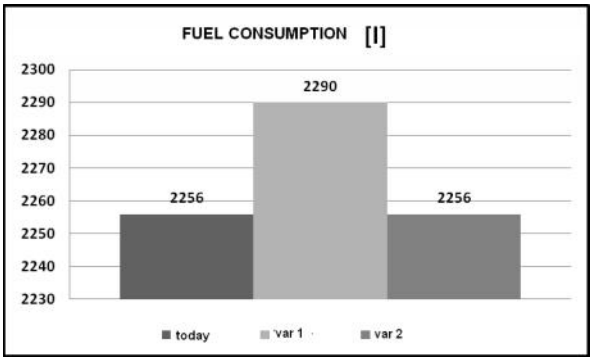
Travel times in the case of public transport vehicles Option 2 slightly shorter than observed in the existing situation, while the travel times in Option 1 are slightly longer.

5.4.3.1. Energy

Fuel consumption

Indicator	Before - current situation	After – Option 1 (Model)	After – Option 2 (Model)	Difference: After 1–Before	Difference: After2 –Before
Fuel consumption – morning rush hour	2127	2169	2044	+42 L (+2%)	-77L (-4%)
Fuel consumption- afternoon rush hour	2256	2290	2256	+34L (+2%)	0





In the morning rush hour the lowest fuel consumption can be observed in Option 2, which represents a 4% reduction compared to "today/ before" status (due to the uncertainty of the model the target value of 5% reduction can be marked as achieved). Option 1 represents a 2% increase compared to the "today/ before" status.

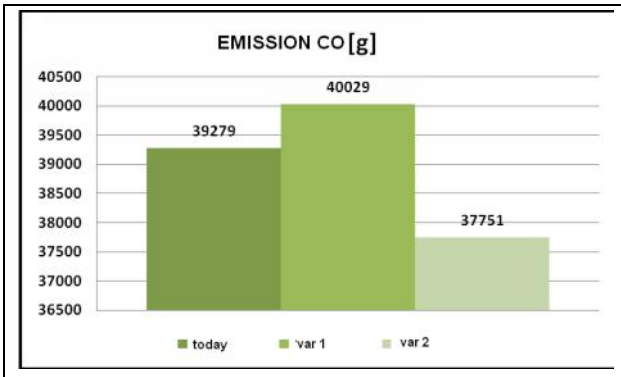
In the afternoon rush hour the lowest fuel consumption can be observed in Option (which represents a 2% reduction compared to the "today/ before" status.

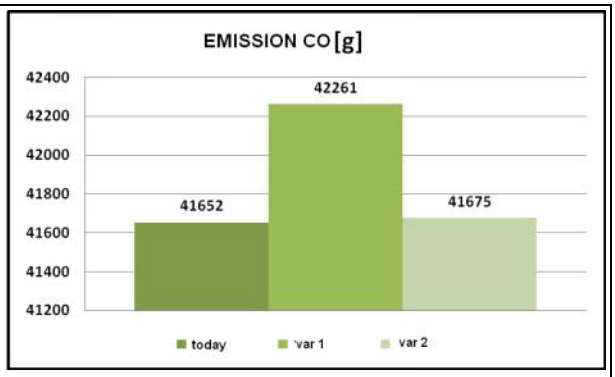
5.4.3.2. Environment

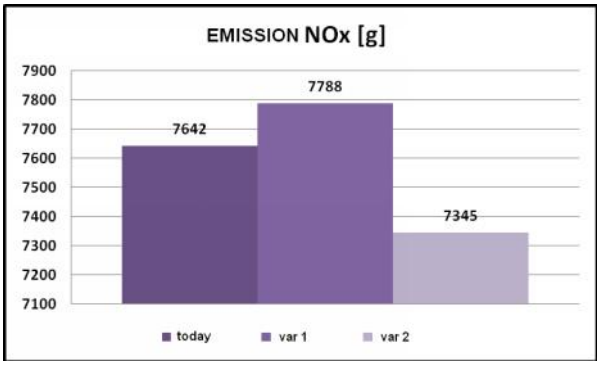
Modelled emission results – CO, NO_x, VOC

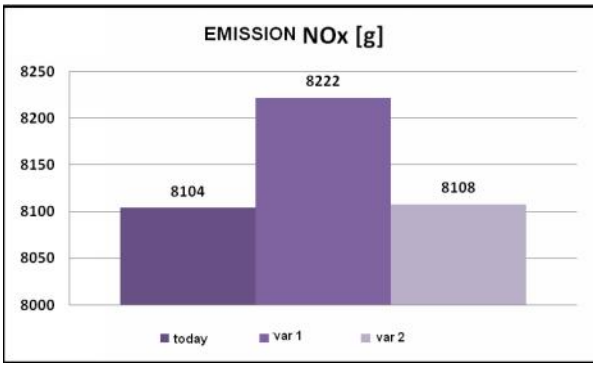
Indicator	Before - current situation	After 1– Option 1 (Model)	After 2– Option 2 (Model)	Difference: After 1 –Before	Difference: After 2 –Before
CO – morning rush-hour (kg)	39,28	40,03	37,75	+0,75 (+ 1,9%)	-1,53 (-3,9%)
CO – afternoon rush hour (kg)	41,65	42,26	41,68	+0,61 (+1,5%)	+0,03 (+0,1%)
CO – total (kg)	**80,93**	**82,29**	**79,43**	+1,36 (+1,7 %)	-1,5 (-1,9%)
NO_x – morning rush-hour (kg)	***7,64***	7,79	7,35	+0,15 (+2,0%)	-0,29 (-3,8%)

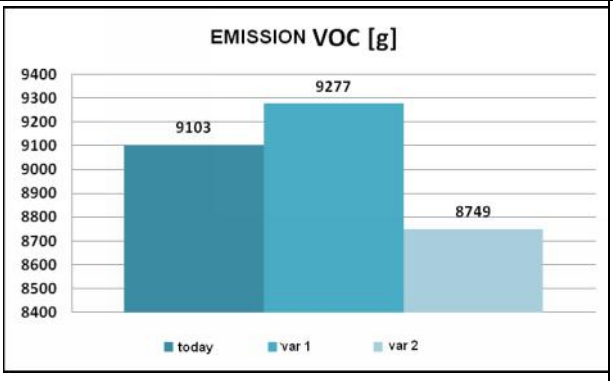
NO_x – afternoon rush hour (kg)	***8,10***	8,22	8,11	+0,12 (+1,5%)	+0,01 (+0,1%)
NO_x – total (kg)	***15,74***	**16,01**	**15,45**	+0,27 (+1,7 %)	-0,29 (-1,8%)
VOC – morning rush-hour (kg)	9,10	9,28	8,75	+0,18 (+2,0%)	-0,35 (-3,8%)
VOC– afternoon rush hour (kg)	9,65	9,79	9,66	+0,14 (+1,5%)	+0,01 (+0,1%)
VOC – total (kg)	18,75	19,07	18,41	+0,32 (+1,7%)	-1,34 (-1,8%)

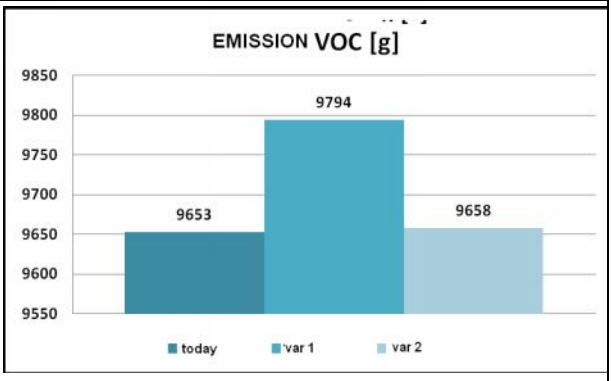












In the morning rush hour, the lowest CO emissions are calculated for Option 2 and they amount to 37,75 kg, which is approximately 4% lower than the current situation (Before). For

Option 1 the CO emissions are approximately 2% higher than the today/ before status. In the afternoon the tip of the smallest CO calculated on the current situation and amount to 41,65 kg. In Option 2, CO emissions are virtually identical to current situation, while the Option 1 shows an increase by 1,5%. The total values (morning and afternoon rush hour summed), reveal the increase of 1,7% for Option 1 and a 1,9% decrease for Option 2 compared to the "Before" situation.

NO_x emissions are lowest in Option 2 and amount to 7,35 kg. This represents a decrease of 4% compared to the "Before". In the afternoon rush hour, the NO_x emissions are the lowest in the "Before" scenario, and account for 8,10 kg. In Option 2 emissions are virtually identical to the Before scenario, while for Option 2 an increase of 1,5% can be observed. For Option 1 and 2 the total values represent an increase by 1,7% and decrease of 1,8%, respectively.

The lowest VOC emissions are calculated for Option 2 and amount to 8,75 kg, which refers to an approximately 4% decrease compared to the existing situation (Before scenario), while for Option 1 an increase by 2% can be observed. For the afternoon rush-hour, the lowest VOC emissions are calculated for the existing network and account for 9,65 kg. For Option 2, the VOC emissions results are virtually identical to the "Before" scenario, while for Option 1 an increase by 1,5% can be observed. The total VOC decrease of 7, 1% can be expected, if Option 2 is implemented.

Main output of the study

VARIATION	Investment cost	Delay for private cars [min]		Travel time (bus) S→J [min]		Travel time (bus) J→S [min]		CO [kg/h]	
do nothing	0 €	morning	afternoon	morning	afternoon	morning	afternoon	morning	afternoon
		1,85	2,60	12,08	16,34	9,34	9,90	39,28	41,65
variation 1	191.400 €	morning	afternoon	morning	afternoon	morning	afternoon	morning	afternoon
		3,34	5,35	8,70	15,70	9,60	11,01	40,03	42,26
variation 2	378.840 €	morning	afternoon	morning	afternoon	morning	afternoon	morning	afternoon
		1,98	2,30	8,95	9,30	8,45	8,78	37,75	41,67

The table presents the key differences of individual variations in cost performance, traffic conditions and environmental impact.

Option 2 is being preferred as there would be significant savings in travel times, lower environmental impacts, as well as minimal impact on passenger traffic, compared to option 1.

Arrangements for dedicated bus lanes for public transport influence traffic mostly at the northern part of the corridor. In option 2 the model indicated that 10% of the traffic load would remain out of the road network. This means that for a satisfactory operation of traffic in this area there should be 10% less cars entering the area. In absolute amounts, this means a bit more than 1.000 vehicles less within the present system (during peak hours).

There is a sufficient capacity for the reduction of private cars in P & R Stožice (1.280 parking places).

5.4.3.3. Benefits from the model at the decision making level

The traffic model showed that the implementation of the dedicated bus lanes is a way to go, but before implementation the traffic system should be slightly changed not to cause problems to buses that are entering the corridor from connecting roads (!), and being even more important more effort must be put into travel behaviour changes.

The traffic model and verification followed by traffic experts and public discussion (event on 15th of May 2012) showed that the current preferred solution for the implementation of the yellow lanes would be the reconstruction of Dunajska street.

However, by its activities the local CIVITAS ELAN team managed to find the solution for implementing dedicated bus lanes at one important section of Dunajska street, which is technically, financially, politically and publicly accepted without any other preconditions. The implementation of the yellow lanes will be done as follows:

- at the section of Dunajska road from Vilharjeva street to Linhartova street dedicated bus lanes (yellow lanes) will be implemented at both sides of Dunajska street where the **current side parking area will be redesigned to dedicated bus lanes**. Approximately 80 on street parking places are taken away for that reason, and one traffic light needs to be replaced, otherwise no extra road work is going to be done apart from surface signs adjustments;

Section of Dunajska road from Vilharjeva street to Linhartova street

- at the section of Dunajska road from Linhartova street to Topniška street one side dedicated bus lane will be implemented **by using the existing road profile**. It was agreed between traffic experts that according to the city traffic model, the CIVITAS ELAN modelling of Dunajska street and based on traffic data it is best to implement a dedicated bus lane in the Northern direction (out of the city centre, since the afternoon peak hour is causing more delay to PT than morning flow towards the city centre). For the implementation of the additional yellow lane, no road expansion needs to be done as almost the same profile will be used. The other car lanes will be narrowed; consequently speed will be reduced

as well. At this section some reconstruction will also be done to the pavement to improve cycling and walking conditions.

Section of Dunajska road from Linhartova street to Topniška street

5.4.4. Corridor campaign – Northern part

Since people sometimes have the impression that there is no bus stop near to their doorstep, the CIVITAS ELAN team in Ljubljana wanted to show the real distance to the nearest bus stops. With this intention to encourage bus usage, signs with the slogan "*A step to the bus, a moment to your destination*" were produced and put up at 30 locations on the demonstration corridor area during European Mobility Week 2011. The signs include information about the distance to the nearest bus station – in meters and in minutes.

The campaign focused on the Northern section (block of flats along Dunajska Street) where the implementation of dedicated bus lanes is being planned.

"A step to the bus, a moment to your destination", EMW 2011

Lessons learned:
Most of the citizens' dialogue events took place in the city centre on the street or at City Hall. But not all citizens are willing to get there; therefore we decided to act in other parts of the city as well. No doubt it was the right decision. The local CIVITAS ELAN team that was putting signs in place was observed and people were curious. During a day when team was fixing signs more citizens were informed on corridor than in the City Hall. Many even promised to test the bus (after several years). Unfortunately we were not prepared with questionnaires or gadgets. Next time for sure!

5.4.5. Public participation and stakeholders involvement – Northern part

A citizen dialogue event (public discussion and stakeholder involvement) took place on 15 May 2012 in Ljubljana's City Hall, where micro traffic study for implementation of dedicated bus lanes was presented by City Studio (the city traffic consultants), the city's public transport operator (LPP) presented their point of view on the dedicated bus lanes, especially benefits for passengers and company. The University of Ljubljana presented the results on the public opinion survey*. There were 52 active participants at the discussion that followed, being from very diverse groups: citizens, representatives from city quarters, academics (traffic engineering experts), design consultant, city administration (Ljubljana and other municipalities), urban planning consultants, NGOs and journalists.

The discussion can be regarded as a very positive, since the study was assessed as correct and good by "traditional" traffic experts, and – after for years – this time the discussion on *road*

diet and the implementation of other sustainable urban mobility measures went in "the right direction" and in a dignified manner. It was exposed that widening of Dunajska road is not the way to go and that the proposed changes are going to be hard and stressful especially for daily commuters, therefore a regional concept must be taken into account before implementation (P+R system, rail connections improvements, etc.).

*Results of public opinion survey (summary):

Respondents were asked if they would support the implementation of the yellow lanes in the Dunajska-Slovenska-Barjanska corridor. The survey was done within measure 4.1-LJU "Individualised Mobility Marketing Campaign" on a broader corridor area with a sample of 1,069 households in January 2009 ("Before status") and with 1,245 households in May 2012 ("After Status").

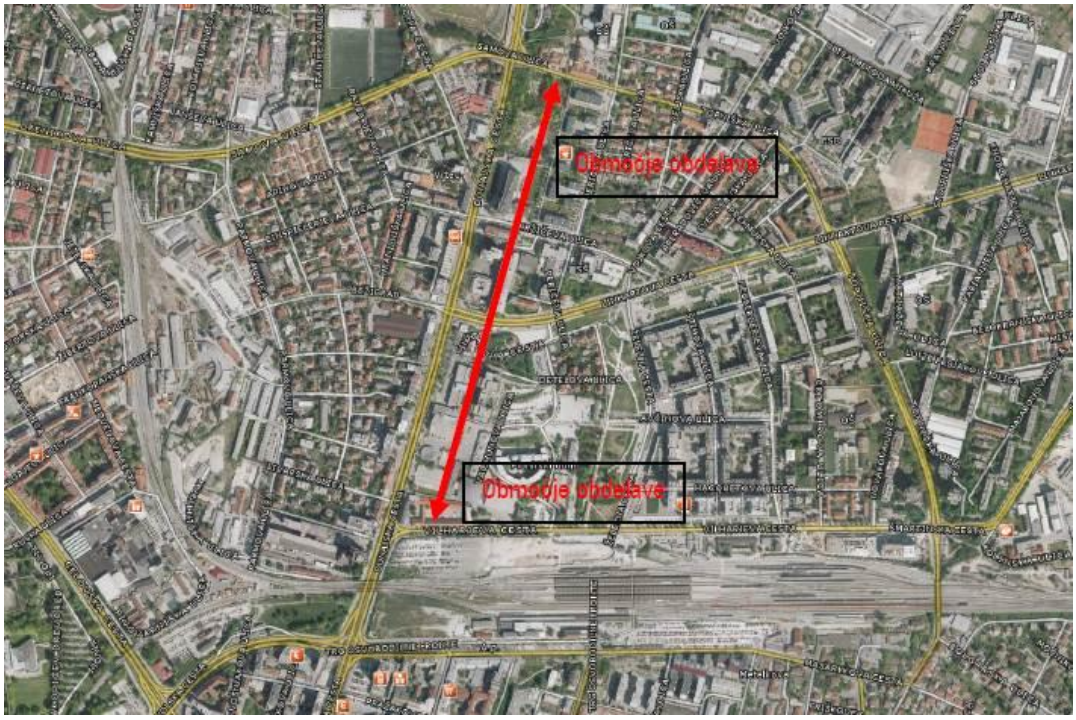
In general, the acceptance of the yellow lanes implementation has slightly decreased (-6%), which could point out the fact that the traffic conditions in the city have improved.
Introducing a separate yellow lane regardless of the impact on fluidity of cars is supported by more than half of the population (57,3% in 2012), reflecting the significant level of support for the transition to public transport.

Indicator	**Before (Jan 2009)**	**B-a-U (date)**	**After (May 2012)**	**Difference: After –Before**	**Difference: After – B-a-U**
Public acceptance of the corridor related measures (implementation of the yellow lanes)	82,4%	-	77,6%	-4,8% (-6% rel)	-
Public acceptance of the implementation of the yellow lanes) "Would you support the implementation of yellow lanes – reserved only for PT?"	Yes: 47,3%	-	Yes: 44,3%	Yes: -3% (-6% rel)	-
	Yes, even if this slows down car traffic: 8,3%	-	Yes, even if this slows down car traffic: 13%	Yes, even if this slows down car traffic: + 4,7 (+57% rel)	-
	Yes, if this will not slow down the car traffic: 35,9%	-	Yes, if this will not slow down the car traffic: 33,9%	Yes, if this will not slow down the car traffic: -2% (-6% rel.)	-
	No: 4%	-	No: 2,8%	No: -1,2% (-30% rel)	-
	Undecided: 3,9%	-	Undecided: 5,2%	Undecided: +1,3% (33% rel.)	-

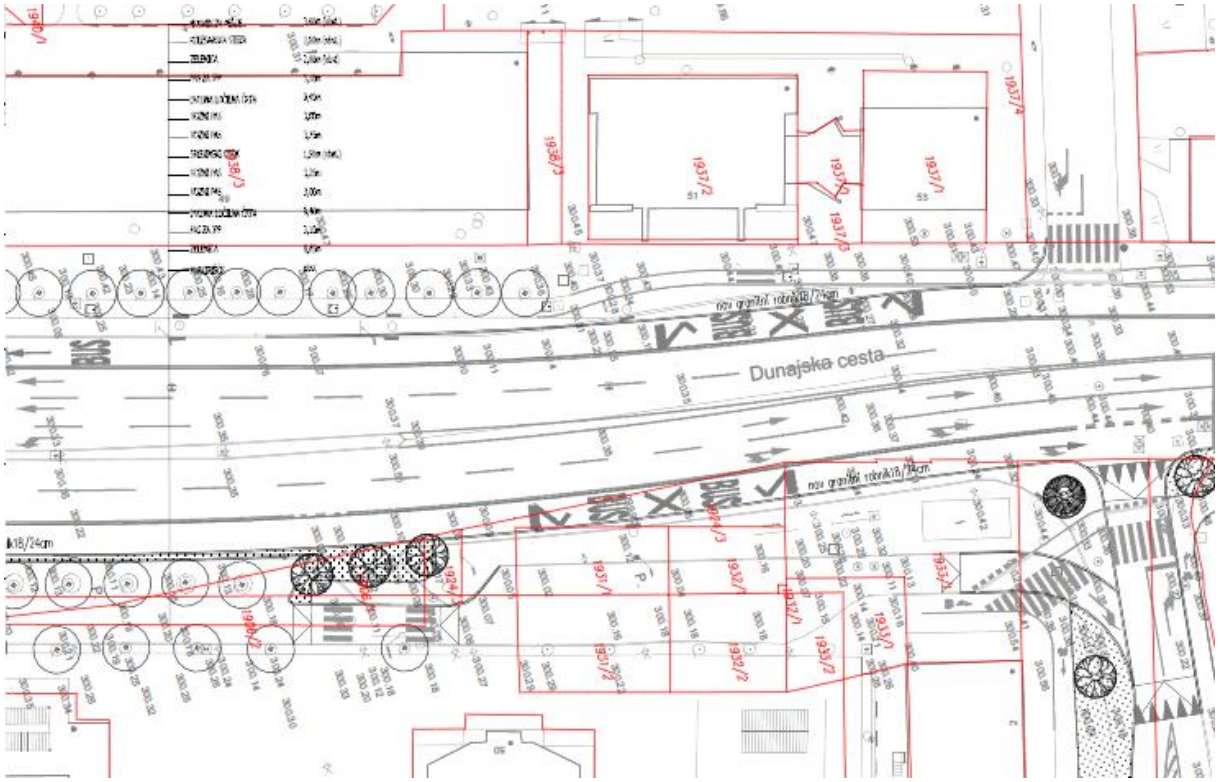
Lessons learned:
Regardless of good intentions, some change of opinions within specific stakeholders group take longer than planned. While the expectations for the support of sustainable mobility measures were high, there have been some strong opponents. With the right work, some adapting and investments of lot of energy, we finally achieved the changes, which were at the first evaluation workshops assessed as impossible.

5.4.6. Technical documentation

Since the implementation of the additional yellow lanes will only take place after the end of the ELAN project, it could also not be evaluated within the lifetime of the project. Yet, the Integrated High-Quality Mobility Corridor stayed the basic goal for COL's sustainable transport policy. Therefore, the main objectives of measure 2.1-LJU became all tasks that would enforce the process of implementing sustainable transport policies, with the corridor itself as soon as possible. Within CIVITAS ELAN task 2.1.2, the preparation of all technical documents that are obligatory (building permits, traffic expertise, etc. described in detail in the measure description sheet of 2.1-LJU) was overtaken for the dedicated bus lanes at the northern part of the corridor.



Dunajska street – section of the reconstruction



Section from technical documentation for Dunajska road from Vilharjeva street to Linhartova street dedicated bus lanes (yellow lanes) will be implemented at both sides of Dunajska street

Section from technical documentation for Dunajska road from Linhartova street to Topniška street – one side dedicated bus lanes

The technical documentation was finished in September 2012.

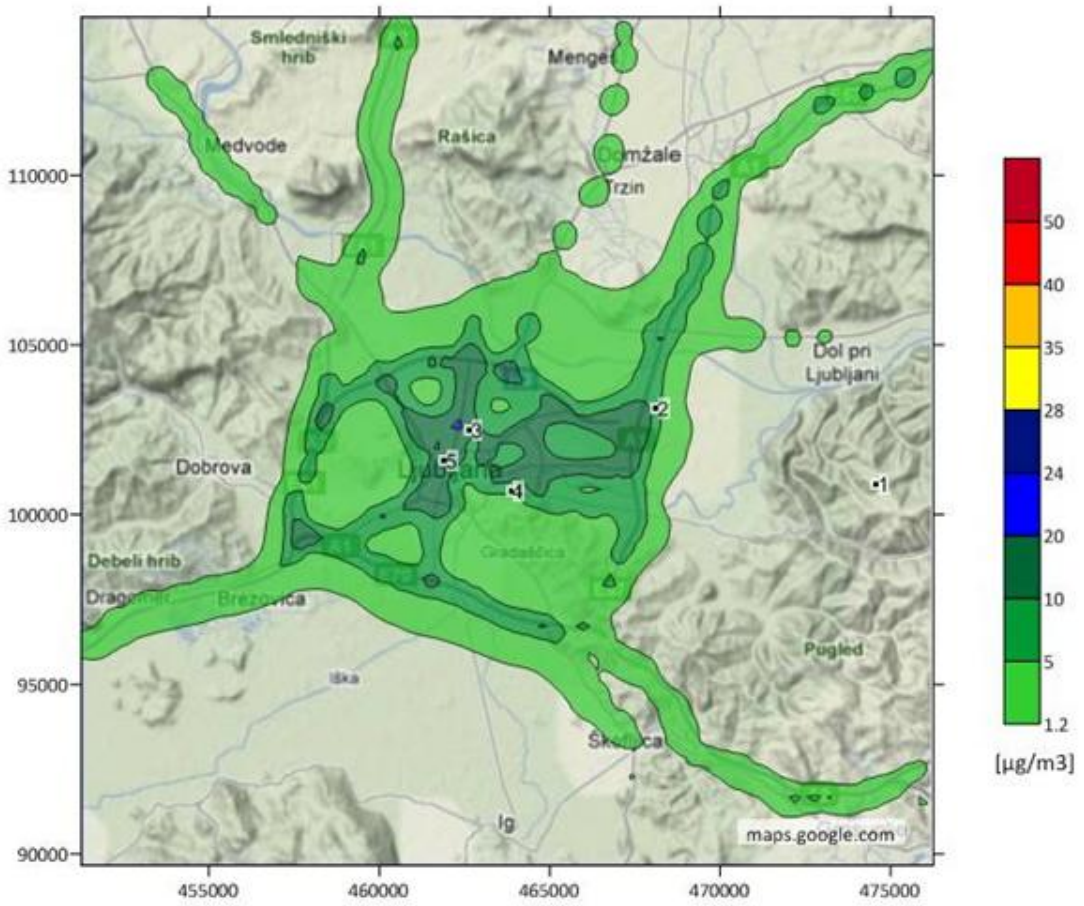
5.4.7. Pollution modelling

Since the implementation of the yellow lanes will only take place after the end of the CIVITAS ELAN project modelling served as a professional tool not only for evaluation but played an important role in the decision-making process within COL.

Emissions from traffic were estimated with a pollution model on the basis of traffic counters, traffic patterns on roads and emission factors for different pollutants. After that, the model for the dispersion of air pollution was tested for decision support. Being located in a basin, Ljubljana often has quite unfavourable weather conditions. Meteorological conditions are characterized by low wind speeds and temperature inversions in winter. All these conditions were taken into account in air pollution modelling.

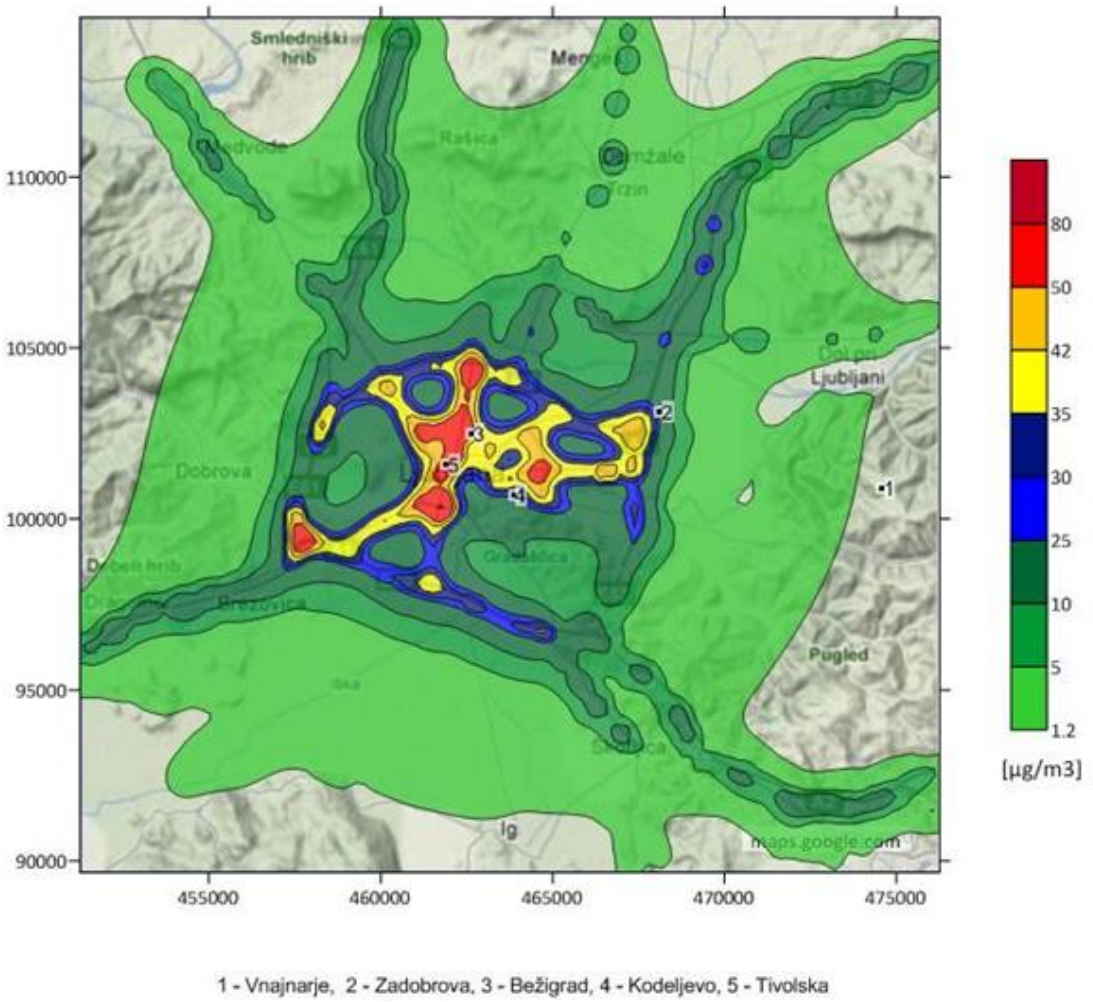
For traffic data, actual data from traffic counters were used, as well as the macro city model.

In calculating the meteorological fields over the area of modelling meteorological data from several stations in Ljubljana (AMP Bežigrad, AMP Zadobrova, AMP Vnajnarje) and 3D meteorological fields from ALADIN were used.



1 - Vnajnarje, 2 - Zadobrova, 3 - Bežigrad, 4 - Kodeljevo, 5 - Tivolska

Calculation of the spread of PM_{10} as a result of traffic in 2011; annual average values



Calculation of the spread of PM_{10} as a result of traffic in 2011; annual maximum values

5.5. Central part of the corridor

5.5.1. Slovenska street

In the middle of the corridor along Slovenska road is the city centre. In this section of the corridor there are already dedicated lanes for public transport but further improvements for pedestrians and cyclist are still needed. With graduated traffic regime changes and reduction of on-street parking (within street reconstructions) the pedestrian area is extending towards the inner road ring. A safer and more pleasant urban environment is stimulating walking and cycling as a daily transport mode on both sides of Slovenska street.

The idea of closing one part of the Slovenska street is not a new one. For several times it was closed for testing, mostly during weekends, summer holidays and, in the last few years, always during the European Mobility Week. The closure of the street for private cars for a section of 500 meters would not change the accessibility conditions, but still there is no agree-

ment on the long-term effects between different stakeholders: decision makers, traffic experts, mobility managers, citizens, freight delivery contractors, cyclist, etc.

While traditionally orientated traffic engineers are still forecasting city degradation due to traffic collapse, disagreement with this perspective is getting clearer and visible in the last four years. The closure of the city centre in 2008 for all traffic modes has an important role for the implementation of the closure of a section of Slovenska street. As for the old city centre already after one year, it was possible to feel a revitalisation since its closure to traffic.

The central part of the corridor is quite highly populated, beside that there are many employees, visitors, schoolchildren, students and tourists coming to the city centre every day. It was clear that traffic changes in 2008 affected each of them, but in less than two years it was obvious that the "negative" scenario is not going to happen.

For this part of the corridor it was therefore very important to stress the positive effects in a campaign. And because citizens have already had good experiences with the pedestrianisation of the city centre it was worth to highlight them.

Through citizens' engagement events, the foreseen change of Slovenska street became the universally established image of sustainable mobility in Ljubljana.

Slovenska Street – "Ljubljana in the near future"

5.5.2. Citizens engagement and corridor campaign in the central part

The specific objectives of the citizens' engagement activities for the "Integrated High-quality Mobility Corridor" were:

- Widely inform the public about the intention of making the corridor and get key stakeholders to collaborate;
- Collect views and opinions of stakeholders and the public and take them into consideration when implementing the corridor;
- Present to stakeholders and citizens, how their views were taken into account or how they contributed to the improvement of the project;
- Obtain support of the stakeholders and the public for project execution by including them in the process;
- Search for all possibilities on stakeholder and citizen participation in the implementation of the measures;
- Involving stakeholders and citizens in monitoring and evaluation of the measure effect.

All four levels of stakeholders' and citizen engagement were planned:

a) informing/ raising awareness,
b) consultation with stakeholders and other forms of obtaining feedback from stakeholders (meetings, opinion polls, interviews, etc.),
c) stakeholders' involvement in decision-making processes and
d) joint collaboration on project implementation.

A first general citizens' engagement event at the level of informing, raising awareness and consultation with citizens took place on 19th and 22nd of September 2009 with questionnaires. Residents were asked to express their general opinion on the proposed solution for the central part of the corridor. The picture of the closed and redesigned Slovenska Street was attached.

19th of September 2009 – CIVITAS ELAN Day in Ljubljana where questionnaires were given to residents to gather the public opinion on the possible solutions

To the first question "Do you like Slovenska cesta without cars?" 558 persons responded. 528 of them answered the first question with "yes" and 30 people with "no". It can be concluded that 94.6% support the idea of Slovenska street without cars, and only 5.4% of respondents don't.

Public approval of the suggested solution (closing central part of the corridor for private transport) was extremely high (~ 95%) and as such extremely encouraging.

The next steps related to citizens' engagement focused more on specific public groups. Several public discussions and workshops were organised with the Cycling Platform of Ljubljana and measure 4.6-LJU. The main topic of discussion were the improvement of cycling paths within the corridor and adjacent streets as well as question of shared space implementation in the central part of the corridor.

On 10th of April 2010 a roundtable was organised by measure 2.1-LJU at the Atrium of the Slovenian Academy of Sciences and Arts where different aspect on the closure of the city centre were presented. Discussions highlighted the positive and negative effects on different stakeholders with the goal to find out what was learned from the closure in 2008.

Roundtable 10th of April 2010 on closing of city centre

Lessons learned from the retrospective roundtable on the closure of the city centre:

- Citizens need time to get used to new situations, and want to be heard, even if their problems seem minor in the general framework
- The city administration should talk to citizens and stakeholders sooner
- Stakeholder, especially from the freight delivery sector, must be included in the planning process
- Traffic models don't predict the future

Within the European Mobility Week 2010 an open public discussion was held at Ljubljana City Hall with the Mayor. Two themes were strongly related to the corridor: the implementation of the yellow lanes at the northern part of the corridor (Dunajska cesta) and the closing of the central part of the corridor for private cars (Slovenska cesta).

Several improvements for pedestrians and cyclists along the corridor in the city centre were realised in July 2011 when additional streets were closed for traffic and limited access for freight delivery and residents was implemented. These streets are: Vegova, Peternelova, Gosposka, Salendrova in Turjaška street and Novi trg/ New Square. With these closures, Slovenska street at the central part is now the last street to be closed.

Access with private cars is possible for residents only and controlled with an electronic card. On street parking is possible with a special permission card (only for residents). Freight deliveries are possible only from 6.00 to 9.30.

Unlike the events at the closure of 2008, closing of those streets did not cause any complaints among residents or other stakeholders. It cannot be said with certainty whether this was due to an intensive dialogue with the people, the media campaign on sustainable mobility in general or the positive experience after the closure of the city centre in 2008, but most probably all had an integrated effect.

6. Evaluation

6.1. Measure description and implementation process

This measure was planned as the development of a high quality mobility North-South corridor going through the city centre and towards neighbouring municipalities, integrating a variety of measures and transport modes. It would introduce public transport lanes ("yellow lanes") through the entire length of the corridor with Park-and-Ride (P+R) service at each end of the corridor. It begins at the northern part of the town where Dunajska road crosses the motorway ring and where nearby P&R Stožice is located. Further in southbound direction the corridor crosses the northern part of the city's inner road ring and runs along Slovenska road through the city centre towards the end of Barjanska road.

Since the measure implementation was facing severe barriers, it was decided (in the 4th amendment of the project) to replace the physical implementation of the corridor with a traffic model, in order to confirm the impacts of the model implementation. The model compares 2 design alternatives to the existing situation (Option 1 – implementation of yellow lanes on the existing road profile: 1 yellow lane-1 regular lane in 1 direction; Option 2 – implementation of yellow lanes on a broadened road profile for a central section of the corridor, only: 1 yellow lane-2 regular lanes in one direction). The parameters which were studied in the model are: fuel consumption, travel times and speeds, emissions and costs of implementation. This was to be the basis for the preparation of the final design and technical documentation that is needed for the implementation of the high quality North-South mobility corridor.

Also two mobility management plans were developed within this measure: for the new administrative building of the Municipality of Ljubljana and for the Ministry of Foreign Affairs.

The deviations from the original plan were mainly associated with the delay in measure implementation:

- **Deviation 1 – Corridor not implemented.** After long discussions with the political leadership at the City of Ljubljana, it was decided not to implement the high quality mobility corridor in the lifetime of the CIVITAS ELAN project. The reason behind it was primarily the fear of public opposition to such big-impact measures.
- **Deviation 2 – P+R South not constructed.** The P+R would serve as a southern intermodal point for the corridor, but because of the national spatial planning requirements regarding the flood protection of the designated area, the process was delayed and brought to a halt. This also played a crucial role in preventing the corridor to proceed with the implementation.

6.2. Evaluation approach and key results

Since there was no implementation in real-life for this measure the focus was on process evaluation. For the model that was developed to compare the potential impacts of the two proposed corridor implementation scenarios, a comparative analysis was done for the indicators that refer to the main transport parameters (air pollution – CO, NO_x, VOC, fuel consumption, travel times and average travel speed for the sections in question, delays caused by congestion). Modal split and cycling rate, public acceptance of the corridor implementation were also recorded to monitor the potential changes in travel habits as a result of the public discussions on the measure. Public transport users' satisfaction concerning the schedules, on time arrival, travel time and speed were also monitored to assess their perception of the current situation of the corridor.

6.3. Impact evaluation

- **Key result 1 – Fuel consumption;** the results of the model show, that approximately 4% of lower fuel consumption can be expected when Option 2 of the high-quality mobility corridor would be implemented. Option 1, on the other hand shows a potential increase in fuel consumption by 2%.

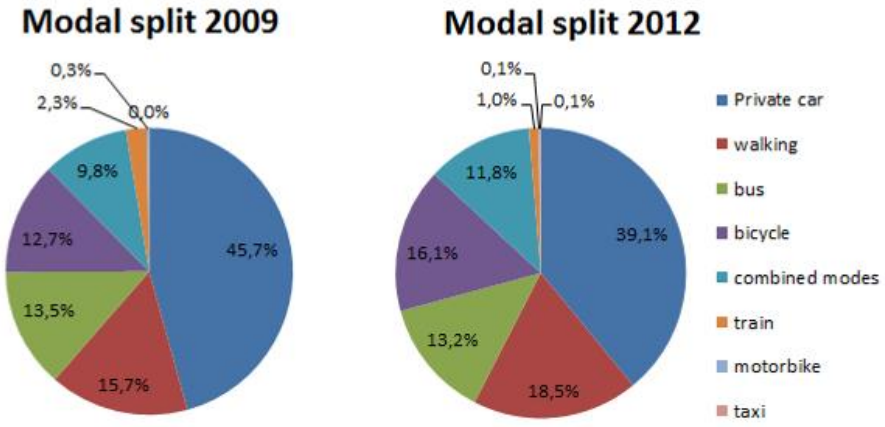
- **Key result 2a – Emissions - CO;** the results show a potential decrease of CO emissions if Option 2 would be implemented. The reduction of up to 3,9% (maximum value) or -1,9% (combined for all modelled sections of the corridor; morning and afternoon peak) can be observed; on the other hand an increase by up to 2% is expected for Option 1.

- **Key result 2b – Emissions - NO_x;** the results show a potential decrease of NO_x emissions if Option 2 would be implemented. The reduction of up to 3,8% (maximum value) or 1,8% (combined for all modelled sections of the corridor; morning and afternoon peak) can be observed; on the other hand an increase by up to 2% is expected for Option 1.

- **Key result 2c – Emissions - VOC;** the results show a potential decrease of VOC emissions if Option 2 would be implemented. The reduction of up to VOC up to 3,8% (maximum value) or 1,8% (combined for all modelled sections of the corridor; morning and afternoon peak) can be observed; on the other hand an increase by up to 2% is expected for Option 1.

- **Key result 3 – Travel times/ speed;** the results regarding travel times show a reduction of approximately 4 minutes for cars and 7 minutes for public transport buses for Option 2. Option 1 shows an increase of travel times for cars for approximately 1 minute, while travel times for buses are similar to the "before" status. In terms of travel speed Option 1 shows a decrease of travel speeds by up to 9 km/h, while Option 2 shows an increase up to 5 km/h for public transport buses.

- **Key result 4 – Modal split;** the results of the modal split survey show that in the period 2009-2012 a significant shift towards bicycle use has been made; a 3,4% increase in total modal share (27,2% relative increase). Also a reduction in car use can be observed; the modal share of cars decreased by 6,6% (almost 15% relative reduction).



6.4. Process evaluation

- **Barrier 1 – Financial:** Lack of resources – the limitation of funding in COL led to problems with the purchase of the land for the P+R; no consensus with land owners has been achieved yet, and time consuming negotiations with land owners were slowing down the process, causing a delay in measure implementation.

- **Barrier 2 – Political-strategic:** Lack of transport strategies (the lack of a vision and failure to implement the spatial strategic plans) combined with an unclear political standpoint about the implementation of the corridor (whether to choose the 2+2 lane profile, dedicated bus lines, Barjanska road construction, etc.). There also was a strong objection to ideas of changing road usage by closing a part of the corridor for private cars. Also there was the important political condition that measure 2.1-LJU would not be implemented before some other non-CIVITAS related traffic measures are implemented, for example the completion of the inner ring road and Roška – Njegoševa bridge. As decisions were changed and not taken in a timely manner, the process was slowed down and planning was difficult. Additional work and costs were needed, and the implementation was delayed.

- **Barrier 3 – Space/ spatial constraints:** Space is limited near Barjanska street at the southern part of the corridor due to a Roman Wall (bottle-neck effect); there is not enough space for dedicated bus lanes within the present traffic regime; a decision to change the traffic regime on a wider scale and higher level is needed; the barrier was actually an absence of decisions on the inner ring regime and left-turning problem at the adjacent crossroad.

- **Barrier 4 – Organizational:** Lack of communication between COL departments, inexperience of different departments with project work in COL, time consuming data collection and gathering of information makes the coordination of work difficult and inefficient.

- **Barrier 5 – Administrative:** The long process of adopting spatial planning documents/ permissions slowed down the planning and implementation process.

- **Driver 1 – Political and organizational:** Support at the political (local) level, especially the Mayor and Vice-Mayor Koželj; political support encouraged and promoted the measures – work became easier and faster. After this, better cooperation between COL departments had been expected.

- **Driver 2 – Political and organizational:** New Measure Leader with enthusiasm; the former Measure Leader was overloaded with local projects. Consequently there was a delay in measure implementation. The new ML worked full time on CIVITAS ELAN. Pressure on key stakeholders and highlighting problems enforced the process and cooperation between partners has been strengthened. Project partners put the measure to the forefront as the most important.

- **Driver 3 – Political-strategic:** Indirect requests for traffic reduction measures from non-CIVITAS ELAN partners: an operational programme on PM_{10}, an operational programme on noise reduction, European alert on air quality. The CIVITAS Initiative worked in parallel to European and national directives and programmes on air, noise and health.

- **Driver 4 – Integration, communication:** The media and some leaders supported changes in transport culture and policy. Clear public support (95 % of the people asked in the survey) for the introduction of the corridor and the closure of Slovenska street for personal car traffic. The level of interest and public participation has improved.

- **Driver 5 – Financial:** The financial crisis and the lack of resources enforced the City of Ljubljana to look for cost-efficient solutions to reduce traffic in the city centre.

6.5. Lessons learned

- **Lesson 1** – Public interest should be gained from the very beginning and gradually (for controversial measures such as this one); one such example is through the activities of NGOs, also by helping to overcome political and administrative barriers.

- **Lesson 2** – Information can be regarded as extremely negative or as extremely positive in such controversial cases; for example, the media mainly reported about negative aspects ("the glass is half empty"), while on the other hand the media should be expected to provide information on positive aspects too ("the glass is half full").

- **Lesson 3** – Despite the apparent failure to meet the expectation of a fully implemented integrated high-quality mobility corridor within the duration of the CIVITAS ELAN project, however, it may be noted that the effort made in the implementation of the corridor had a major influence on a more sustainable political decision in the content and adoption of an urban transport policy for the City of Ljubljana until 2020. This apparent success is perhaps still under-emphasized.