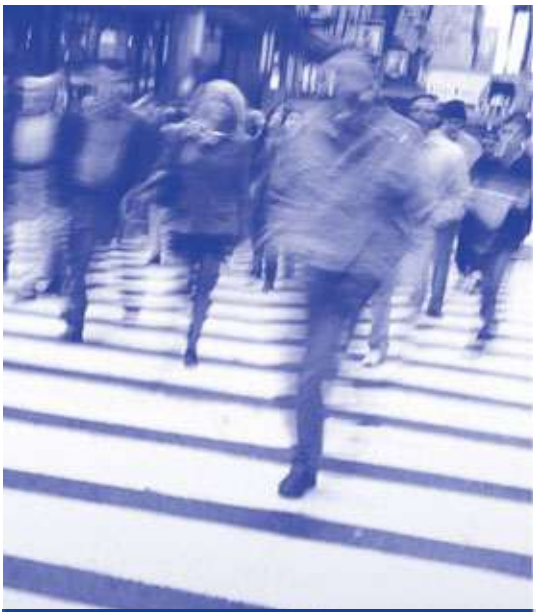

CIVITAS
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POINTER

Measure Evaluation Results

26 – Strategic Traffic management in Ústí nad Labem

Deliverable F

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Measure title: **Strategic Traffic management**

City: **Ústí nad Labem** *Project:* **Archimedes** *Measure number:* **26**

Executive summary

The measure consisted of two tasks, 11.3.4 Strategic Traffic Management (RTD) and 3.8 Strategic Traffic Management (DEMO), dealing with the optimal system of traffic management and application of intelligent telematics (ITS) in the city.

Current system of traffic management was analysed in individual functional areas, involving the subsystems of traffic light management, safety traffic information, parking, public transport, freight transport, surveillance systems, emergency systems, transport fees and charges, maintenance and administration of road infrastructure, etc. The analysis described principles of individual subsystems and their interlinks and communication.

Specific strengths and weaknesses of the current system were identified. These concerned in particular the need to improve the transfer of information among the various subsystems, which is currently neither rapid nor complete. Therefore, information may not be available to all or to some of the subsystems of traffic management in required time.

Based on the findings, appropriate improvements were recommended. Given the large number of separate subsystems for traffic management and their problematic interconnection, the proposed solution for strategic traffic management in the city was not based on the existing architecture of management systems. The reason was particularly the problematic sharing of traffic information, which optimisation would require significant investments and technological and organizational changes.

The more effective solution is to change the entire traffic management system, which would enable integration of all the existing subsystems and continuous real-time sharing of information. The proposal of new traffic management scheme was based on conclusions of the previous study, specifically in terms of identified shortcomings of the current management scheme. The proposal defines an integrated traffic management system gathering, processing, storing and sharing information among the relevant bodies in the city with centralised management. Entities proposed to be included within the architecture of ITS are primarily administrators of roads, units of the IRS and road users (drivers, pedestrians, cyclists and PT passengers). Surveillance and regulation functions were also proposed to be integrated to effectively eliminate violations of traffic rules.

The proposed solution is designed to contribute to improving the quality of transport in the city, increasing traffic flow, improving road safety and lowering negative effects of traffic in the city, including the amount of accidents, injuries, deaths, material damages, emissions, noise pollution. The impact of the proposed traffic management scheme will be essential particularly during emergency events, which in Ústí nad Labem typically result from unfavourable weather conditions, such as floods and winter ice and snow. As a result of improved strategic traffic management, the city will be more suitable for development of non-motorised transport (pedestrians and cyclists) and for PT services.

The proposal was integrated into the Sustainable Urban Transport Plan of Ústí nad Labem.

A Introduction

A1 Objectives

The measure objectives are:

(A) High level / longer term:

- To develop a strategic traffic management plan for the city

(B) Strategic level:

- To reduce the environmental impacts of traffic

(C) Measure level:

(1) To reduce the number of vehicles entering the city centre

(2) To reduce congestion and pollution level

(3) To enable priority for PT services

(4) To optimise traffic flow in the city

A2 Description

The measure was aimed at developing a strategic traffic management strategy suitable for the city conditions and subsequently designing measures to restrict traffic in the city and reduce the environmental impact of traffic on the living environment.

Research has been conducted to analyse the conditions and structure of the existing traffic management in the current state, application of intelligent transport systems and transfer of traffic data in the city. On the basis of the results, a proposal for optimal solution for strategic traffic management and ITS development was designed.

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **Use of new technology/ITS** – Traffic management proposal is utilising a scale of ITS technologies for data collection and processing, and production of optimal traffic strategy and information use
- **New organisational arrangement –** Traffic management uses selected tools for new organisation of transport with the individual preferences, at different places under specific circumstances
- **New policy instrument** - Traffic management is an instrument for implementing new transport policy, prioritising safety, fluency, public transport, pedestrians, vulnerable road users and more environmental friendly transport

B2 Research and Technology Development

City of Ústí developed new traffic management strategy, providing improvements in road safety, enabling prioritisation of preferred modes, increasing traffic efficiency, facilitating traffic calming, ensuring access control etc. Research involved analysis of the current state and deficits of traffic management in the city, of new trends and technologies and of possibilities for application of ITS. Findings were processed into the proposal for optimal traffic management and development of the scheme for traffic control station.

B3 Situation before CIVITAS

Currently, traffic on local roads has reached such a level that it is necessary to address issues of sustainable development and seek complex transport solutions for the city. The centre of the city is overloaded by individual transport. Also the not co-ordinated and not regulated supplying of business activities creates problems. Possibilities offered by construction of the new transport infrastructure are limited and the trend in the development of motor transport requires application of regulatory measures. Moreover, specific suitable alternatives and new opportunities must be developed.

One objective of the city is aimed at regulation and segregation of motor transport in order to avoid safety risks for the population and to limit emission of harmful gases, noise and vibrations. It furthermore deals with priority for public transport (PT) and support of walking and cycling modes and also promotion for quality and cleaner life in the city.

The city of Ústí nad Labem has a target to develop a traffic management strategy and implement measures to restrict traffic in the city centre. The goal is to improve traffic flow in the city and reduce the environmental impact of traffic.

B4 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1: Existing transport infrastructure defined *(M10 – M11)*

The current status of the transport infrastructure and transport equipment on the territory of the city was analysed, which is the basis for gradual implementation of an intelligent transport system.

Detailed description of road infrastructure in the city was described, including pedestrian routes and significant civil engineering works. Specific risks resulting from the local natural and climatic conditions (such as floods, falling rocks from the cliffs, frost and ice, etc.,), as well as risks resulting from industrial activities in the area (such as accidents at factories), were identified.

Stage 2: Analysis of the current traffic management system (M12 – M17)

Current management and organisation of road traffic in the city was described in terms of the system of traffic management via traffic light signals, technological equipment of traffic light devices, comparison of accidents and consequences on traffic light controlled intersections, and traffic management system realised via variable traffic signs.

Collection of traffic data and information was presented. Organisation of parking and parking fees in the city was reviewed. Operation of urban public transport was described. Current organisation of freight transport was identified. Surveillance and rescue systems in the city were presented. Management and maintenance of transport infrastructure was analysed.

Stage 3: Development of the proposal for optimal traffic management suitable for Ústí nad Labem (M18 - M23)

Based on the analysis of the current state, proposal for optimal traffic management scheme was developed. The detailed traffic management scheme was designed for the city, including integration of elements of the Intelligent Transport System (ITS). It defined conditions and basic structure of strategic traffic management suitable for Ústí nad Labem, which would increase opportunities for introducing measures to reduce motor traffic in the city centre, to limit negative effects of transport on the city environment and to increase fluency of traffic.

The proposal defines optimal traffic management via traffic lights, variable traffic signs and application of ITS. It describes traffic management in emergencies. It provides an overview of data transfer (reception, processing and provision of information through radio, internet, SMS of information boards) and describes the proposed transport information centre. It describes the system of navigation to available parking lots. It gives overview of preferential measures for public transport vehicles and provision of information to passengers. It identifies traffic management suitable for freight vehicles in the city. It describes the appropriate payment and fee system and management of transport infrastructure. It is aimed at improving effectiveness and quality of local transport in a complex way.

Stage 4: Proposal for application of ITS (M24 - M26)

Application of transport telematics was proposed in the following functional areas:

- Management and organisation of traffic on roads in the city
- Traffic data and information
- Parking of vehicles
- Public transport

- Freight transport
- Transport surveillance systems
- Emergency systems
- Traffic payments
- Management and maintenance of road infrastructure

Stage 5: Designing the central traffic control station (M27 - M32)

The traffic control station for the city was designed in order to enable browse and control management parameters for all traffic devices connected to the centre and to monitor the current traffic situation. The workplace itself does not require permanent monitoring or manual operation and is suitable for analysing and subsequently designing measures to improve deficiencies in traffic safety and fluency.

Stage 6: Implementation of solutions into the SUTP (M33 - M35)

The designed solutions were included in the SUTP and the related action plan for its implementation was developed with defined priorities.

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **Measure 27 City Centre Access Control in UNL –** Traffic management is one of the tools for city centre access control
- **Measure 67 Efficient Goods Distribution in UNL –** Strategic traffic management enables to optimise transport of goods, especially in the city centre
- **Task 11.2.2 Public Transport Priority Systems in UNL** – Priority for city public transport is enabled by strategic traffic managements and utilisation of ITS technologies
- **Measure 50 Mobility Improvements in UNL** – efficient traffic management aims to improve mobility of road users and accessibility of services
- **Task 11.8.9 SUTP Development in UNL** – the measure provides inputs for traffic management plan included in the Sustainable Urban Transport Plan of Ústí nad Labem

C Impact Evaluation Findings

C1 Measurement methodology

Strategic traffic management shall cover all possible services and benefits, which should be organised and managed centrally, with the collection of actual data, processing data to the highest use and targeted distribution of information, preference, traffic flow management and optimization, warning, enforcement and improvement of rescue services.

Remark: Economy and environmental indicators has low impact

C1.1 Impacts and Indicators

Table C1.1.1: Indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA / UNITS
	TRANSPORT					
21	TRANSPORT	Transport System	Traffic Levels	Traffic flow by vehicle type - peak	Average vehicles per hour by vehicle type - peak	Veh/h, quantitative, measured
22	TRANSPORT	Transport System		Traffic flow by vehicle type - off peak	Average vehicles per hour by vehicle type – off peak	Veh/h, quantitative, measured
23	TRANSPORT	Transport System	Congestion Levels	Average vehicle speed – peak	Average vehicle speed over total network	Km/h, quantitative, derived
24	TRANSPORT	Transport System		Average vehicle speed - off peak	Average vehicle speed over total network	Km/h, quantitative, derived
	TRANSPORT	Transport System	Time consumption	Average vehicle time – peak	Average time one single vehicle spends on the network	Veh/h, quantitative, derived
	TRANSPORT	Transport System		Average vehicle time – off peak	Average time one single vehicle spends on the network	Veh/h, quantitative, derived
3	ENERGY	Energy consumption	Fuel consumption	Total fuel consumption	Total fuel consumption of all infrastructure users per area per time per traffic management scenario	Total vehicle fleet consumption per scenario
8	ENVIRONMENT	Pollution	Emissions	CO2 emissions	CO2 per area per modelled scenario	Kg, quantitative, modelled by traffic model
9	ENVIRONMENT	Pollution	Emissions	CO emissions	CO per area per modelled scenario	Kg, quantitative, modelled by traffic model
10	ENVIRONMENT	Pollution	Emissions	NOX emissions	NOX per area per modelled scenario	Kg, quantitative, modelled by traffic model
11	ENVIRONMENT	Pollution	Emissions	Particulate emissions	PM per area per modelled scenario	Kg, quantitative, modelled by traffic model

Table C1.1.2: Methods for evaluation of indicators

NO.	INDICATOR	TARGET VALUE	SOURCE OF DATA AND METHODS	FREQUENCY OF DATA COLLECTION
21	Traffic flow by vehicle type (peak period)	Density shift by 5%	Traffic Management methods shall be included into micro-simulation model	Before and after
22	Traffic flow by vehicle type (off-peak period)	Density shift by 5%	Micro-simulation will react on different scenarios and Traffic Management Strategies	Before and after
23	Average vehicle speed (peak period)	Increase by 5%	All strategies shall be evaluated by microscopic simulation	Before and after
24	Average vehicle speed (off-peak period)	Decrease by 5%	Values of indicators shall be calculated in the micro-simulation model	Before and after
	Average vehicle time (peak period)	Increase by 5%	Scenarios will be defined and modelled	Before and after
	Average vehicle time (off-peak period)	Decrease by 5%	Before and after values shall be compared to evaluate the benefits	Before and after
3	Total fuel consumption	Decrease by 5%	Traffic micro-model PTV VISSIM and environmental modules	Before and after
8	CO2 emissions	Decrease by 5%	Traffic micro-model PTV VISSIM and environmental modules	Before and after
9	CO emissions	Decrease by 5%	Traffic micro-model PTV VISSIM and environmental modules	Before and after
10	NOX emissions	Decrease by 5%	Traffic micro-model PTV VISSIM and environmental modules	Before and after
11	Particulate emissions	Decrease by 5%	Traffic micro-model PTV VISSIM and environmental modules	Before and after

Data collection:

Direct observation and recording by radar, data from loops and cameras, traffic counts made at the regular intervals (each five years), traffic model including delays at intersections, type of management and priority, review of information systems;

Methodology:

Implementation of micro-simulation model on the central area before and after traffic management strategy scenario gives the calculated benefits compared to do-nothing scenario. PTV Vision software package shall be used for analysis.

C1.2 Establishing a Baseline

Before state of traffic management and application of ITS in the city is quite satisfactory. All major intersections in the city centre are traffic-light controlled and modernisation of dynamic preference for PT is efficient.

The most important deficit of the current state is poor inter-connection of individual subsystems of traffic management, where most of the information has to be transferred by a person. This may lead to mistakes, critical delays in reactions and time-consuming operations. The issue is especially serious during natural disasters, such as floods of the Elbe river, when immediate responses are required.

Another problem of the city is the unfinished highway D8, which completion is continuously being postponed due to protests of environmentalist who refuse its completion. As a result, intensive transit traffic is passing the city on everyday basis and there are no suitable bypassing routes available to lead such traffic away from sensitive city parts.

Current state of traffic organisation can be significantly optimised.

C1.3 Building the Business-as-Usual scenario

The Business-as-Usual scenario reflects the state, when there is no optimisation of the existing traffic management realised and the conditions are the same as in the current state (same as the Before state).

Evaluation was performed by the use of the traffic model of the city. The state before reflects the current state of traffic management while the scenario after includes traffic optimisation measures, such as application of ITS, dynamic control of traffic lights, coordination of traffic control).

Important and most congested parts of the road infrastructure were micro-simulated in detail. Relevant data were analysed for individual and public transport and pedestrians. The model was calibrated with data of the existing traffic flow in the city from the year 2011.

C2 Measure results

Reference area and network scope

Selected indicators are calculated by means of the VISSIM and VISUM software. The model network represents roads within the area approximately corresponding to the cadastral area of the city of Ústí nad Labem (traffic intensity, traffic output) or the central part of the city of Ústí nad Labem (microscopic model, traffic output, average speed), whereas this is divided into two part for its computational complexity (computation time considerably rises with the growth of the number of vehicles in the network and the number of intersections).

Figure 1: Scope of the evaluated model network in the mezzo-scopic model (the cadastral map and roads out of the evaluated road network are displayed in grey)

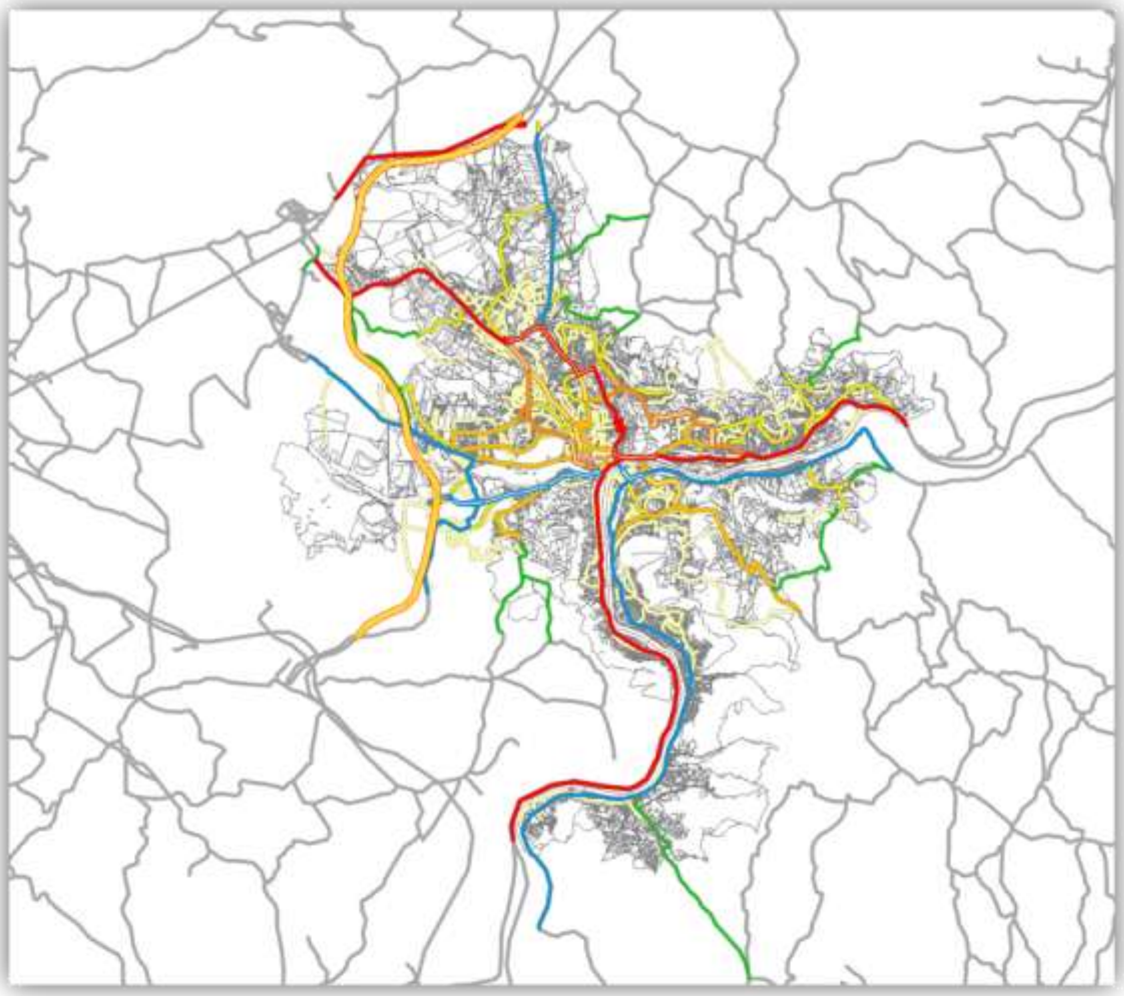


Figure 2: Scope of the evaluated model network in the microscopic model

The scenario BEFORE reflects the state of traffic intensities, the road infrastructure and level of traffic management corresponding with the year 2011.

The scenario AFTER is simulated on the same traffic model of Ústí nad Labem (the year 2011) with changes in traffic management with optimised sharing of information, dynamic control of intersections with mutual coordination responding to the real-time situation. The scenario reveals improved traffic flow and throughput of intersections.

The results are presented under sub headings corresponding with evaluated indicators – economy, energy, environment, society and transport.

C2.1 Economy

Economic indicators were not selected for the evaluation.

C2.2 Energy

Fuel consumption was calculated from data on pollution of CO emissions and data on measured emissions of CO per fuel unit [(g of CO)/(kg of fuel)] according to the source CVD, v. v. i. For the calculations, modal split was identified based on transport performance of individual vehicle categories derived by the traffic model on the entire road network of the city.

Traffic intensities in the scenarios Before and After are almost identical, it can be assumed, that fuel consumption will be very similar. Even though the scenario After optimises the traffic flow and results in certain differences in traffic speed, impact on fuel consumption is quite small and the resulting difference is smaller than the uncertainty of the calculation. Therefore, CO emissions derived from the traffic model are equal for both scenarios and the specific consumption is not in this case dependent on speed.

Table C2.2.1: Values of traffic emissions on the city territory before and after measure implementation

	Personal vehicles	Light freight vehicles	Heavy freight vehicles	TOTAL
Performance per 24 hours [veh/km]	830 290	62 502	103 960	996 752
Modal split [%]	83,30	6,27	10,43	100,00
Emissions of CO [g/day]				1 708 000
Measured emissions [g of CO/ kg of fuel]	9,67	52	170	29,05 (average according to modal split)
Fuel consumption [kg/day]				5 8802,16

Table C2.2.2: Energy indicator

Indicator	Before (2011)	B-a-U	After (2011)	Difference: After –Before	Difference: After – B-a-U
3 - Total fuel consumption	5 8802,16 kg/day	-	5 8802,16 kg/day	0 kg/day (0 %)	-

C2.3 Environment

The value of emissions produced by motor transport is calculated by the traffic model and corresponds with the traffic performance on the city territory. CO_2 emissions and emissions of solid particles are not calculated because the existing traffic model of the city is not able of such calculations.

Due to the fact, that traffic intensities in the scenarios Before and After are practically identical, it was assumed that produced emissions remain at the same level (please see also the section on Energy). Therefore, results calculated by the traffic model are the same for both scenarios.

Table C2.3.1: Traffic pollutants on the city territory – values before and after measure implementation – calculated for the year 2011

	NOx	SO_2	CO	HC
unit	[g/day]	[g/day]	[kg/day]	[g/day]
emissions	2 171 978	190 359	1 708	523 771

Table C2.3.2: Environment indicators

Indicator	Before (2011)	B-a-U	After (2011)	Difference: After –Before	Difference: After – B-a-U
8 – CO_2 emissions	*not rated*				
9 – CO emissions	1708 kg/day	-	1708 kg/day	0 kg/day (0 %)	-
10 – NO_X emissions	2 171 978 g/day	-	2 171 978 g/day	0 kg/day (0 %)	-
11 – Particulate emissions	*not rated*				

C2.4 Transport

Traffic level – indicator no. 21 and 22

The traffic intensity is determined on the basis of model prognosis in the VISUM software environment. Outputs of the transport model are traffic flow diagrams that show profile traffic intensities within 24 hours in three categories of vehicles – passenger cars, light trucks up to 3.5t and trucks over 3.5t. The hour intensity is presented for the peak period (an hour of a day with the highest intensity of the daylong traffic value) and off-peak period (an hour of a day between the morning and afternoon peak hour with the lowest intensity of the daylong traffic value).

Table C2.4.1: Average amount of vehicles on individual road types on the specific road network in the peak period (indicator no. 21 – values before implementation)

Road category	Length [km]	Average intensity [veh/h] – peak period			
		Personal vehicles	Light freight vehicles	Heavy freight vehicles	all
Highways and speedways	17,98	1 066	115	266	1 448
I class roads	34,44	710	68	41	818
II class roads	39,12	553	52	25	630
III class roads	27,11	32	6	4	41
Local roads	227,09	145	11	3	159
Total					**3096**

Table C2.4.2: Average amount of vehicles on individual road types on the specific road network in the off-peak period (indicator no. 21 – values before implementation)

Road category	Length [km]	Average intensity [veh/h] – peak period			
		Personal vehicles	Light freight vehicles	Heavy freight vehicles	all
Highways and speedways		824	89	274	1 187
I class roads	34,44	548	52	42	643
II class roads	39,12	427	40	26	493
III class roads	27,11	25	4	4	33
Local roads	227,09	112	9	3	124
Total					**2480**

Table C2.4.3: Average amount of vehicles on individual road types on the specific road network in the peak period (indicator no. 21 – values after implementation)

Road category	Length [km]	Average intensity [veh/h] – peak period			
		Personal vehicles	Light freight vehicles	Heavy freight vehicles	all
Highways and speedways		1013	114	253	1379
I class roads	34,44	724	69	37	830
II class roads	39,12	664	50	25	739
III class roads	27,11	35	6	4	45
Local roads	227,09	144	12	3	159
Total					**3152**

Table C2.4.4: Average amount of vehicles on individual road types on the specific road network in the off-peak period (indicator no. 21 – values after implementation)

Road category	Length [km]	Average intensity [veh/h] – peak period			
		Personal vehicles	Light freight vehicles	Heavy freight vehicles	all
Highways and speedways	17,98	832	87	260	1180
I class roads	34,44	543	53	39	635
II class roads	39,12	406	39	26	470
III class roads	27,11	23	4	4	32
Local roads	227,09	134	8	3	145
Total					**2462**

Congestion level – indicator no. 23 and 24

The level of congestion is evaluated on the basis of dynamic microscopic simulation of the traffic flow. Its evaluation is based on the microscopic model created in the VISSIM software environment. The evaluated indicator is the average driving speed, which is determined by one-digit entry for the whole simulated network or by colour analysis of individual inter-node sections. Indicator is calculated again for the peak and the off-peak hour.

Table C2.4.5 – Average speed of traffic flow on the selected road network before measure implementation

	Average driving speed [km/h]	
City centre area	**Peak hour**	**Off-peak hour**
Masarykova	16,1	21,3
Důlce	12,6	16,2
Average:	**14,35**	**18,75**

Table C2.4.6 – Average speed of traffic flow on the selected road network after measure implementation

	Average driving speed [km/h]	
City centre area	**Peak hour**	**Off-peak hour**
Masarykova	16,9	22,2
Důlce	13,9	17,3
Average:	**15,38**	**19,74**

Figure 3 – Graphical representation of average driving speed in the area of Důlce (year 2011, peak hour, all vehicles)

Figure 4 – Graphical representation of average driving speed in the area of the Masarykova street (year 2011, peak hour, all vehicles)

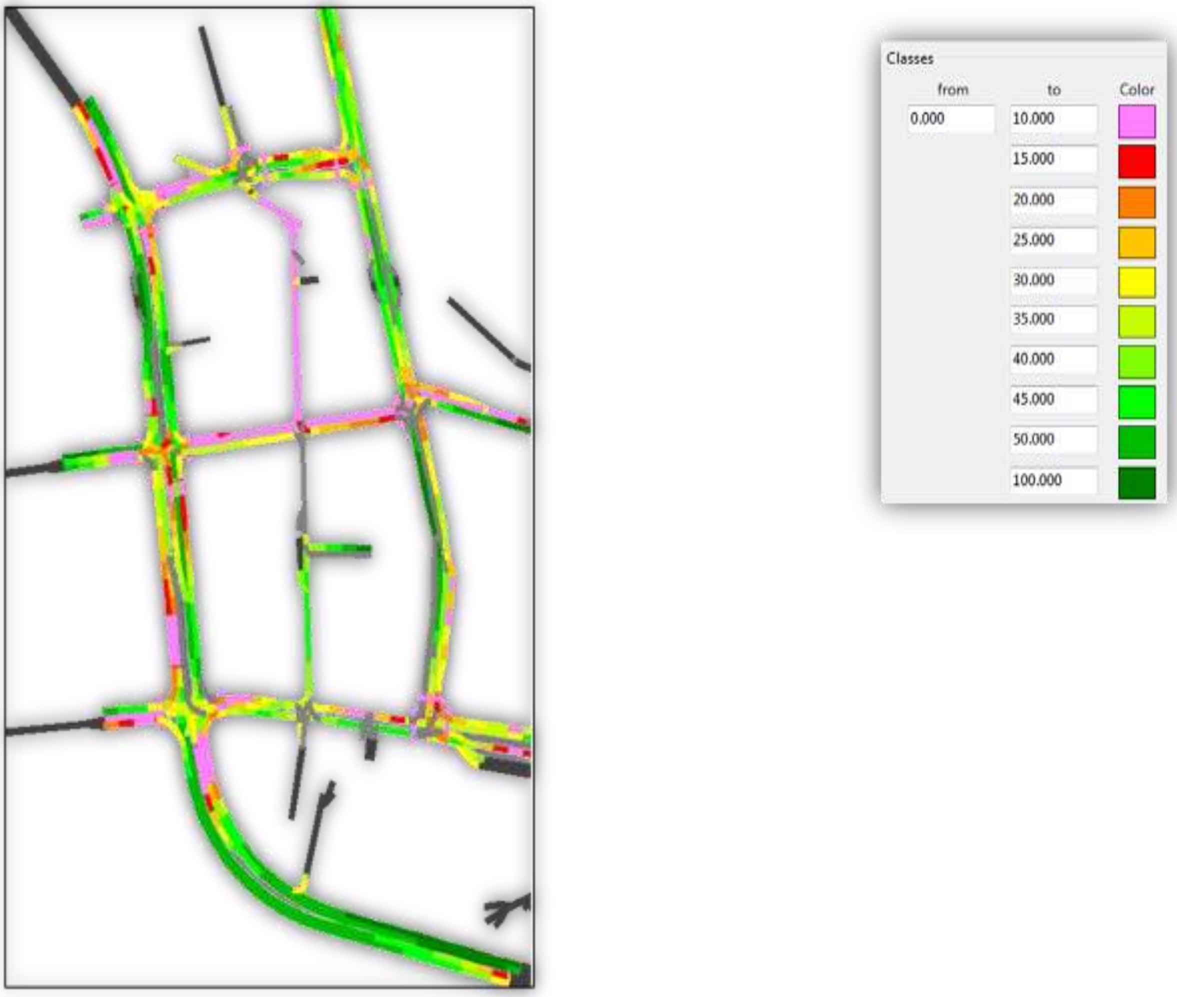


Figure 5 – Graphical representation of average driving speed in the area of the Důlce (year 2011, off-peak hour, all vehicles)

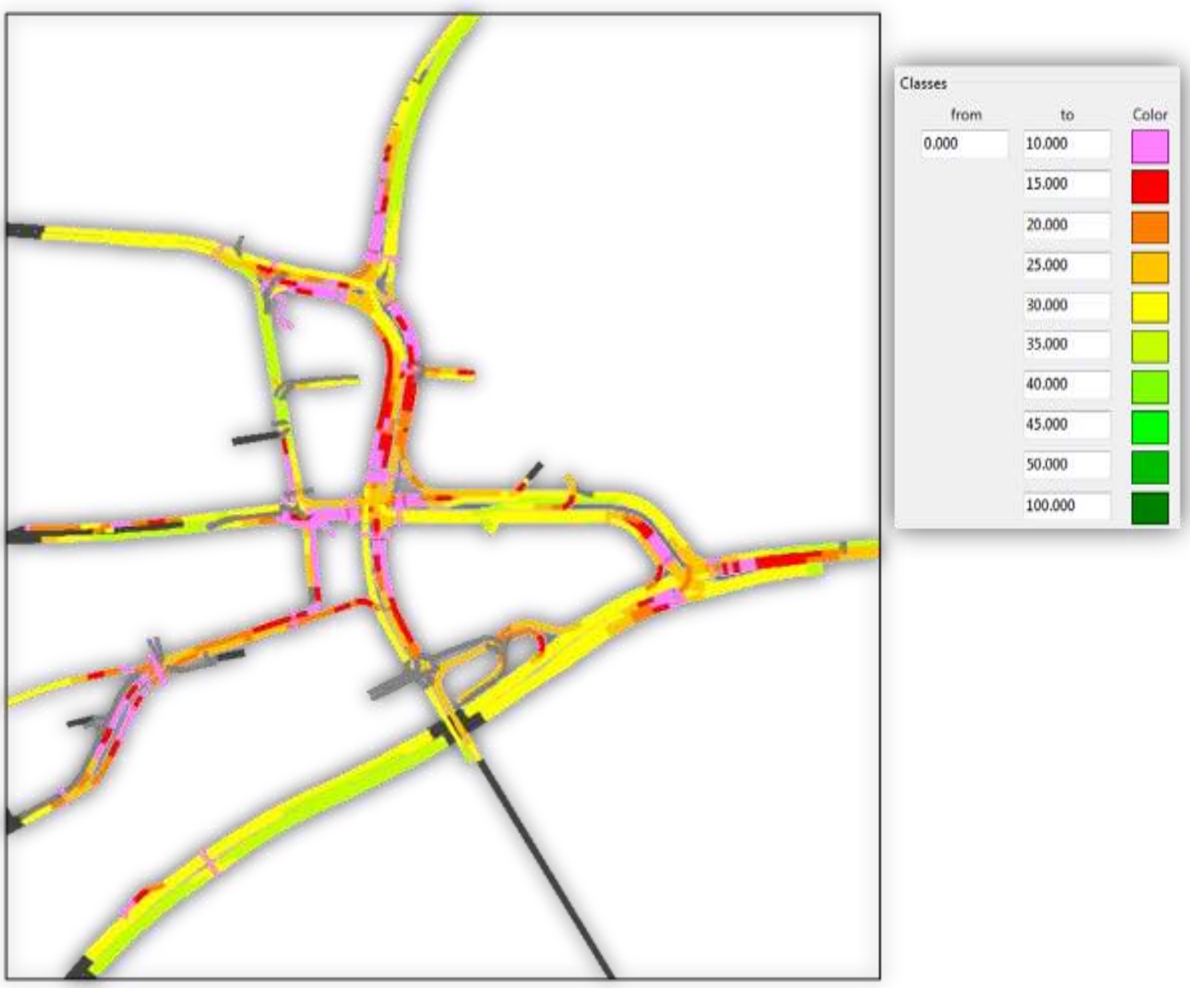
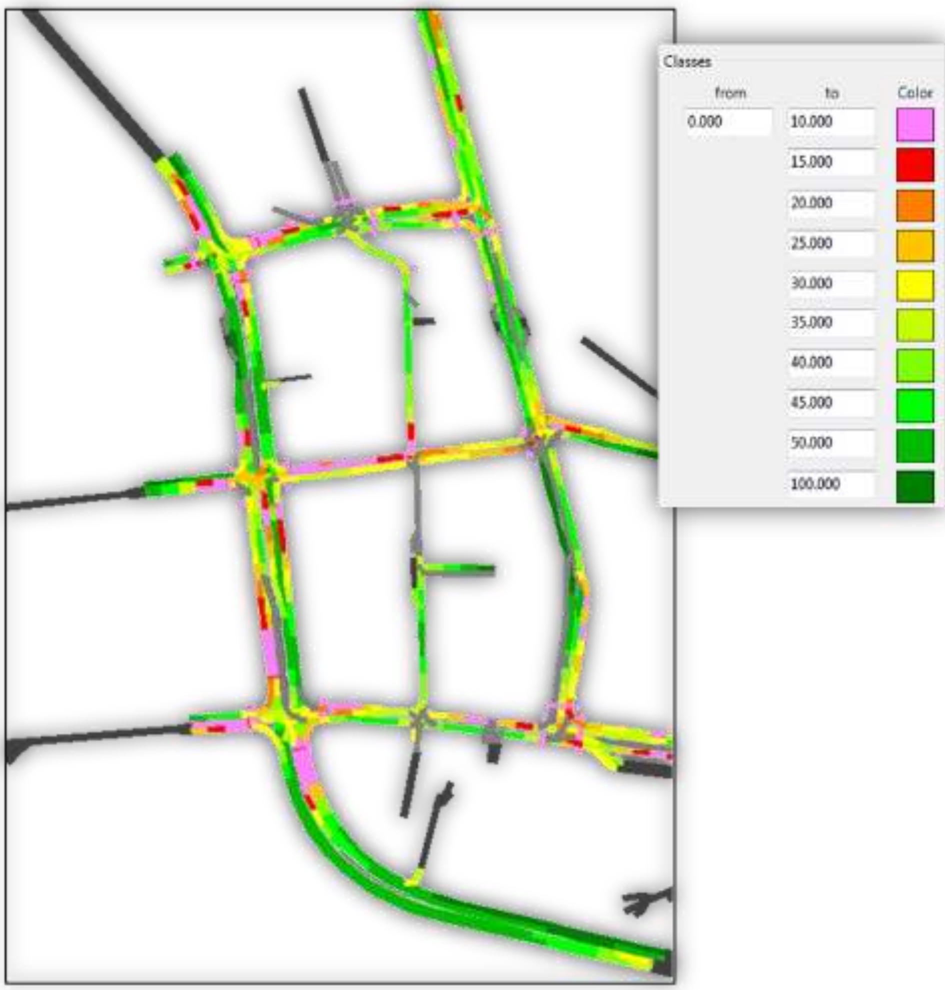


Figure 6 – Graphical representation of average driving speed in the area of the Masarykova street (year 2011, off-peak hour, all vehicles)



Time consumption (indicators without number)

Time consumption in the road network is in the central area of the city evaluated on the basis of dynamic microscopic simulation of traffic flow. Its evaluation is based on the microscopic model created in the VISSIM software environment. The indicator is the traffic output expressed in vehicle-hours for the whole simulated network. The indicator is calculated again for the peak and the off-peak hour.

Table 2.4.7 – Average time spent in the model network, rated for 1 vehicle, the scenario BEFORE

	Average time spent in the model network [hour/veh]	
City centre area	**peak hour**	**off-peak hour**
Masarykova	0,025	0,018
Důlce	0,048	0,036
Sum for both areas	**0,074**	**0,054**

Table C2.4.8: Average time spent in the model network, rated for 1 vehicle, the scenario AFTER

	Average time spent in the model network [hour/veh]	
City centre area	**peak hour**	**off-peak hour**
Masarykova	0,023	0,018
Důlce	0,043	0,034
Sum for both areas	**0,033**	**0,026**

Table C2.4.8: Transport indicators

Indicator	Before (2011)	B-a-U (date)	After (2011)	Difference: After –Before	Difference: After – B-a-U
21 - Traffic level (peak)	3096 veh/h	-	3152 veh/hour	56 veh/hour (+1,81 %)	-
22 - Traffic level (off peak)	2480 veh/h	-	2462 veh/hour	-18 veh/hour (-0,73 %)	-
23 - Congestion level (peak)	14,35 km/h	-	15,38 km/h	1,03 km/h (+7,2 %)	-
24 - Congestion level (off peak)	18,75 km/h	-	19,74 km/h	0,99 km/h (+5,3 %)	-
Time consumption (peak)	0,074 hour/veh	-	0,033 hour/veh	-0,041hour/veh (-55,4 %)	-
Time consumption (off peak)	0,054 hour/veh	-	0,026 hour/veh	-0,028 hour/veh (-51,9 %)	-

C2.5 Society

Society indicators were not selected for the evaluation.

C3 Achievement of quantifiable targets and objectives

Table C3.1: Target of indicators

NO.	TARGET	RATING
3 – Total fuel consumption	Decrease by 5%	O
8 – CO_2 emissions	Decrease by 5%	NA
9 – CO emissions	Decrease by 5%	O
10 – NO_X emissions	Decrease by 5%	O
11 – Particulate emissions	Decrease by 5%	NA
21 – Traffic level - peak	Density shift by 5%	O
22 – Traffic level – off peak	Density shift by 5 %	O
23 – Congestion level - peak	Increase by 5%	★★★
24 – Congestion level – off peak	Decrease by 5%	★★
Without no. – Time consumption - peak	Increase by 5%	★★★
Without no. – Time consumption – off peak	Decrease by 5%	★★★
NA = Not Assessed O = Not Achieved ★ = Substantially achieved (at least 50%) ★★ = Achieved in full ★★★ = Exceeded		

C4 Up-scaling of results

The proposed principles for improvements of traffic management would result in improvements on the entire city road network and better target emergency situations. Up-scaling of the measure is currently not required as the measure was designed as optimal for the city with significant requirements for its implementation. However, up-scaling could be applied on larger utilisation of modern technologies and trends in the management system.

C5 Appraisal of evaluation approach

Evaluation of efficiency of proposed solutions was based on calculations of the transport model of the city. The scenarios (Before and After) were modelled to gain data about traffic performance, time consumption, speed of traffic flow and produced emissions. The transport model is based on national traffic censuses and calibrated by the rate of motorisation development and actual data gathered in the city, therefore, the final data are considered as relevant.

There is no precisely defined average consumption of fuel, which could be used for calculations. The values are subject of substantial uncertainty due to diverse vehicle fleet and differences in technical conditions, driving abilities and behaviour, load of vehicles, etc. Therefore, calculation of pollution of emissions is used for fuel consumption as the transport model enumerates production of emissions with regard to diverse vehicle fleet and thus the calculated consumption of fuel should be adequate, reflecting the real situation.

C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – the optimisation of traffic management in the city (application of modern technologies, interconnection of subsystems, coordination of intersections, real-time management, etc.) and establishment of the central traffic control station results in improvements of traffic flow, elimination of congestions, decrease of time consumption and reduction of negative impacts on the environment (decrease in emissions)

- **Key results 2 –** optimised traffic situations provides opportunities for development of preferred transport modes, such as city public transport, cycling and walking

- **Key results 3 –** optimised traffic management is most valuable during emergency situations, which require immediate and adequate response and efficient cooperation of individual management units

C7 Future activities relating to the measure

The measure was designed and included in the SUTP of Ústí nad Labem and the action plan for intelligent traffic management was produced. Individual steps of the action plan should be followed in order to reach the required state of traffic management, involving establishment of a central traffic control station in the city.

The responsibilities for implementation of the action plan will be assigned during the process of official approval of the SUTP by city authorities. Budget and personnel allocation and the time schedule for individual steps of the action plan will be defined each year within setting the overall budget of the city.

Optimal efficiency of the measure requires completion of the Highway D8 in the vicinity of the city.

D Process Evaluation Findings

D.0 Focused measure

Table C2.4.1:

	0	No focused measure
Reason 3*	1	Most important reason
Reason 8*	2	Second most important reason
Reason 2*	3	Third most important reason

*) Reasons from checklist in Guidelines for the Completion of the MERT

D.1 Deviations from the original plan

The deviations from the original plan:

- **Deviation 1 –** The measure was delayed by time-consuming gathering and processing of data about modern methods of traffic management, technologies and trends for each sub-system of the city traffic management system. The measure was finalised and did not have negative impact on other project activities.

D.2 Barriers and drivers

D.2.1 Barriers

<u>**Preparation phase**</u>

- **Barrier 2 (Institutional)** – difficult and time-consuming obtaining of input data due to the fact, that currently the information is not shared and many separated subjects are involved in the current system of traffic management (involving an administrator of roads, an administrator of parking facilities, an administrator of traffic light devices, the PT company, the Police of the Czech Republic and the Municipal police, etc.)
- **Barrier 6 (Positional)** – It is necessary to connect the existing systems and services, lack of exchange and mutual sharing and non-existing connections in the current state

<u>**Implementation phase**</u>

- **Barrier 11 (Spatial) –** Missing bypassing routes to redirect the unnecessary traffic away from sensitive city parts and the unfinished Highway D8 results in additional saturation of traffic in the city
- **Barrier 9 (Financial)** – The system is quite complex and requires significant investments

- **Barrier 4 (Problem related)** – Complexity of the measure presents significant demands on time, costs and personnel and long-time efforts and commitments in order to reach the planned effect

Operation phase

- The measure was not put into operation.

D.2.2 Drivers

Preparation phase

- **Driver 10 (technological)** – Potential in technologies and available technical facilities offer great opportunities for the city

Implementation phase

- **Driver 12 (environmental)** – Great effect of the measure on the city transport and thus on the living environment of the city
- **Driver 4 (problem related) –** Pressure of the traffic problems in the city, possibilities revealed for improvements and presented positive impacts of such improvements give a high priority for measure implementation
- **Driver 2 (cultural)** – Optimised traffic management offers possibilities also for development of preferred modes of transport, such as public transport and cycle transport, and encourages walking trips in safer and calmer environment

Operation phase

- The measure was not put into operation

D.2.3 Activities

Preparation phase

- **Activities 5 (involvement) –** intensive cooperation with involved stakeholders during data gathering and processing
- **Activities 10 (technological)** – identification of technological benefits

Implementation phase

- **Activities 1 (political)** – through discussions and presentations of measure impacts, ensuring political support for measure implementation
- **Activities 4 (problem related) -** revealing the necessity to connect individual subsystems of the existing traffic management in the city, to implement the central traffic control station and to apply modern technologies in order to ensure priority for implementation

Operation phase

- The measure was not put into operation.

D.3 Participation

D.3.1 Measure Partners

- **Measure partner 1 –** Ústí nad Labem Municipality – developing the strategic traffic management solution
- **Measure partner 2 –** Pontex Co. – the subcontracted provider designing the central control traffic station for the city
- **Measure partner 3 –** NTD Group, administrator of traffic light devices
- **Measure partner 4** – units of the Integrated Rescue Systems *(IZS)*: the Police of the Czech Republic, the Municipal Police, the Emergency Services, the Fire Brigade
- **Measure partner 5** – Municipal Services of Ústí nad Labem *(Městské služby Ústí nad Labem)*, the administrator of the road network
- **Measure partner 6 -** the Public Transport Company of Ústí nad Labem *(Dopravní podnik města Ústí nad Labem)*

D.3.2 Stakeholders

- **Stakeholders 1 -** car users
- **Stakeholders 2 -** public transport users
- **Stakeholders 3 -** cyclists
- **Stakeholders 4 -** pedestrians
- **Stakeholders 5 –** all other vulnerable road users
- **Stakeholders 6 –** residents, commuters and also visitors
- **Stakeholders 7 –** local businesses

D.4 Recommendations

D.4.1 Recommendations: measure replication

- **Recommendation 1 -** address the issues of traffic management as a complex solution for the entire city, not restricted to only a certain area in the city
- **Recommendation 2 –** if possible, provide alternative routes for unnecessary traffic

D.4.2 Recommendations: process (related to barrier-, driver- and action fields)

- **Recommendation 1 –** thoroughly analyse and research the existing functioning of all involved subjects and identify specific deficits in traffic management

- **Recommendation 2** – ensure smooth and efficient communication and data sharing among all the sub-systems involved in traffic management in the city