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POINTER

Measure Evaluation Results

40 – Drive Safely Campaign in Ústí nad Labem

49 – Road Safety Measures in Ústí nad Labem

THE CIVITAS INITIATIVE
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Measure title: **Drive Safely Campaign & Road Safety Measures**

City: **Ústí nad Labem** Project: **Archimedes** Measure number: **40 & 49**

Executive summary

Ústí nad Labem is committed to improving its living environment. Within the long-term goal, the city aims to increase the safety level on local roads, encourage walking and cycling in the city and improve the urban space. It focuses at reducing number of deaths and injuries caused by traffic and consequently decreasing the number of road accidents. Safety inspections were performed and accident data were studied to identify safety actions necessary to achieve improvements and to determine how to implement traffic calming in the most effective way.

The road safety audit revealed many deficits, some of which are quite serious and pose major safety risks. The emphasis of remedial solutions was placed on improving the safety level and assessing requirements and effects of proposed modifications.

According to the findings, the following steps were recommended to be followed:

- Identify localities with the majority of accidents by periodic analysis;
- Systematically eliminate safety deficits on the basis of detailed inspections;
- Determine efficiency of realised measures by periodic analysis;
- Remove the most serious safety deficits identified by the inspections;
- Systematically find solutions from the most dangerous roads to less severe ones;
- Prioritise detailed inspections for individual road sections;
- Educate administration and maintenance personnel performing the periodic inspections according to the Road Act and its implementing regulations directing to deal with safety deficits and deficits;
- Include reconstruction of intersections and road sections with high accident rate as a priority in the action plan for investment measures; and
- Conduct the safety inspections of the road network periodically.

As a result, specific solutions for localities with intensive traffic and most frequent occurrence of traffic accidents were developed. Feasibility of traffic calming was performed and localities suitable for calm zones were recommended. Road infrastructure and safety conditions by local schools were surveyed and adequate solutions for safety improvements were designed. The proposed solutions were included in the Sustainable Urban Transport Plan of Ústí nad Labem.

The measure was supported by public campaigns aimed at safe behaviour of road users and raising awareness about road safety issues.

Measure evaluation for individual indicators was based on data from:

- Police statistics about traffic accidents in the city,
- Conducted safety audit,
- Speed measurements of traffic flow,
- Questioners of the public about road safety issues.

Proposed safety improvements were assessed in terms of their costs and benefits and suitable solutions were included in the action plan of the Sustainable Urban Transport Plan of Ústí nad Labem.

A Introduction

A1 Objectives

The measure objectives are:

(A) High level / longer term:

- To improve road safety in the city
- To increase the quality of urban space to encourage walking and cycling in the city

(B) Strategic level:

- To reduce the number of deaths and injuries caused by road accidents
- To increase compliance with the speed limit and encourage safe behaviour of road users
- To increase awareness about road safety issues

(C) Measure level:

(1) To identify major black spots and safety shortcomings on the city road network

(2) To propose measures leading to road safety improvements

(3) To identify areas suitable for traffic calming and develop specific solutions

(4) To promote reduction of driving speed and road safety principles

A2 Description

Ústí nad Labem has a target to reduce the amount of traffic accidents in the city and their consequences through road safety measures. Within the long-term goal, the city aims to increase the safety level on local roads, encourage walking and cycling in the city and improve the urban space.

This package of measures included the following CIVITAS Archimedes tasks:

- **Task 11.5.3 - Safety Audit** (RTD)
  - Performing safety audit and revealing safety deficit on the road network in the city
- **Task 5.10 - Road Safety Audit & Actions** (DEMO)
  - Based on findings of the safety audit, solutions were identified and the action plan for road safety improvements in the city was develop
- **Task 11.5.4 - Traffic Speed Reduction** (RTD)
  - Analysing feasibility of traffic calming in the city
- **Task 5.11 - Traffic Speed Reduction Publicity Campaign** (DEMO)
  - Implementing public campaign to encourage speed reduction and increase road safety in the city
- **Task 4.15 - Drive Safely Campaign** (DEMO)
  - Launching the public campaign to eliminate dangerous behaviour of drivers and increase awareness about road safety issues

Safety inspections were performed and data on accidents were studied in order to identify required action for safety improvements and to determine how to implement traffic calming in the city. Based on the findings, specific solutions were developed and public campaigns were launched (please see the implementation section B4). Recommendations for road safety improvements were included in the SUTP of Ústí nad Labem. These recommendations include:

- Proposal for implementation of 42 calm zones in the city (residential, pedestrian and tempo 30 zones), including description of their characteristics, traffic signs, construction requirements, and related valid legislation
- Individual localities suitable for applying traffic speed reduction were identified
- Based on the safety audit, road safety measures suitable for specific locations with frequent traffic accidents were identified and proposed for implementation (please see the CBA section C2.6.2)

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **New conceptual approach** – new methodology for recovery of safety at localities with frequent accidents on the city road network was developed
- **Targeting specific user groups** – specific road safety actions were designed for specific groups of road users to encourage their safer behaviour and improve their safety in the city traffic
- **New policy instrument –** improved road safety policy for the city was developed and included in the SUTP of the city for approval and acceptance by city authorities
- **New physical infrastructure solutions** – new traffic calming solutions for the existing road infrastructure in the city were proposed and included in the SUTP of the city for future implementation

B2 Research and Technology Development

A road safety audit was performed in the city to assess the existing state of traffic infrastructure in Ústí nad Labem and to reveal safety deficits.

Road accidents analysis was based on the up-to-date official records and periodic updates. Conducted road safety inspections were performed by experienced safety auditors. Monitoring of road safety defects was conducted by means of a passing vehicle in both directions. For the inspections, the tablet method was used, where parameters are manually recorded during the passage to the PC by predefined input tools by a road safety auditor. This reduces the time needed for data processing afterwards in the office. The system is independent from the particular vehicle; it is portable, easily storable and allows quick installation in a vehicle with no specific requirements. Its use is variable according to the task, structure of collected data and the purpose. The work was carried out by the expert team using the inspection devices for data gathering from the driver's perspective. The team was not familiar with the road network, which was a benefit for evaluating safety deficits in terms of random users.

Figure 1 – The vehicle equipped with a tabled used for road safety inspections in Ústí nad Labem

The task was performed in the following steps:

- Development of methodology;
- Training of personnel;
- Selection of localities with the majority of road accidents;
- On-spot inspections of the selected localities in terms of safety deficits, traffic load, potential for accidents and other hazards;
- Proposal of actions to improve safety, assessment of costs and benefits;
- Measurements of traffic speed by static radars;
- Analysis of traffic flow characteristics based on measurements;
- Data collection from local school and preschool facilities;
- On-spot safety inspections by the local school and preschool facilities;
- Analysis of traffic safety situation at school and preschool facilities;
- On-spot inspections of all the major roads in the city; and
- Analysis of the current safety conditions of major local roads, identification of safety deficits and proposal for corrective actions.

The goal was to identify any visually detectable safety deficits with no regard to technical, legal and financial viability and reliability. These findings served as input for a proposal of recovery solutions, priority of implementation with respect to the statistics of accidents, location, costs, and seriousness of safety deficits, speed and importance of each road.

Based on the findings, major shortcomings were assessed and mitigating countermeasures were developed in order to reduce fatal and serious road accidents, primarily on busy roads and in sensitive city areas (such as by schools).

In addition, the measure involved a feasibility study of applying traffic calming restrictions in the city. Characteristics of calm zones were described, including traffic signs, construction requirements and related valid legislation. Forty-two localities suitable for implementation were identified and traffic calming measures were analysed for each section.

The developed solutions were included in the SUTP of Ústí nad Labem for future implementation.

B3 Situation before CIVITAS

In a long term, with the growing rate of motorisation, number of traffic accidents in the city and their consequences continuously grow. It is therefore necessary to deal with transport safety, from road safety deficits to behaviour issues of drivers, in order to reduce the number of killed and injured people in road accidents.

Table 1 – Road accidents in Ústí nad Labem in 2009 compared to the year 2008 (+/-)

	no. of accidents	+/-	deaths	+/-	serious injuries	+/-	light injuries	+/-	alcohol at a driver	+/-	Civitas corridor	+/-
total number of accidents	1620	-696	8	-1	39	0	320	-27	56	-39	1304	-608
accidents with physical consequences	1329	-685	-	-	-	-	-	-	32	-31	1074	-602

Table 2 - Road accidents in Ústí nad Labem distributed throughout a week

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
the year 2009	265	269	224	258	259	182	163
+/- in 2008	-127	-70	-165	-103	-152	-61	-18

Currently, majority of local roads lack calming elements, the city does not have any systematic prevention strategy and the number of casualties as a result of road accidents is increasing.

B4 Actual implementation of the measure

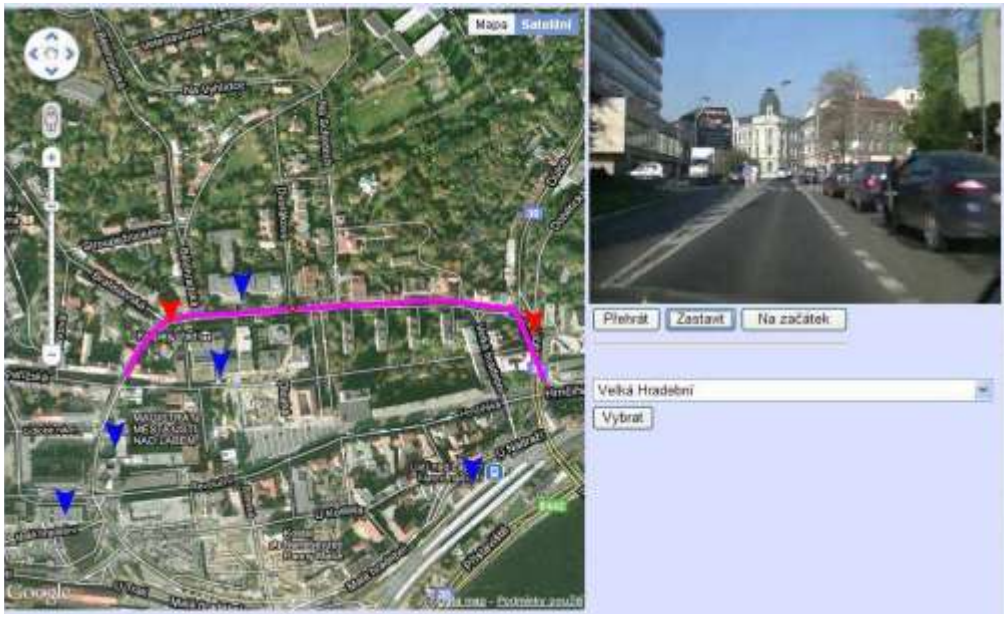
The measure implementation involved realisation of public campaigns aimed at promotion of speed reduction and safe driving, and at rising awareness about road safety issues. Beside public events held in the city, road safety campaigns involved workshops, traffic education of children, implementation of a website, production of educational materials, promotion in media, etc.

Physical road safety solutions developed within the measure, resulting from the road safety inspections and surveys, have not been implemented so far. They were included in the SUTP of Ústí nad Labem for future implementation, along with the action plan describing specific steps required for road safety improvements.

Data processing *(M12 – M18):* Background data were collected from other successful road safety campaigns in the Czech Republic and abroad, from the CIVITAS ARCHIMEDES research tasks 11.5.3 Safety Audit and 11.5.4 Traffic Speed Reduction. Promotion forms were targeted to address specific groups of roads users.

Website *(M18 – M25):* New website dedicated to road safety in the city was launched on www.bezpecnepousti.cz. The website includes individual sections with advice and recommendations for safe behaviour of drivers, pedestrians and cyclists. It also contains an interactive map of dangerous locations in the city with safety warnings and videos. Specific sections are devoted to accident rate in the city, traffic intensity on individual roads, traffic control and traffic training.

Figure 2 – An image from the website showing videos and safety warnings on one of the major roads in the city centre



Educational materials *(M23 – M27)*: Furthermore, educational leaflets were produced in entertaining graphical format. The leaflets were designed separately for individual road user groups – pedestrians, drivers and cyclists. They described basic traffic safety rules for each target group through pictures and rhyming slogans to be attractive and simple to remember.

Figure 3 - Graphic brochures about road safety warnings and advices

Workshops *(M27 – M29)* - Within the road safety campaign, the city of Ústí nad Labem organised several workshops focused on safe traffic behaviour of young/potential drivers on the one hand, and elderly people on the other. The workshops included presentations, discussions on road safety issues and competitions with presents for young students. Safety gadgets were distributed also to elderly people. Educational materials were informing about safety issues. Two short TV spots summarising the workshops were produced. These workshops were organised at the local University, High School, at retirement homes and at the Senior Club of Ústí nad Labem during November 2011.

Figure 4 – Workshops with students and seniors about road safety issues

Promotion *(M27 - M30)* - To support its activities, the CIVITAS team participated at the international conference on Safe Transport in Prague, promoted campaign events through local media, including newspaper, radio, local TV and the Facebook page. All campaign activities were supported by distribution of safety gadgets and attractive educational materials, and promoted via various media operating in the city.

Figure 5 - Distribution of gadgets for traffic education

Public events *(M30 – M37):* There were public events organised in the city centre to increase awareness about road safety issues. This involved a public event focused on children, which was aimed at promoting safety of trips to/from schools. The programme of the event included various activities for children and their parents, including competitions on traffic behaviour, knowledge quizzes, traffic training on a mobile traffic court operated by the Municipal Police, distribution of safety accessories from CIVITAS, etc.

Figure 6 – Public event focused on safety of children

The CIVITAS team further participated on the annual Ústí nad Labem half-marathon. During this popular international event, information about the campaign activities was presented to the wide public, along with promotional presents, brochures and education leaflets.

Figure 7 - Public event promoting safety of road users held during the annual half-marathon in Ústí nad Labem

Another public event was held in front of the largest shopping complex in the city centre over the course of three days. Activities were aimed at encouraging drivers to reduce their speed, promoting the importance of safe driving and on the prevention of traffic accidents. The target group consisted of both drivers and non-drivers, especially vulnerable users. Part of the programme was devoted specifically to children and young families.

Figure 8 – Public event raising awareness about road safety issues, traffic accidents and their consequences

Traffic education *(M33 – M41)* – The traffic court in the city operated by the Municipal Police serves for school and pre-school children in Usti nad Labem to learn basic traffic rules theoretically in the indoor classroom and practically at the outside court. Within the campaign, this traffic court received new equipment that makes learning easier and more fun. The classroom was equipped with traffic games and puzzles (card games, dominos and quizzes on traffic rules), flipchart with traffic-themed magnets, colourful stationery, carpet with roads, intersections and pedestrian crossings, new educational materials include comics-style studying brochures and traffic tests, etc. This opens new ways of more attractive and graphic learning of safe traffic behaviour. For outdoor practice, wooden traffic signs and several new bicycles with adequate cycling gear were provided. Furthermore, each school that visits the traffic court is awarded safety vests and other safety gadgets for pupils. The school also receives safety stop disks for safe crossing of streets. In addition to permanent training premises, Usti nad Labem acquired a mobile traffic court, which includes child scooters, mobile vertical and horizontal traffic signs, mobile traffic lights, pedestrian traffic cones and safety stop disks for safe street crossing. The mobile traffic court supplements the permanent traffic court in the city operated by the Municipal Police and allows training in distant and less accessible areas. Thanks to the mobile court, preventive training is undertaken by all primary school children in Ústí nad Labem.

Figure 9 – Traffic education of children in Ústí nad Labem

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **Task 11.8.9 – SUTP Development in Ústí nad Labem** – measure results were included in the SUTP for future implementation

C Impact Evaluation Findings

C1 Measurement methodology

C1.1 Impacts and Indicators

Table C1.1.1: Indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	Economy					
2a		Costs	Operating Costs	Operating costs	Costs per pkm	Euros/pkm, quantitative, derived or measurement
2b			Capital Costs	Capital costs		
	Society					
13		Acceptance	Awareness	Awareness level	Awareness of the policies/measures	Index (%), qualitative, collected, survey
14			Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
			Obedience	Traffic rules violation level	Number of traffic rules violators (special focus on speeding) as an index of total road users	Index (%), qualitative, collected, survey
	Transport					
20		Safety	Transport Safety	Injuries and deaths caused by transport accidents	Number of accidents, fatalities and casualties caused by transport accidents	No, Quantitative, measurement
				Inspected road sections	The length of road sections inspected within road inspections carried out by a professional expert	surveyed within inspections / length of road sections (km)

Measure title: Drive Safely Campaign & Road Safety Measures (11.5.3, 11.5.4, 4.15, 5.10, 5.11)

City: Ústí nad Labem **Project**: Archimedes **Measure number:** 40 & 49

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
				Identified black spots	The amount of critical accident black spots in the territory of the Municipality	surveyed within inspections / number of locations
				Identified shortcomings	The sum of shortcomings identified for every single black spot.	surveyed within inspections / number of shortcomings

Table C1.1.1.2: Detailed description of the indicator methodologies

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
2a	Operating costs	BCR 1.2 – 2.0	CBA-oriented approach has been chosen to evaluate key economic indicators, traffic model calculations and engineering estimates were utilised, data from accident statistics, localisation of accidents, safety audits and inspections and recommended safety improvements (accident costs are part of operating costs).	2 x
2b	Capital costs	BCR 1.2 – 2.0	CBA-oriented approach has been chosen to evaluate key economic indicators, traffic model calculations and engineering estimates were utilised, data from accident statistics, localisation of accidents, safety audits and inspections and recommended safety improvements (costs for safety improvements are part of capital costs)	2 x
13	Awareness level	25 %	data collected by surveys and questioners among city residents both in paper and electronic version during public events and through local media and city website	2 x
14	Acceptance level	25 %	data collected by surveys and questioners among city residents both in paper and electronic version during public events and through local media and city website	1 x
	Traffic rules violation level	-15 %	data from measurements of traffic characteristics to assess acceptance of traffic restrictions before and after campaign activities	2 x
20	Injuries and deaths caused by transport accidents	-40 %	data from official police records on road accidents with periodic annual updates, statistical data	annually, 3 x
	Inspected road sections	45 km	realized safety inspections and audits	continuously M8 – M20
	Identified black spots	15	realized safety inspections and audits	continuously M8 – M20
	Identified shortcomings	10	realized safety inspections and audits	continuously M8 – M20

Data collection:

Accident statistics, accident localisation, available accident records, specific safety inspections, recording of traffic behaviour, speed measurement, analysis of accident records, inquiry at school officers, polls with winner awards.

C1.2 Establishing a Baseline

Improvements will be demonstrated through series of countermeasures for strategic upgrading of road infrastructure, improvement of driving behaviour, traffic law obedience, awareness of road safety aspects and consequences of violation of traffic restrictions.

Assessment take into consideration implemented campaigns and application of proposed safety countermeasures (new traffic signals, pedestrian crossings, roundabouts, traffic calming zones, improvements of the infrastructure, etc.) based on safety inspections and black spots treatment.

C1.3 Building the Business-as-Usual scenario

Detail analysis of actual accident rate and respect to the traffic rules in the city is the baseline for improvements. Existing level of public approach to road safety issues (such as safety of road users, driving behaviour, traffic law obedience, etc.) were surveyed to give indication on the situation before realization of measure activities.

For baseline data on road safety indicators, available official statistics on traffic accident were analysed. The potential savings in casualties was evaluated based on model scenarios, where the potential for safety improvements in relation to relative accident rate was defined. Possible benefits of improvements of public acceptance and awareness level was derived from the comparison of before and after data from surveys.

C2 Measure results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport.

C2.1 Economy

Economic analysis for the proposed solutions was realised.

The required Benefit Cost Ratio (BCR) for the indicators of operating costs (2a) and capital costs (2b) was calculated to 10,542 (please see the C2.6.4 - Compare the Lifetime Costs and Benefits).

Operating costs (no. 2a)

Operating costs were calculated for the CBA period 2011 – 2025 (please see C2.6.3 Life Time Cost and Benefit).

Capital costs (no. 2b)

Investment costs were calculated for the CBA period 2011 – 2025 (please see C2.6.3 Life Time Cost and Benefit).

Table C2.1.1: Results of indicators – category: economy

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After –Before	Difference: After – B-a-U
No. 2a – Operating costs	-	865 249 €	1 888 211 €	-	BCR = 10,542
No. 2b – Capital costs	-	0	571 200 €	-	BCR = 10,542

C2.2 Energy

No indicators.

C2.3 Environment

No indicators.

C2.4 Transport

Transport safety (no. 20) - Injuries and deaths caused by road accidents

The number of traffic accidents and its consequences is evaluated using the statistics of road accidents and records from the police database. The following table shows the statistics of the accidents and consequences in the municipality of Usti nad Labem for last 5 years.

Table C2.4.1: Traffic accidents in the city

	2007	2008	2009	2010	2011
total number of accidents	1968	1762	1226	1049	1135
number of accidents with after effects on health	164	209	217	181	190
number of persons killed	11	5	4	8	5
number of seriously injured persons	32	23	28	8	27
number of slightly injured persons	162	239	236	215	202
number of accidents under the influence of alcohol	80	73	41	0	14

The period of years 2009 - 2011 was used for comparison of an annual development, corresponding with frequency of data collection (the interval of 3 years).

Table C2.4.2: Comparison of the years 2009 (state before) and 2011 (state after)

	2009	2011	difference 2011 - 2009	difference in percentage
total number of accidents	1226	1135	-91	-7,42%
number of accidents with after effects on health	217	190	-27	-12,44%
number of persons killed	4	5	1	25,00%
number of seriously injured persons	28	27	-1	-3,57%
number of slightly injured persons	236	202	-34	-14,41%
number of accidents under the influence of alcohol	41	14	-27	-65,85%

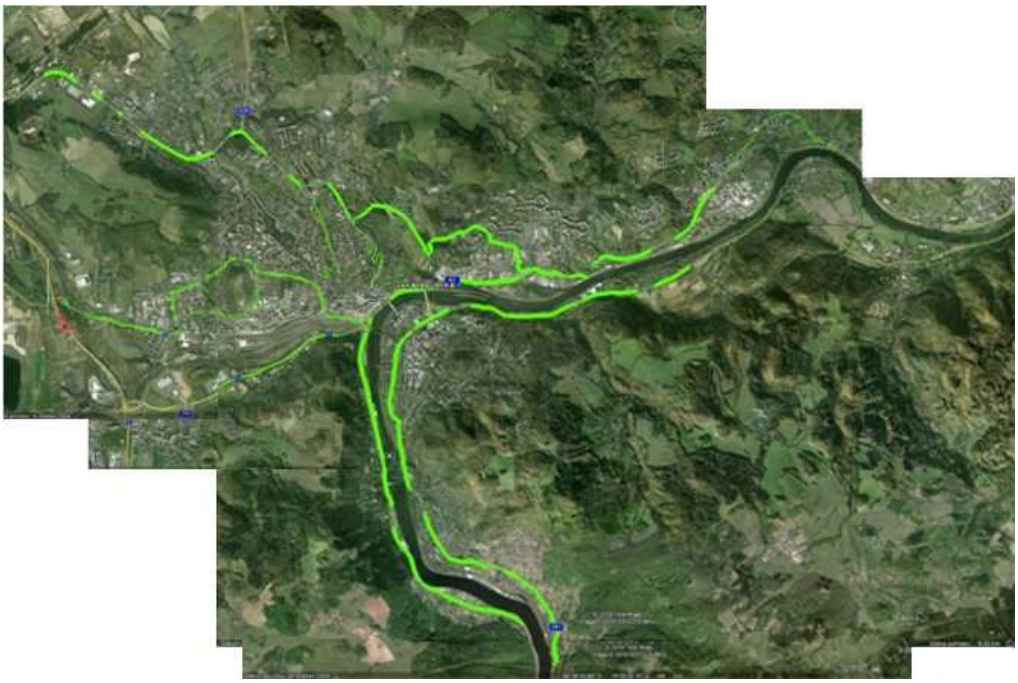
Number of fatalities in 2011 was about 25% higher than in 2009, the number of serious injuries decreased by 3,57 %, number of light injuries by 14,41 %.

Inspected road sections

Inspections were realised by a vehicles equipped with monitoring devices and GPS recording. Road sections with high traffic importance were selected, involving the following streets:

Opletalova, Podmokelská, Přístavní, Pražská, Hlavní, Seifertova, Drážďanská, Krčínova, Neštěmická, Výstupní, Na Návsi, Malátova, Hoření, Krušnohorská, Sociální péče, Božtěšická, Všebořická, Havířská, U Trati, Panská, Klíšská, Jateční, Textilní, Tovární, U Vlečky, Průmyslová, Okružní, Masarykova, Winstona Churchilla, Bratislavská, Velká hradební, Předmostí, Bělehradská, Roosveltova, Důlce, Sebuzínská, Litoměřická, Železničářská, Děčínská, Vítězná.

Figure 10 – green marked routes of road safety inspections in Ústí nad Labem



(*Source:* Google Earth)

Within the total of 10 inspections, approximately 53,5 km of roads in both driving directions were analysed for safety improvements, which is about 107 km of inspected routes.

Table C2.4.3: Road sections inspected in the city

Road section	1	2	3	4	5	6	7	8	9	10	total
Length [km]	11	2,8	10	3,9	5,9	2,1	3,8	1,9	2,1	10	53,5

Identified black spots – accident locations

Analysis of data from traffic accidents and of their consequences revealed 37 localities with significant accumulation of accidents. These are primarily intersections with intensive traffic. Potential for traffic accidents at these locations was assessed with the following results:

- 2 localities with high traffic safety risk,
- 10 localities with moderate traffic safety risk.

Identified shortcomings

Total of 229 traffic safety defects has been identified during the inspections of selected road sections on major roads and through roads in the city. Distribution of severity of the shortcomings is presented in the following table:

Table C2.4.4: Safety shortcomings revealed during the inspections

RATING	Low risk	Medium-low risk	Moderate risk	Moderately high risk	High risk	TOTAL
frequency	3	55	70	69	32	**229**

Table C2.4.5: Results of indicators – category: transport

Indicator	Before	B-a-U	After	Difference: After –Before	Difference: After – B-a-U
No. 20 – Transport safety					
Injuries and deaths	Deaths: 4 Serious i.: 28 Minor i.: 236 (year 2009)	-	Deaths: 5 Serious i.: 27 Minor i.: 202 (year 2011)	Deaths: +1 (+25 %) Serious i.: -1 (-3,57 %) Minor i.: -34 (-14,41 %)	-
Inspected roads sections	-	-	53,5 km of roads (year 2010)	-	-
Black spots	-	-	37 localities with frequent accidents (year 2010)	-	-
Shortcomings	-	-	229 shortcomings (year 2010)	-	-

C2.5 Society

The indicator was specified by the following statistical data:

Table C2.5.1: Speed measurements realised by the Municipal Police in the period from 29th April 2010 to 7th May 2010, using a mobile radar at different localities

	Speed limit exceeded by						Speed within the acceptable speed limit		Total measured vehicles
	>40 km/h		>20 km/h		<20 km/h				
Type of measurement	vehicles	%	vehicles	%	vehicles	%	vehicles	%	
Measurement of the Municipal Police, signalised**,** working days	0	0%	0	0%	0	0%	610	100%	610
Measurement of the Municipal Police, non-signalised**,** working days	12	0,11%	115	1,02%	468	4,14%	10708	94,74%	11303
Measurement of the Municipal Police, **non-marked,** weekend	3	0,50%	31	5,12%	118	19,47 %	454	74,92%	606
AVERAGE		0,20%		2,05%		7,87%		89,89%	

Table C2.5.2: Number of vehicles passing on the red light at intersections controlled by traffic lights, monitored at 6 localities (28.4. – 5.5.2010)

	Stopping at the red light		Passing on the red light		Σ measured vehicles
Passage of an intersection	318 128	99.90%	321	0,10%	318 449

Table C2.5.3: Speed measurements realised by the CIVITAS team in Ústí nad Labem (28.5. - 7.5. 2010)

	Exceeding the speed limit		Driving within the speed limit		Σ measured vehicles
non-marked localities: Vinařská, Sociální péče, Výstupní	number	%	number	%	
	42564	49,73	43029	50,27	85593

Obedience - traffic rules violation

Enumeration of the indicator on violation of traffic rules is based on data of speed measurement realised by the Municipal Police (please see the deliverable R49.1 – Safety Audit in Ústí nad Labem).

For the indicator, the data BEFORE were gathered on unmarked road sections in the city at different time periods. As a result 94,74 % of drivers were driving within the permitted speed limit.

For the state AFTER, speed measurements were realised on sections properly marked by traffic sings and warnings (such as presence of children, a dangerous section or a complicated intersection). As a result, 100% of monitored drivers were driving within the speed limit.

Comparison of BEFORE and AFTER data reveals effectiveness of enforcement of traffic regulations. Monitoring compliance with traffic restrictions with and without application of traffic signs and warnings reveals efficiency of implementing preventive safety solutions in the city.

Awareness level (no. 13)

Awareness of city residents about road safety issues and major causes and consequences of traffic accidents in the city was surveyed during public events realised in the city and by questioners on the city website.

Before data were gathered before launching the campaigns to improve safety of road users (October and November 2010 – the sample of 137 respondents). After data were gathered after the implemented public events (September 2011 – the sample of 142 respondents).

Before and after the activities realised to increase awareness about road safety issues, people in the city were asked if they prefer thorough monitoring of driving speed and strict speed limits in the city.

Their answers are presented in the following table:

	BEFORE		AFTER	
	No. of answers	Percentage	No. of answers	Percentage
Yes	55	**40,2 %**	58	**40,9 %**
Partially	63	**46,0 %**	70	**49,3 %**
No	14	**10,2 %**	14	**9,9 %**
I do not know	5	**3,7 %**	0	**0,0 %**
TOTAL ANSWERS	137	**100 %**	142	**100 %**

Acceptance level (no. 14)

Acceptance of existing traffic restrictions in the city was assessed. Behaviour of drivers was monitored to gather objective results rather than subjective opinion of road users. Speed measurements of traffic flow were performed by the Municipality employees at hidden locations on 3 road profiles in the city without any markings. According to the measurements, 50,27% of drivers were respecting the speed limit while 49,73% of drivers were driving above the speed limit.

Table C2.5.4: Results of indicators – category: society

Indicator	Before (2010)	B-a-U (-)	After (2010)	Difference: After –Before	Difference: After – B-a-U
Obedience	94,74 % of drivers obey the speed limit	-	100 % of drivers obey the speed limit		5,26 %
No. 13 – awareness level	40,15 + 45,99 = 86,14% respondents require better control of traffic restrictions		40,85 + 49,30 = 90,15 % respondents require better control of traffic restrictions		4,01 %
No.14 – acceptance level	-	-	50,27 % of drivers obey the speed limit	-	-

C2.6 Cost benefit analysis

The package includes soft measures proposed to reduce the overall number of road accidents, mainly with fatal and serious consequences. The theoretical model and economic calculations were used to evaluate their potential efficiency. CBA analysis is recommended to assess countermeasures proposed at certain black spot locations comparing the estimated costs needed for the implementation and maintenance of the measure with potential generated savings. Expected benefit-cost ratio (BCR) of such actions is expected in the range of 1.2 – 2.0.

Costs include not only the new installations, safety improvements and better control of compliance with traffic restrictions, but also costs for intensive safety behaviour campaigns.

Criteria applicable in the CBA evaluation and the following:

- capital costs – initial investments must be concerned with several black spots treatments, such as installation of barriers, improvements and reconstructions of intersections, facilities for vulnerable road users, lightning, new traffic signs and traffic light devices
- operational costs – costs calculated for operation and maintenance of proposed treatments, such as traffic signalization, seasonal road surface maintenance, repair works
- number of accidents – based on solutions proposed for different black spots, potential operational revenues and economic return in traffic related accidents was calculated and evaluated against the costs of individual treatments (including life costs, accident costs of different accident types and others)

Based on the project life of proposed countermeasures, respective increase / decrease in traffic volumes and traffic accidents was taken into account, based on traffic modelling prognoses and official accident statistics available on the annual basis. Vast experience in road-safety-oriented research projects realized in the past show strong economic potential of safety upgrading by low-cost treatments on a large scale giving savings in accident costs of up to 4 Euros on every 1 Euro reasonably invested. Specific economic returns of both individual treatments and their possible combinations were analysed.

Values of basic economic indicators were recommended within the CIVITAS project (higher priority) or were approved by the Czech government, specifically average economical loss from the accident per accident type and road category, cost of life loss etc.

These steps were followed:

1. Step one – appraisal case – do something, compared to do nothing, do minimum or BaU.

   In this step the active scenario was defined as a proposal of complex safety measures, their investment costs, operational costs, income, other benefits.

   Possible benefits for safety improvements were adopted from the PIARC Good Practice Guidelines, where rate of return was mentioned.

2. Step two – determination of the project life from technical, market and economic criteria;

Expected project life is proposed to be 10 years, which is common project life for safety measures. Standard CBA methodology for project assessment was applied on investment, operation and maintenance costs and social benefits resulting from lowering the accident rate. Number of accidents was calculated from the accident rate and traffic volumes, generated by the traffic model of the city.

3. Step three – determination of the key impacts of the project;

   Key impacts are safer behaviour of drivers and other road users, and lower number of accidents and reduction of their consequences. Higher respect to traffic restrictions decrease seriousness of accidents, especially with participation of vulnerable road users.

4. Step four – determination of the main parties affected by the project;

   Improvements are aimed at all road users, especially vulnerable road users, such as children.

C2.6.1 Evaluation period for CBA

- The time period for the CBA was set to 15 years (2011 – 2025)
- The price level used for calculations is from the year 2010.
- The exchange rate used for CBA calculations is 26 CZK / EUR
- Derivation of values from $€_{2002}$ to $€_{2010}$ values:
  - The exchange rate for calculations from $€_{2002}$ to CZK_{2002} was 30,56 CZK/EUR
  - The inflation between the years 2002 and 2010 was 21,12%
  - The exchange rate for calculations from CZK_{2010} to $€_{2010}$ was 26 CZK/EUR ($\rightarrow €_{2010} = 1{,}42 \cdot €_{2002}$)

The values used for CBA calculations were the recommended values taken from the CBA Recommendations for CIVITAS Evaluation and values common for economic assessment of efficiency of transport structures and investments in the environment of the Czech Republic (ČSHS – data calibrated for the Czech Republic).

C2.6.2 Method and values for moefication

For CBA calculations, 10 localities (mainly intersections) with frequently occurring traffic accidents were selected, based on results of the task 11.5.3 Safety Audit. Specific solutions for road safety improvements at these localities were developed. The overview of proposed solutions is listed below:

- Intersection U Vlečky x Textilní x Průmyslová
  - vertical traffic signs with reflective background
  - horizontal traffic signs - a line marked with the STOP sign (V6b) and complementary signs (TP 133)
  - pedestrian crossing
  - optical narrowing of driving lanes (guiding stripes)
- Intersection Masarykova x Brněnská x Pařížská
  - vertical traffic signs with reflective background
  - highlighted horizontal traffic signs
  - traffic light devices
- Intersection Opletalova x Opletalova
  - raised traffic islands (sewers)
  - vertical traffic signs with reflective background
  - horizontal traffic signs (V 6b)
  - information radars
- Roundabout Na Rondelu
  - change of the intersection to the roundabout
  - horizontal traffic signs
  - dividing concrete belts to separate bypasses
  - large-screen information tables at the entrances
  - vertical traffic signs with reflective background
  - surface paint coat (www.rocbinda.cz) highlighting the pedestrian crossing
- Intersection Božtěšická x Vinařská
  - vertical traffic signs with reflective background
  - horizontal traffic signs – the right of way (V 6a)
  - traffic islands
  - traffic light devices
- Intersection Havířská x entrance to Tesco
  - horizontal traffic signs in the street K Zahrádkám - longitudinal dashed line and solid line, lateral solid line
  - pedestrian crossing
  - vertical traffic signs with reflective background
  - traffic light devices with directional signals
- Railroad across the street Přístavní
  - horizontal traffic signs - white zigzag line (V 12e)
  - vertical traffic signs – information table (Z 3) with reflective background
- Intersection Božtěšická x Petrovická x Sociální péče
  - vertical traffic signs o reflective background
  - horizontal traffic signs - transverse solid line (the STOP line) with the right of way (V 6a)

  - horizontal traffic signs - white zigzag line (V 12e)
  - horizontal traffic signs – optical psychological brake (V 18)
  - raised traffic islands (sewers)
- Velká Hradební between the streets Bratislavská and Na Schodech
  - horizontal traffic signs – double longitudinal solid line (V01b)
  - horizontal traffic signs - white zigzag line (V 12e)
  - surface paint coat (www.rocbinda.cz) highlighting the pedestrian crossing
- Roundabout Pod Větruší
  - Changing the intersection to the turbulent type
  - horizontal traffic signs
  - large-screen information tables at the entrances

Costs for implementation of proposed solutions on these sample areas are easily comparable in terms of investments, maintenance and replacement of individual elements (of horizontal traffic signs, vertical traffic signs, traffic light devices etc.).

There are two different scenarios evaluated:

Zero variant (0)

The variant reflects the current state and assumes that there will be no solutions implemented for safety improvements. For calculation of costs and benefits, data on traffic accidents and their consequences on the sample localities are based on data about traffic accidents gathered by the Police of the Czech Republic in the period 1.1.2007 – 31.3.2010.

Active variant (A)

At selected localities with frequently occurring traffic accidents, application of road safety improvements is considered. Solutions are proposed on the basis of road safety audit performed in the city. It involves implementation of separating islands, reconstruction of route surface, replacement of traffic signs, reduction of areas with interacting traffic flows at intersections, improvements of boarding areas for PT vehicles, etc.

For duration of the CBA period, reduction of traffic accidents at these localities was assessed. Reduction of traffic accidents and their consequences was considered as average reduction of accident rate, based on statistical data of the Police of the Czech Republic from the period from 1.1.2007 to 31.3.2010 and based on real experience from operation of similar measures in the city and their effects on accidents. The CBA reflects results of the safety audit performed in the city in 2010, which helped to identify safety shortcomings. Therefore, the CBA covers only the period until this year.

Costs for operation, maintenance and replacement and reconstruction, if adequate, were calculated. Benefits resulting from reduction of traffic accidents and their consequences were calculated.

Change in time consumption of road users, as well as fuel consumption, was not considered as relevant because the proposed solutions do not have significant impacts on improvements of traffic flow. For both variants, these indicators were considered to be more or less at the same level.

C2.6.3 Life time costs and benefits

Investment costs

- Variant 0
  - No investments at any locality
  - Costs: 0 CZK / 0 €
- Variant A
  - Investments for implementing proposed road safety improvements
  - Average costs common for the Czech Republic were considered

Table C2.6.1: Capital costs in the evaluation period (not discounted)

LOCALITY	CZK	€
intersection U Vlečky x Textilní x Průmyslová	72 200,00	2 776,92
intersection Masarykova x Brněnská x Pařížská	6 054 200,00	232 853,85
intersection Opletalova x Opletalova	255 400,00	9 823,08
roundabout Na Rondelu	1 640 800,00	63 107,69
intersection Božtěšická x Vinařská	5 935 500,00	228 288,46
intersection Havířská x entrance to Tesco	287 200,00	11 046,15
railroad across the street Přístavní	23 500,00	903,85
intersection Božtěšická x Petrovická x Sociální péče	205 600,00	7 907,69
Velké Hradební between the streets Bratislavská and Dvořákova	327 800,00	12 607,69
roundabout Pod Větruší	49 000,00	1 884,62
TOTAL COSTS	14 851 200,00	571 200,00

Costs for operation, maintenance and overhauls

- Variant A
  - Costs for operation and maintenance of the 10 localities were estimated
  - Lifetime of the measures was defined as follows:
    - The existing road surface is on average 25 years old
    - Road facilities (traffic islands, direction belts, kerbs) – 50 years of lifetime
    - Traffic light devices – 10 years followed by complete replacement
    - Vertical traffic signs – 10 years followed by complete replacement
    - Horizontal traffic signs – 4 years followed by complete replacement
- Variant 0
  - Horizontal and horizontal traffic signs are in the middle of their lifetime
  - Operation of traffic light devices - 500 000 CZK/year
  - Operating costs for the entire period of CBA are presented in the following table

Table C2.6.2: Operation and maintenance cost in the evaluation period (not discounted) – variant 0

	2012		2015		2016		2020		2024		2025		TOTAL including yearly costs for operation of traffic lights	
	Improvements of vertical traffic signs		Improvements of horizontal traffic signs and traffic light devices*		Improvements of vertical traffic signs		Improvements of vertical traffic signs		Improvements of vertical traffic signs		Improvements of horizontal traffic signs and traffic light devices*			
LOCALITY	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€
U Vlečky x ul. Textilní x Průmyslová	0	0	13 200	508	0	0	0	0	0	0	13200	508	26 400	1 015
Masarykova x Brněnská x Pařížská	31 900	1 227	39 600	1 523	31 900	1 227	31 900	1 227	31 900	1 227	39600	1 523	206 800	7 954
Opletalova x Opletalova	12 200	469	9 900	381	12 200	469	12 200	469	12 200	469	9900	381	68 600	2 638
roundabout Na Rondelu	539 000	20 731	304 600	11 715	539 000	20 731	539 000	20 731	539 000	20 731	304600	11 715	2 765 200	106 354
Boženšická x Vinařská	9 800	377	16 500	635	9 800	377	9 800	377	9 800	377	16500	635	72 200	2 777
Havířská x entrance to Tesco*	533 700	20 527	6 009 900	231 150	533 700	20 527	533 700	20 527	533 700	20 527	6 009 900	231 150	18 654 600	717 485
railroad across the street Přístavní	8 800	338	0	0	8 800	338	8 800	338	8 800	338	0	0	35 200	1 354
Boženšická x Petrovická x Sociální péče	21 700	835	29 100	1 119	21 700	835	21 700	835	21 700	835	29100	1 119	145 000	5 577
Velká Hradební between Bratislavská and Dvořákova	51 700	1 988	39 600	1 523	51 700	1 988	51 700	1 988	51 700	1 988	39600	1 523	286 000	11 000
roundabout Pod Větruší	29 700	1 142	58 800	2 262	29 700	1 142	29 700	1 142	29 700	1 142	58800	2 262	236 400	9 092
TOTAL	1 238 500	47 635	6 521 200	250 815	1 238 500	47 635	1 238 500	47 635	1 238 500	47 635	6 521 200	250 815	22 496 400	865 246

* it was considered in CBA calculations that the traffic light devices are in the present state in the half of their lifetime

Measure title: Drive Safely Campaign & Road Safety Measures (11.5.3, 11.5.4, 4.15, 5.10, 5.11)

City: Ústí nad Labem **Project**: Archimedes **Measure number:** 40 & 49

Table C2.6.3: Operation and maintenance costs in the evaluation period (not discounted) – variant A

	2014		2015		2018		2020		2022		2025		TOTAL including yearly costs for operation of traffic lights	
	Improvements of horizontal traffic signs		Improvements of traffic light devices*		Improvements of traffic light devices*		Improvements of horizontal traffic signs and traffic light devices**		Improvements of horizontal traffic signs		Improvements of traffic light devices*			
LOCALITY	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€	CZK	€
U Vlečky x ul. Textilní x Průmyslová	65 200	2 508		0	65 200	2 508	13 600	523	65 200	2 508		0	209 200	8 046
Masarykova x Brněnská x Pařížská**	553 700	21 296	500 000	19 231	553 700	21 296	6 040 200	232 315	553 700	21 296	500 000	19 231	13 201 300	507 742
Opletalova x Opletalova	14 900	573		0	14 900	573	123 300	4 742	14 900	573		0	168 000	6 462
roundabout Na Rondelu	1 460 300	56 165		0	1 460 300	56 165	94 800	3 646	1 460 300	56 165		0	4 475 700	172 142
Božtěšická x Vinařská**	509 900	19 612	500 000	19 231	509 900	19 612	6 016 700	231 412	509 900	19 612	500 000	19 231	13 046 400	501 785
Havířská x entrance to Tesco*	33 700	1 296	6 000 000	230 769	33 700	1 296	10 100	388	33 700	1 296	6 000 000	230 769	16 611 200	638 892
railroad across the street Přístavní	16 500	635		0	16 500	635	7 000	269	16 500	635		0	56 500	2 173
Božtěšická x Petrovická x Sociální péče	12 200	469		0	12 200	469	26 000	1 000	12 200	469		0	62 600	2 408
Velká Hradební between Bratislavská and Dvořákova	327 800	12 608		0	327 800	12 608	39 600	1 523	327 800	12 608		0	1 023 000	39 346
roundabout Pod Větruší	60 200	2 315		0	60 200	2 315	58 800	2 262	60 200	2 315		0	239 400	9 208
TOTAL COSTS	3 054 400	117 477	7 000 000	269 231	3 054 400	117 477	12 430 100	478 081	3 054 400	117 477	7 000 000	269 231	49 093 300	1 888 204

* it was considered in CBA calculations that the traffic light devices are in the present state in the half of their life-time

** maintenance of the newly proposed traffic light devices

Costs for maintenance, operation and reconstruction works are calculated for the existing and proposed technical elements for the Variant A.

Residual value

The residual value is the positive value left at the end of the CBA period. It was calculated for each solution. The methodology used for the calculations is the methodology of traffic economic model HDM-4.

$$S_V = \frac{\max\{0; W_L - (Y - y^*)\}}{W_L} \cdot UNDISCST$$

S_V = the residual value of a structure

W_L = lifetime in years

Y = the last year of the analysis

y* = the year of initiating operation of a structure

UNDISCST = un-discounted economic costs

Table C2.6.4: Calculation of the residual value for the Variant 0

	PRICE		Last year of maintenance	Lifespan	S_v [€]
	CZK	€			
existing road surface at the end of its lifetime	0	0	0	25	0
existing physical road facilities (kerbs, traffic islands) at the end of their lifetime	0	0	0	50	0
of vertical traffic signs	521 200	20 046	2025	10	20 046
traffic signs	738 500	28 404	2024	4	21 303
traffic light devices*	6 000 000	230 769	2025	10	230 769
				TOTAL	272 118

Table C2.6.5: Calculation of the residual value for the Variant A

	PRICE		Last year of maintenance	Lifespan	S_v [€]
	CZK	€			
existing road surface at the end of its lifetime	0	0	0	50	0
existing physical road facilities (kerbs, traffic islands) at the end of their lifetime	723 750	27 837	2011	50	20 042
of vertical traffic signs	430 100	16 542	2020	10	8 271
traffic signs	2 054 400	79 015	2022	4	19 754
traffic light devices* (locality at Havířská)	6 000 000	230 769	2025	10	230 769
traffic light devices** (locality at Masarykova x Brněnská x Pařížská, Božtěšická x Vinařská)	12 000 000	461 538	2020	10	230 769
				TOTAL	509 606

Savings from reduction of accidents

Operating costs of users, time consumption and time savings, noise level and other environmental indicators are considered to be at the same level for both variants (zero and active). Proposed measures are aimed specifically at improving road safety. Analysis of economic efficiency of the proposed measures does not assess these criteria.

Benefits of proposed solutions are calculated as social benefits resulting from reduction of traffic accidents.

Table C2.6.6: Recommended values for casualties of traffic accidents

	Fatality	Severe injury	Light injury	Damage only
Country	(€2002 PPP, factor prices)			44 000 CZK
Czech Republic	932 000	125 200	9 100	Source: HDM-4
	(€2010 PPP, conversion factor prices)			
Czech Republic	1 323 440	177 784	12 922	1 692

Source: CBA Recommendations for CIVITAS Evaluation, J. Piao, J. Preston

Variant 0

The amount of traffic accidents and their consequences for the Variant 0 is based on statistical data of the Police of the Czech Republic. The values are average annual traffic accidents and consequences from the period 1.1.2007 – 31.3.2010. Every year, the amount of traffic accidents increases in direct correlation to the growth of motorisation in the Czech Republic. The rate of traffic growth for the CBA evaluation period is, according to the traffic model, on average 5,79% per year. The following table present values calculated for the initial year of CBA (the year 2011).

Table C2.6.6: Savings resulting from reduction of traffic accidents in the evaluation period (not discounted) – variant 0

	Traffic accidents and their consequences per year				Damage caused by traffic accidents [€ / year]
LOCALITY	No. of accidents	No. of killed people	No. of seriously injured	No. of lightly injured	
U Vlečky x Textilní x Průmyslová	8,62	0	0	5,23	82 167,10
Masarykova x Brněnská x Pařížská	8,31	0,31	0,31	1,54	499 339,84
intersection Opletalova x Opletalova	6,15	0	0,31	1,23	81 412,90
intersection Na Rondelu	12,92	0	0	3,08	61 660,40
Intersection Božtěšická x Vinařská	8,31	0	0,62	2,15	152 068,90
Intersection Havířská x entrance to Tesco	7,38	0	0,31	3,38	111 276,36
railroad across the street Přístavní	5,85	0	0,31	1,23	80 905,30
intersection Božtěšická x Petrovická x Sociální péče	8,31	0	0,92	2,15	205 404,10
Velká Hradební mezi ulicemi Bratislavská a Dvořákova	23,08	0	0,62	2,46	181 065,56
roundabout Pod Větruší	33,23	0	0	0,31	60 230,98
TOTAL	122,16	0,31	3,4	22,76	1 515 531,44

Variant A

The Active Variant considers reduction of traffic accidents and their consequences as a result of implementing the proposed road safety improvements. The reduction was calculated and the results are presented in the following table.

Table C2.6.7: Savings from accident reductions in the evaluation period (not discounted) – variant A: Traffic accidents and their consequences per year

LOCALITY	Reduction [%]	Reduced no. of accidents	reduction [%]	Reduced no. of killed people	reduction [%]	Reduced no. of seriously injured	reduction [%]	Reduced no. of lightly injured	Damage caused by traffic accidents [€ / year]
U Vlečky x Textilní x Průmyslová	-45%	4,74	-57%	0,00	-57%	0,00	-57%	2,25	37 082,06
Masarykova x Brněnská x Pařížská	-35%	5,40	-30%	0,22	-30%	0,22	-30%	1,08	348 834,86
Opletalova x Opletalova	-18%	5,04	-17%	0,00	-17%	0,26	-17%	1,02	67 468,65
Na Rondelu	-36%	8,27	-66%	0,00	-46%	0,00	-46%	1,66	35 482,68
Boženěšická x Vinařská	-15%	7,06	-15%	0,00	-15%	0,53	-15%	1,83	129 258,57
Havířská x entrance to Tesco	-58%	3,10	-58%	0,00	-58%	0,13	-58%	1,42	46 736,07
Railroad across the street Přístavní	-19%	4,74	-43%	0,00	-43%	0,18	-43%	0,70	48 491,59
Boženěšická x Petrovická x Sociální péče	-18%	6,81	-17%	0,00	-17%	0,76	-17%	1,78	170 344,80
Velká Hradební between the streets Bratislavská a Dvořákova	-19%	18,69	-30%	0,00	-30%	0,43	-30%	1,72	131 041,54
Pod Větruší	-36%	21,27	-66%	0,00	-46%	0,00	-46%	0,17	38 147,25
TOTAL		85,1321		0,217		2,5058		13,6331	1 052 888,06

C2.6.4 Lifetime costs and benefits

For the CBA, investment and operating costs were calculated. Benefits of the Variant A compared to the Variant 0 were presented:

- Positive value – benefit
- Negative value – cost

Discounted costs are presented in two forms of outputs:

- Tables presented in more details, used for evaluation calculations (version I)
- Tables presented in the recommended templates for MERTs (version II)

Table C2.6.4.1: Lifetime costs of proposed measures (discounted) – version I

(in €)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital cost	variant 0	0														
	variant A	571 200														
Operating and maintenance cost	variant 0	19 231	47 635	19 231	19 231	250 815	47 635	19 231	19 231	19 231	47 635	19 231	19 231	19 231	47 635	250 815
	variant A	57 693	57 693	57 693	117 477	269 231	57 693	57 693	117 477	57 693	478 081	57 693	117 477	57 693	57 693	269 231
Residual value	variant 0															272 118
	variant A															509 606
Total	variant 0	19 231	47 635	19 231	19 231	250 815	47 635	19 231	19 231	19 231	47 635	19 231	19 231	19 231	47 635	250 815
	variant A	628 893	57 693	57 693	117 477	269 231	57 693	57 693	117 477	57 693	478 081	57 693	117 477	57 693	57 693	269 231
Differences	A - 0	609 662	10 058	38 462	98 246	18 416	10 058	38 462	98 246	38 462	430 446	38 462	98 246	38 462	10 058	18 416

*Within CIVITAS ARCHIMEDES, the discount rate for Ústí nad Labem was recommended to be 5,5 %.

Foreseen benefits of the active variant were enumerated.

- Positive value – benefit
- Negative value – cost

Table C2.6.4.2 - Lifetime benefits (in €) of CIVITAS measure (discounted) – version I

(in €)			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Revenue		variant 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		variant A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		difference	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
External cost / benefit	Costs of traffic accidents	variant 0	1 515 531	1 603 281	1 696 111	1 794 315	1 898 206	2 008 112	2 124 382	2 247 384	2 377 507	2 515 165	2 660 793	2 814 853	2 977 833	3 150 250	3 332 649
		variant A	1 052 888	1 113 850	1 178 342	1 246 568	1 318 745	1 395 100	1 475 876	1 561 329	1 651 730	1 747 365	1 848 538	1 955 568	2 068 796	2 188 579	2 315 298
		difference A – 0	462 643	489 430	517 768	547 747	579 462	613 013	648 506	686 055	725 777	767 800	812 255	859 285	909 037	961 671	1 017 351
Differences in total benefits (€)		A – 0	462 643	489 430	517 768	547 747	579 462	613 013	648 506	686 055	725 777	767 800	812 255	859 285	909 037	961 671	1 017 351

*Within CIVITAS ARCHIMEDES, the discount rate for Ústí nad Labem was recommended to be 5,5 %.

Table C2.6.4.3 - Lifetime cost/benefits (in €) of CIVITAS measure (discounted), variant 0 – version II

	Capital cost	Operation cost	Maintenance cost	Other cost (salvage / residual value)	Revenue	Savings from accident reductions	Savings from Journey time savings	Savings from reductions of environmental emissions	Total cost	Total Benefit	Cumulated cost
Year 1	0	19 231		0	0	0			19 231	0	-19 231
Year 2	0	47 635		0	0	0			47 635	0	-47 635
Year 3	0	19 231		0	0	0			19 231	0	-19 231
Year 4	0	19 231		0	0	0			19 231	0	-19 231
Year 5	0	250 815		0	0	0			250 815	0	-250 815
Year 6	0	47 635		0	0	0			47 635	0	-47 635
Year 7	0	19 231		0	0	0			19 231	0	-19 231
Year 8	0	19 231		0	0	0			19 231	0	-19 231
Year 9	0	19 231		0	0	0			19 231	0	-19 231
Year 10	0	47 635		0	0	0			47 635	0	-47 635
Year 11	0	19 231		0	0	0			19 231	0	-19 231
Year 12	0	19 231		0	0	0			19 231	0	-19 231
Year 13	0	19 231		0	0	0			19 231	0	-19 231
Year 14	0	47 635		0	0	0			47 635	0	-47 635
Year 15	0	250 815		-272 118	0	0			-21 303	0	21 303
Total	0	865 249		-272 118	0	0			593 131	0	-593 131

Table C2.6.4.4 - Lifetime cost/benefits (in €) of CIVITAS measure (discounted), variant A – version II

	Capital cost	Operation cost	Maintenance cost	Other cost (salvage / residual value)	Revenue	Savings from accident reductions	Savings from Journey time savings	Savings from reductions of environmental emissions	Total cost	Total Benefit	Cumulated cost
Year 1	571 200		57 693	0	0	462 643			628 893	462 643	-166 250
Year 2	0		57 693	0	0	489 430			57 693	489 430	431 737
Year 3	0		57 693	0	0	517 768			57 693	517 768	460 075
Year 4	0		117 477	0	0	547 747			117 477	547 747	430 270
Year 5	0		269 231	0	0	579 462			269 231	579 462	310 231
Year 6	0		57 693	0	0	613 013			57 693	613 013	555 320
Year 7	0		57 693	0	0	648 506			57 693	648 506	590 813
Year 8	0		117 477	0	0	686 055			117 477	686 055	568 578
Year 9	0		57 693	0	0	725 777			57 693	725 777	668 084
Year 10	0		478 081	0	0	767 800			478 081	767 800	289 719
Year 11	0		57 693	0	0	812 255			57 693	812 255	754 562
Year 12	0		117 477	0	0	859 285			117 477	859 285	741 808
Year 13	0		57 693	0	0	909 037			57 693	909 037	851 344
Year 14	0		57 693	0	0	961 671			57 693	961 671	903 978
Year 15	0		269 231	509 606	0	1 017 351			778 837	1 017 351	238 514
Total	571 200		1 888 211	509 606	0	10 597 800			2 969 017	10 597 800	7 628 783

Measure title: Drive Safely Campaign & Road Safety Measures (11.5.3, 11.5.4, 4.15, 5.10, 5.11)

City: Ústí nad Labem **Project**: Archimedes **Measure number:** 40 & 49

Table C2.6.4.5 - Calculation of NPV (discounted)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Undiscounted cash flow															
Changes in total cost (€)	609 662	10 058	38 462	98 246	18 416	10 058	38 462	98 246	38 462	430 446	38 462	98 246	38 462	10 058	18 416
Changes in total benefit (€)	462 643	489 430	517 768	547 747	579 462	613 013	648 506	686 055	725 777	767 800	812 255	859 285	909 037	961 671	1 017 351
Net cash flow (€)	-147 019	479 372	479 306	449 501	561 046	602 955	610 044	587 809	687 315	337 354	773 793	761 039	870 575	951 613	998 935
Discount Factors															
Discount Rate	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%	5,5%
Base Year	2011														
Discounted cash flow															
Changes in total cost (€)	609 662	9 534	34 556	83 668	14 866	7 696	27 894	67 538	25 062	265 856	22 517	54 518	20 230	5 015	8 703
Changes in total benefit (€)	462 643	463 915	465 190	466 469	467 751	469 037	470 326	471 619	472 916	474 216	475 519	476 826	478 137	479 451	480 769
Net cash flow (€)	-147 019	454 381	430 634	382 801	452 886	461 341	442 432	404 081	447 854	208 359	453 002	422 308	457 907	474 437	472 066
Cumulative cash flow (€)	-147 019	307 363	737 997	1 120 798	1 573 684	2 035 025	2 477 457	2 881 538	3 329 392	3 537 752	3 990 754	4 413 062	4 870 969	5 345 406	5 817 472

Changes in NPV (€)	5 817 472
Internal Rate of Return IRR	326,0%
Benefit Cost Ratio BCR	10,542

*Within CIVITAS ARCHIMEDES, the discount rate for Ústí nad Labem was recommended to be 5,5 %.

Finally, calculation of net present values was realised.

- NPV = 5 817 472 €
- IRR = 326 %
- BRC = 10,542

C2.6.5 Summary of CBA results

The proposed road safety improvements present economic benefits resulting from reduction of traffic accidents and their consequences.

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
2a	Operating costs, BCR 1.2 – 2.0	***
2b	Capital costs, BCR 1.2 – 2.0	***
13	Awareness level increased by 25 % (about 90 % of respondents is aware about road safety issues)	***
14	Acceptance level increased by 25 % (about half of the respondents follows the traffic restrictions)	***
20	Reduction by 40% of injuries and deaths caused by traffic accidents	O
	Reduction by 15 % of violation of traffic rules	O
	45 km of road sections inspected	***
	15 black-spot places identified	***
	Shortcomings identified at 10 sample localities with frequently occurring	***
NA = Not Assessed **O = Not Achieved** *** = Substantially achieved (at least 50%)** **** = Achieved in full** ***** = Exceeded**		

C4 Up-scaling of results

Solutions developed to increase road safety in the city were targeted for the entire city territory.

However, only the most critical locations in the city (primarily the main intersections in the city centre) were assessed within measure evaluation. Other localities, where traffic accidents occur, are suitable for up-scaling.

Safety inspections should be gradually performed on the entire road network of the city and should be periodically repeated. Consequently, based on the defined methodology, safety improvements should be applied in accordance with results of these inspections.

Within the measure, safety improvements for schools in the city were designed. The solutions are suitable for up-scaling to other public areas, especially with frequent flow of children and other vulnerable road users.

Public events and training activities encouraging safe driving and safe behaviour of road users, and increasing awareness about road safety issues and causes and consequences of traffic accidents should be also launched repeatedly to strengthen desired effects.

C5 Appraisal of evaluation approach

Due to the fact, that the package of road safety measures involves diverse solutions, there were several methods used for measure evaluation.

CBA was used to assess economy efficiency of technical solutions aimed at reduction of traffic accidents and their consequences. The analysis was realised on the sample of the most critical locations with frequent traffic accidents.

Other evaluation indicators were assess based on data from measurements of traffic characteristics and from data gathered by the Municipality, by the Municipal Police and the Police of the Czech Republic and based on statistical data.

Indicators related to society were assessed through questioners distributed to road users during public events realised within the project, through local media and the city website.

C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – traffic calming solutions proposed within the measure present significant potential for improvements of safety level on the city road network
- **Key result 2** – large amount of safety deficits was identified during safety inspections and safety improvements for localities with frequent road accidents were developed
- **Key result 3** - safety improvements for schools were proposed, providing improved safety primarily for local children
- **Key result 4** - recommendations were included in the action plan for future implementation within the SUTP of Ústí nad Labem
- **Key result 5** – campaign activities raised awareness about road safety issues and about causes and consequences of traffic accidents and helped to improve behaviour of road users
- **Key result 6** – traffic training of children became regular part of education of all primary children in the city and is available to all potential stakeholders in the city
- **Key result 7** – website dedicated to road safety in the city was launched, providing an interactive map with safety warnings and other useful information about local road safety issues

C7 Future activities relating to the measure

Solutions for road safety improvements developed within the measure should be gradually implemented according to the action plan included in the SUTP of Ústí nad Labem.

Road safety inspections should be repeatedly performed on the entire city road network and resulting solutions should be applied. Traffic calming solutions should have priority for implementation as they encourage development of public transport services and non-motorised transport modes, and contribute to improved living environment for people in the city.

Traffic education of individual groups of road users should continue and safe and sustainable behaviour should be continuously encouraged.

D Process Evaluation Findings

D.0 Focused measure

	0	No focussed measure
9*	1	Most important reason
2*	2	Second most important reason
2*	3	Third most important reason

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

D.1 Deviations from the original plan

- **Deviation 1** – There were some adjustments of the time schedule for implementation of public events required in order to launch the campaigns in the most attractive and effective way for the end users. All the measure activates were successfully finished.

D.2 Barriers and drivers

D.2.1 Barriers

Preparation phase

- **Barrier 1 (political)** – Lack of political will of city authorities for unpopular driver-restricting measures, not enforceable by law
- **Barrier 4 (problem related)** – Large amount of data influencing road safety and occurrence of traffic accidents needed to be taken into consideration, collected and processed
- **Barrier 11 (spatial) -** Only the most critical road sections and locations in the city were analysed for safety improvements, not possible to perform safety inspections on the entire road network and provide specific solutions for each locality within the measure

Implementation phase

- **Barrier 8 (organisational)** – Difficult to carry through traffic calming solutions on busy roads in the city.
- **Barrier 5 (communication) –** Implementation of the campaign to raise awareness about road safety issues was aimed at all road users in the city and required wide scale of activities

Operation phase

- **Barrier 10 (technological)** – Operation of the website dedicated to road safety was demanding in terms of processing diverse road safety data and providing interactive maps with safety

D.2.2 Drivers

Preparation phase

- **Driver 1 (strategic)** – reduction of traffic accidents and improvements of safety of all road users is an essential issue, which needs to be addressed
- **Driver 7 (planning)** – experienced road safety auditors involved in measure development

Implementation phase

- **Driver 4 (problem related) –** pressure of the problem causes priority for implementation of safety improvements
- **Driver 8 (organisational) –** the measure revealed possibilities for low-cost solutions which, without large demands, bring significant improvements of the current state

Operation phase

- **Driver 5 (involvement)** – campaign activities were well accepted by city residents due to the importance and urgency of the addressed matter of safety improvements

D.2.3 Activities

Preparation phase

- **Activities 8 (organisational)** – intensive cooperation with involved partners, primarily the Municipal Police and the Police of the Czech Republic, in order to collect and process all relevant data from traffic accidents, providing reliable results and developing effective solutions for road safety improvements
- **Activities 10 (technological)** - speed measurements were realised by different measure partners and by different detecting methods to gain reliable results
- **Activities 7 (planning)** – cooperation with school directors on developing road safety improvements for school facilities and children commuting to these schools
- **Activities 7 (planning)** – data from campaigns aimed at road safety improvements realised in the past in the Czech Republic and abroad were analysed to gather best practise and improve effectiveness

Implementation phase

- **Activities 8 (organisational)** – safety inspections performed by experienced safety auditors on the most critical localities in the city, providing essential data about safety requirements and recommendations for recovery of shortcomings

Operation phase

- **Activities (technological)** – skilled IT experts involved in operation of the website providing valuable data about road safety issues and safety warnings through the interactive map of the city
- **Activities (involvement)** – Wide range of diverse activities realised within the campaign for road safety improvements in order to address various target groups

D.3 Participation

D.3.1. Measure Partners

- **Usti nad Labem Municipality –** development and implementation of measures
- **Municipal Police –** data gathering on road safety accidents, cooperation on traffic education
- **Police of the Czech Republic** – cooperation on road safety events for the public to encourage safe behaviour of road users
- **Units of the Integrated Rescue System –** cooperation on road safety events for public to raise awareness about safety issues
- **Public Transport Company of Ústí nad Labem –** cooperation on improvements for safe behaviour of PT users
- **City Plan Co. –** private transport engineering and consulting company subcontracted for expertise on safety audits and inspections, and development of safety actions

D.3.2 Stakeholders

- **Drivers**
- **Pedestrians**
- **Vulnerable road users**
- **PT users**

D.4 Recommendations

D.4.1 Recommendations: measure replication

- **Recommendation 1 –** accompany restrictions for drivers with an efficient explanatory public campaign
- **Recommendation 2** – repeat periodically activities raising awareness about road safety issues and encouraging safer behaviour of all road users
- **Recommendation** – repeat safety audits and perform safety inspections gradually at localities with frequent traffic accidents in order to develop suitable road safety improvements

D.4.2 Recommendations: process

- **Recommendation 1 –** develop specific activities targeted at specific road users, with their unique needs and habits
- **Recommendation 2** – assign priorities for implementation of individual solutions for road safety improvements based on their efficiency and proportion of their costs and benefits
- **Recommendation 3** – gather experience and best practise from effective road safety solutions, include training of personnel and experienced safety auditors if possible