Co-financed project CB 241
"Advanced traffic management on the E67 transport corridor" (SMART E67) under INTERREG Central Baltic Sea Region Programme 2014-2020

Study on the effectiveness and on the improvements of the Central Baltic transport Project „Smart E67"

Ex-Ante and Ex-Post evaluation

Part I

2016

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Ex-Ante and Ex-Post evaluation, Part I

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Contract	signed on June 30, 2016	
Report date	August 30, 2016	
Report no	ERC/12/2016	
Keywords	Traffic safety, travel time, accidents, emissions, E67 Via Baltica, performance measurement, ITS	
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FOREWORD

SMART E67 project aims to increase the efficiency and safety of passenger and cargo mobility in the Central Baltic region. The project will introduce elements of Intelligent Transport System (ITS) adding information and communication technology to E67 transport corridor – a key transport corridor in Estonia and Latvia (North-South direction) covering 202 km in Latvia and 192 km in Estonia.

The overall objective of this study is to evaluate the project “Smart E67” performance results, to measure the before situation and to investigate possible changes after implementation of new technological ITS measures, 8 in Latvia and 6 in Estonia (adaptive traffic management-roadside variable message signs (VMS), road weather information systems (RWIS), etc).

The list of performance results are: travel time savings, accidents cost savings from improved traffic safety and reduction of vehicle emissions due to the smoother traffic conditions.

The specific objectives of this study are:

- to carry out an Ex-Ante and Ex-Post evaluation of the project Smart E67 actions;
- to find the main impacts of its deliverables to traffic efficiency, road safety and vehicle emission;
- to find suitable methodological approach to carry out abovementioned evaluations, based on existing data delivered by the Client or reachable from open data sources.

By providing to traffic participants on E67 Via Baltica route timely, efficient and accurate traffic information with ITS equipment installed under Smart E67 project, it is expected to gain the decrease of total travel time of passengers and cargos by 0,57% if compared to the current travel time in E67 Via Baltica route sections in Estonia and Latvia. The project will foster safety of passenger and cargo transport and diminish CO2 emissions due to timesavings of transport on road. Introduction of ITS on E67 is the most feasible option to improve the efficiency of passenger and cargo transport in this corridor besides investment intensive infrastructure improvements.

CONTENTS

INTRODUCTION

The study on the effectiveness and on the improvement of the Central Baltic transport project „Smart 67“ is divided into two parts – Ex-Ante evaluation is carried out in summer 2016 and Ex-Post evaluation will be carried out in summer/autumn 2018 after all new ITS applications are in use and effective.

In order to carry out Ex-Ante and Ex-Post evaluations of „Smart 67“ Project, the Consultant selected a suitable analysis methodology and presented it to the Client on 27.06.2016. The methodology is also suitable to carry out Ex-Post evaluation in 2018. The analysis methodology is based on the classical principle of cost/benefit calculation and a more detailed description is presented in Part I Ex-Ante report Chapter 1. HDM-4 reports are presented in Appendix 5 and 6.

The key performance indicators of the project which will be measured are travel time, traffic safety and CO2 emissions. A detailed performance data listing was clarified with customer interviews and correspondence. The interviews took place in Tallinn (09.05.2016, 03.06.2016 and 27.06.2016), in Riga (9th of June 09.06.2016) and during a Skype meeting (25.06.2016). Meeting memos are presented in Appendix 1.

Information about traffic volume, speed, direction and classification data was available from the Client and the analysis was done by the Consultant in August 2016.

In order to measure travel time in the project’s area E67 Via Baltica, the Consultant divided the route into appropriate road sections and those were confirmed by the Client during the meetings. The project’s route description is presented in Part I Ex-Ante report Chapter 2. The project’s actions’ descriptions will be added in Part II (2018) Ex-Post report.

Waze users travel time and speed data collection started on 21.07.2016. During the preparation of the Part I Ex-Ante report data from period 21.07.2016 – 25.08.2016 was delivered to the Consultant for analysis.

In order to attain detailed knowledge of the examined subject, the Consultant made several in-site car trips in full length of the project area on road E67. The in-site car trips’ travelling times are compared to Waze users’ travel time data.

Information about Estonian traffic accidents data is gathered from the Estonian Road Data Bank and Latvian traffic accidents from the Client. Analysis of present traffic accidents, fatalities, injuries and traffic safety indicators is done by the Consultant. Input data of traffic safety and evaluation of traffic safety level are described in Chapter 5.

Description of the methodology of measuring and analysing vehicle emissions is presented in Part I Ex-Ante report Chapter 6.

1. METHODOLOGY OF THE ANALYSIS

Methodology for current Ex-Ante and Ex-Post analyses is based on the classical principle of cost/benefit calculation. For the study, HDM-4 has been used as the accepted and internationally widely used Highway Development and Management tool. Software has been calibrated for Estonian conditions, and local traffic and vehicle fleet specifications are specified. The calibration of HDM-4 for Latvian conditions is still in the planning stage and therefore the HDM-4 calibration setup for Latvian conditions was not available for this analysis. Though there might be some minor differences in traffic flow and traffic fleet between Estonia and Latvia, it will not have, based on the Consultant’s estimation, a significant impact on the current study results.

The analytical framework of the analyses is based on the concept of life cycle analysis of the made investments. Investments’ (installed ITS devices) life time is estimated to be 10 years. During that time the changes in following effects are predicted:

- Road user effects (travel time);
- Road safety effects (accidents);
- Socio-economic and environmental effects (vehicle emissions, energy consumption, traffic noise and other welfare benefits to the population served by the road).

Impact of the road investments (ITS devices) are determined by comparing the total cost streams for various alternatives (installation of ITS devices) against the base case (current situation without the project or do minimum) alternative. In order to make this comparison, a detailed specification of investment program is needed, together with corresponding unit costs, and projected impact to the traffic volumes and environmental conditions. There are several analyses results that can be listed as:

- Road user effects
    - Road user costs (vehicle operation, travel time and accidents)
    - Traffic flow details
    - Average travel speeds
- Environmental effects
    - Vehicle emissions and energy consumptions
- Economic analysis results
    - Discounted cash flow
    - Net Present Value (NPV)
    - Economic Internal Rate of Return (EIRR)
    - Benefit Cost Ratio (BCR)

In Ex-Ante report the current situation on major performance indicators (listed previously) will be examined and defined on the stretches of the road that is under examination (E67 Via Baltica route in Estonia and Latvia). Sections of the E67 Via Baltica route that is to be analysed are presented in Table 2.1.

Impact of the installed ITS devices to the performance indicators will be defined and included into the model for each analysed E67 Via Baltica route section in Ex-Post report to be published in autumn 2018.

2. DESCRIPTION OF THE PROJECT ROUTE

2.1. Description of E67 Via Baltica route sections

The aim of this analysis is to investigate the traffic conditions of Via Baltica, the road that goes through Estonian and Latvian territories (Chart 2.1.). In order to do that, the entire analysed route is divided into sections based on major intersection locations, annual average daily traffic volume (AADT) variation locations, and on the impact area of major cities. Road sections that do not belong under the management of Road Agencies, like urban sections and border areas, will not be included into the analysis. Data analysis of the sections can be found in Table 2.1.

Table 2.1. Analysed sections in the E67 Via Baltica route

No.	State	SEC_ID	E road	Road no	Road DIR	Start km	End km	Via Baltica km	Length, km	Start location name	End location name
0*	EST	E67(4)_1_s0	E67	4	1	0,0	13,040	0,0	13,04	Tallinn City center	Laagri
1	EST	E67(4)_1_s1	E67	4	1	13,040	27,172	13,040	14,13	Laagri	Ääsmäe
2	EST	E67(4)_1_s2	E67	4	1	27,172	64,166	27,172	36,99	Ääsmäe	Märjamaa
3	EST	E67(4)_1_s3	E67	4	1	64,166	102,710	64,166	38,54	Märjamaa	Halinga
4	EST	E67(4)_1_s4	E67	4	1	102,710	122,656	102,710	19,95	Halinga	Jänesselja
5	EST	E67(4)_1_s5	E67	4	1	122,656	141,389	122,656	18,73	Jänesselja	Uulu
6	EST	E67(4)_1_s6	E67	4	1	141,389	191,790	141,389	50,4	Uulu	Ikla (Border area)
7*	EST	E67(4)_1_s7	E67	4	1	191,790	192,250	191,790	0,46	Ikla (Border area)	State Border
8*	LAT	E67(A1)_2_s8	E67	A1	2	101,737	101,237	192,250	0,50	State Border	Ainaži (Border area)
9	LAT	E67(A1)_2_s9	E67	A1	2	101,237	89,400	192,750	11,83	Ainaži (Border area)	Salacgriva City border
10*	LAT	E67(A1)_2_s10	E67	A1	2	89,400	87,700	204,587	1,70	Salacgriva Cty section	
11	LAT	E67(A1)_2_s11	E67	A1	2	87,700	57,071	206,287	30,,62	Salacgriva City border	Jelgavkrasti (P11)
12	LAT	E67(A1)_2_s12	E67	A1	2	57,071	21,300	236,916	35,77	Jelgavkrasti (P11)	Lilaste (V101)
13	LAT	E67(A1)_2_s13	E67	A1	2	21,300	6,940	272,687	14,36	Lilaste (V101)	Adaži
14	LAT	E67(A1)_2_s14	E67	A1	2	6,940	0,0	287,047	6,94	Adaži	Ryga bypass (A4)
15	LAT	E67(A4)_1_s15	E67	A4	1	0,000	4,875	293,987	4,87	Ryga bypass (A4)	Amatnieki (P2)
16	LAT	E67(A4)_1_s16	E67	A4	1	4,875	9,355	298,862	4,48	Amatnieki (P2)	Ulupji (P4)
17	LAT	E67(A4)_1_s17	E67	A4	1	9,355	20,450	303,342	11,09	Ulupji (P4)	Saulkalne (A6)
18	LAT	E67(A6)_2_s18	E67	A6	2	22,957	17,370	314,437	5,58	Saulkalne (A4)	Salaspils (A5)
19	LAT	E67(A5)_1_s19	E67	A5	1	0,000	2,400	320,024	2,40	Salaspils (A6)	Hydropower plant
20*	LAT	E67(A5)_1_s20	E67	A5	1	2,400	2,900	322,424	0,50	Municipality section, Hydropower plant	
21	LAT	E67(A5)_1_s21	E67	A5	1	2,900	8,645	322,924	5,745	Hydropower plant	Kekava (A7)
22	LAT	E67(A7)_1_s22	E67	A7	1	19,427	44,600	328,669	25,173	Kekava (A5)	Iecava (P93)
23	LAT	E67(A7)_1_s23	E67	A7	1	44,600	65,555	353,842	20,955	Iecava (P93)	Bauska City border
24	LAT	E67(A7)_1_s24	E67	A7	1	65,555	68,600	374,797	3,05	Municipality section, Hydropower plant	
25	LAT	E67(A7)_1_s25	E67	A7	1	68,600	85,094	377,842	16,494	Bauska City border	LV border area
26*	LAT	E67(A7)_1_s26	E67	A7	1	85,094	85,594	394,336	0,50	LV border area	State Border

** - section not included into the analysis*

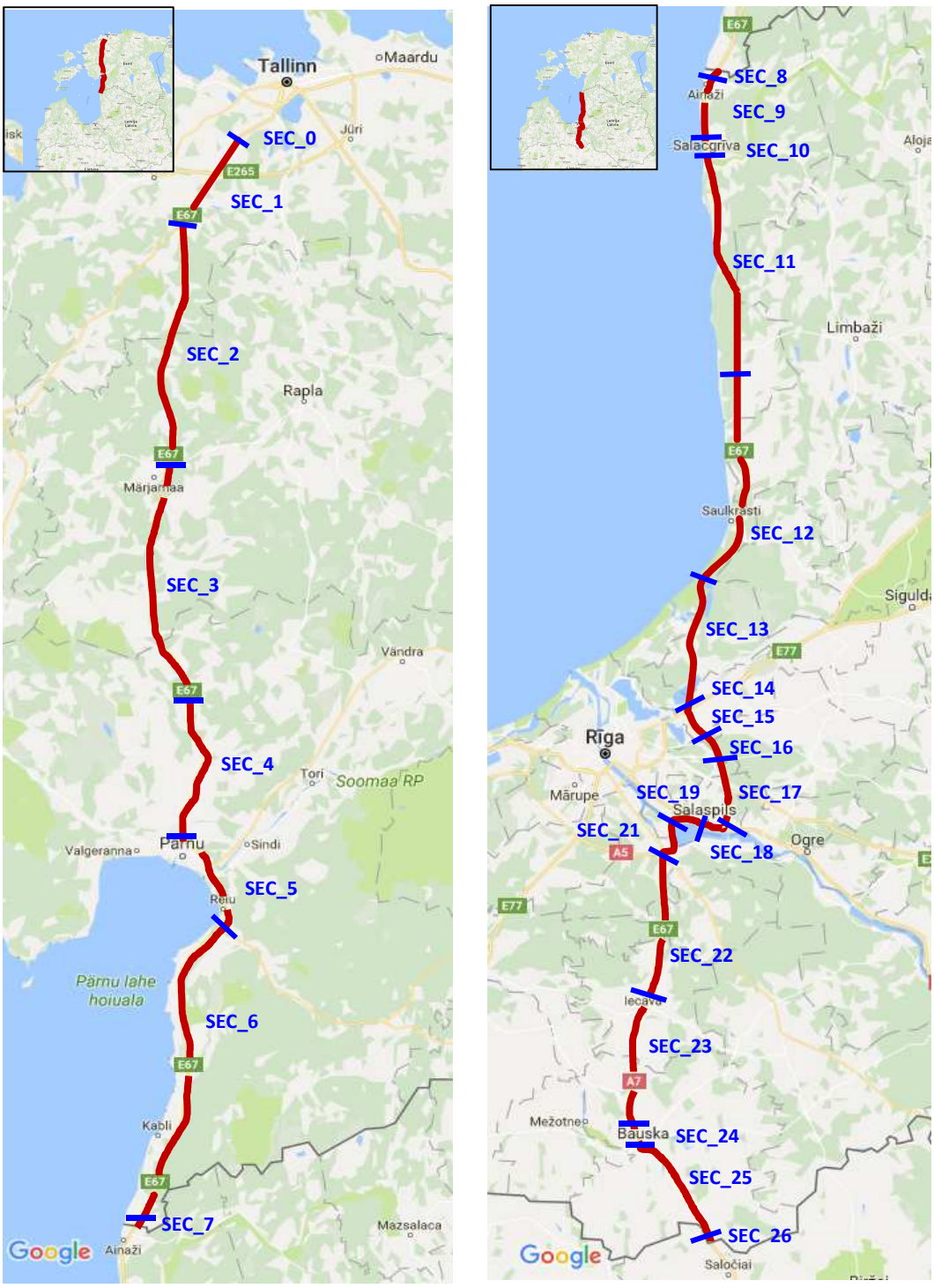


Chart 2.1. Map of E67 Via Baltica route sections in Estonia and in Latvia

2.2. Road and ITS devices locations

The list of already existing ITS devices and their locations on the Via Baltica route as of August 2016 can be found in Table 2.2.

Table 2.2. Location and description of the installed ITS device on the E67 Via Baltica route

Road no	Road DIR	Location, km	Device type	Device location name	Installation year
4	1	18,0	Road camera	Kanama	
4	1	34,1	Road camera	Metsanurga	2012
4	1	43,3	RWS	Kernu	1999
4	1	58,0	Road camera	Vaimõisa	
4	1	64,4	RWS	Märjamaa	1995
4	1	91,0	Road camera	Enge	
4	1	91,1	RWS	Enge	2000
4	1	92,6	Automated speed camera	Pallika	2010
4	2	92,9	Automated speed camera	Pallika	2010
4	1	95,2	Automated speed camera	Libatse	2015
4	2	95,2	Automated speed camera	Libatse	2015
4	1	100,5	Automated speed camera	Pärnu-Jaagupi	2010
4	2	100,9	Automated speed camera	Pärnu-Jaagupi	2010
4	1	103,0	Automated speed camera	Loomse	2010
4	1	111,3	Automated speed camera	Are	2016
4	2	111,6	Automated speed camera	Are	2016
4	1	116,7	Road camera	Räägu	2012
4	1	120,0	RWS	Nurme	2013
4	1	120,4	Automated speed camera	Nurme	2010
4	1	120,7	RWS	Nurme	1997
4	1	137,3	Automated speed camera	Reiu	2010
4	1	139,0	Road camera	Reiu	
4	2	140,9	Automated speed camera	Reiu	2010
4	1	151,0	RWS	Võiste	2013
4	1	161,5	RWS	Võiste	1999
4	1	188,7	RWS	Ikla	2002
4	1	189,0	Road camera	Ikla	
A1	1	81,7	Automated speed camera	Svētciems	
A1	1	72,3	RWS	Vitrupe	
A1	2	45,6	RWS	Dunte	
A1	2	39,2	RWS	Skulte	
A1	1	26,9	Automated speed camera	Svētciems	
A1	2	21,7	RWS	Lilaste	
A1	2	9,2	RWS	Ādaži	
A4	1	8,0	Automated speed camera	Mucenieki	
A7	2	19,2	RWS	Ķekava	
A7	1	20,3	Automated speed camera	Lielvārži	
A7	2	32,9	RWS	Bērziņi	
A7	2	52,9	RWS	Zarini	
A7	1	59,4	Automated speed camera	Code	
A7	2	82,5	RWS	Bauska	

2.3. Speed limit locations and values

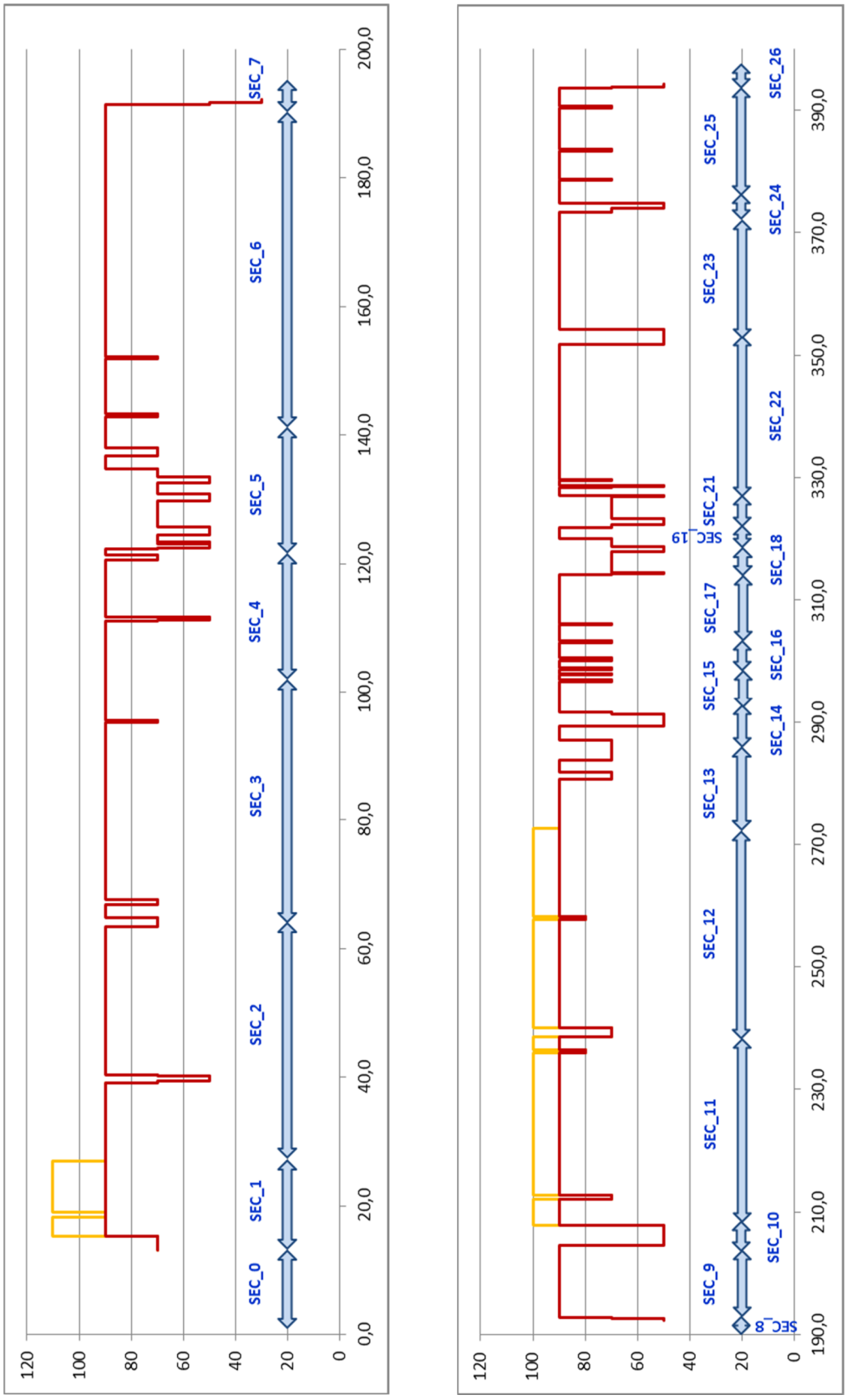


Chart 2.2. Speed limits on E67 Via Baltica route (speed limit 100 km/h and 110 km/h are in force only in summertime)

2.4. Road construction works and other constraints

Road construction and repair works affect the driving speed at road sections. The following table provides an overview of major repair works and the established speed limits that affected the traffic significantly on the analysed section of the road in 2016.

Table 2.3. Road construction works and other constraints on the E67 Via Baltica route

Road no	Start km	End km	Start date	End date	Description	Speed limit
4	15,3	18,6	14.07.2016	30.10.2016	Guardrails installation works	Variable speed limits
4	39,0	40,0	29.01.2016	29.07.2016	Pavement condition issues	50
4	39,3	40,018	13.07.2016	30.08.2016	Road construction works	70
4	95,0	95,5	22.08.2016	29.09.2016	Road lighting installation works	Variable speed limits
4	110,2	110,31	22.08.2016	15.09.2016	Intersection road construction works	70
4	133,5	134,6	22.08.2016	29.09.2016	Road lighting installation works	Variable speed limits
4	166,9	191,79	16.05.2016	30.08.2016	Road construction works	70
A1	79,4	101,36	spring 2016	August 2016	Road construction works	Variable speed limits 70 and 50 km/h
A5	0,3	2,3	spring 2016	Autumn 2017	Road construction works	Signal lights and variable speed limits
A7	68,5	85,12	spring 2016	September 2016	Road construction works	Signal lights and variable speed limits

3. TRAFFIC VOLUME

3.1. Traffic volume on E67 Via Baltica route

3.1.1. Traffic volume on E67 route Estonian sections

The average change in traffic volume over the last decade on the E67 Via Baltica route's Estonian section (road no 4 Tallinn-Pärnu-Ikla) can be found on Charts 3.1 and 3.2. Over the past five years, the traffic volume has increased steadily and now exceeds the so-called economic boom traffic volume values. However, particular attention must be paid to the growth of articulated trucks in recent years – traffic volume of articulated trucks has increased by over 60% compared to the year 2005.

Abbreviations shown on the chart:

- AADT – annual average daily traffic;
- SAPA – light vehicles: passenger cars and vans (vehicle length < 6 m);
- VAAB –buses, light and medium trucks (vehicle length 6-12 m);
- AR – heavy trucks, articulated trucks (vehicle length > 12 m).

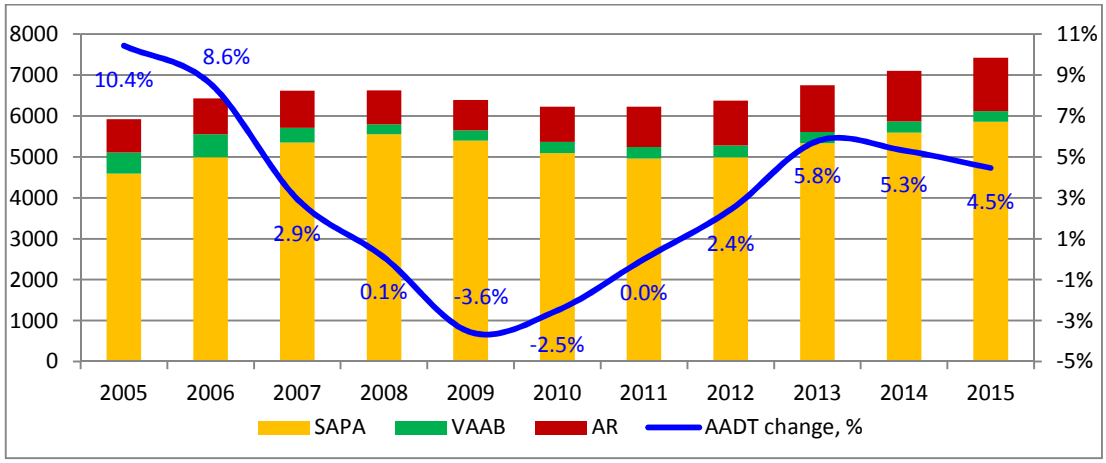


Chart 3.1. Traffic volume trend on E67 Via Baltica Estonian sections 2005-2015

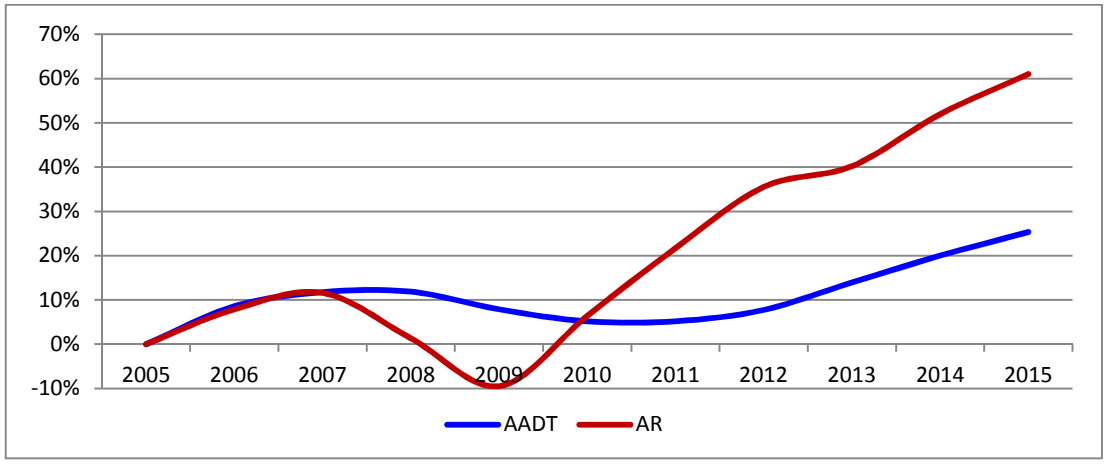


Chart 3.2. Annual average daily traffic and trucks volume trends 2005-2015 on E67 Via Baltica Estonian sections

Table 3.1. Annual average daily traffic 2015 in E67 Via Baltica route Estonian sections

Road no	Start km	End km	Length, km	E67 section	Traffic volume, veh/day			
					AADT	SAPA	VAAB	AR
4	0	13,0	13,0	EST_0	Tallinn city section			
4	13,0	13,7	0,6	EST_1	31345	29728	953	664
4	13,7	14,8	1,1	EST_1	27280	25900	780	600
4	14,8	18,3	3,5	EST_1	20022	19101	508	413
4	18,3	27,6	9,3	EST_1	15136	13123	464	1549
4	27,6	39,2	11,6	EST_2	7745	6345	251	1148
4	39,2	50,1	10,8	EST_2	7565	6244	243	1078
4	50,1	64,2	14,1	EST_2	7417	5819	245	1352
4	64,2	68,5	4,3	EST_3	6520	4930	240	1350
4	68,5	82,6	14,1	EST_3	6510	4948	224	1338
4	82,6	89,6	7,0	EST_3	6090	4620	260	1210
4	89,6	100,7	11,1	EST_3	7090	5510	310	1270
4	100,7	102,7	2,0	EST_3	6768	5240	285	1244
4	102,7	111,4	8,7	EST_4	7720	5977	290	1454
4	111,4	120,7	9,3	EST_4	8152	6540	302	1310
4	120,7	122,7	2,0	EST_4	8727	7134	310	1283
4	122,7	125,2	2,5	EST_5	11639	9742	410	1487
4	125,2	130,9	5,7	EST_5	10811	8696	403	1712
4	130,9	133,4	2,5	EST_5	8368	6691	181	1496
4	133,4	141,4	8,0	EST_5	9155	7271	289	1595
4	141,4	152,4	11,0	EST_6	4408	2914	167	1327
4	152,4	168,3	15,8	EST_6	3986	2557	166	1263
4	168,3	191,8	23,5	EST_6	3220	1795	114	1312
4	191,8	192,3	0,5	EST_7	Ikla state border area			

3.1.2. Traffic volume on E67 route Latvian sections

The average change in traffic volumes on Latvia’s main roads over the last decade can be found on Chart 3.3.

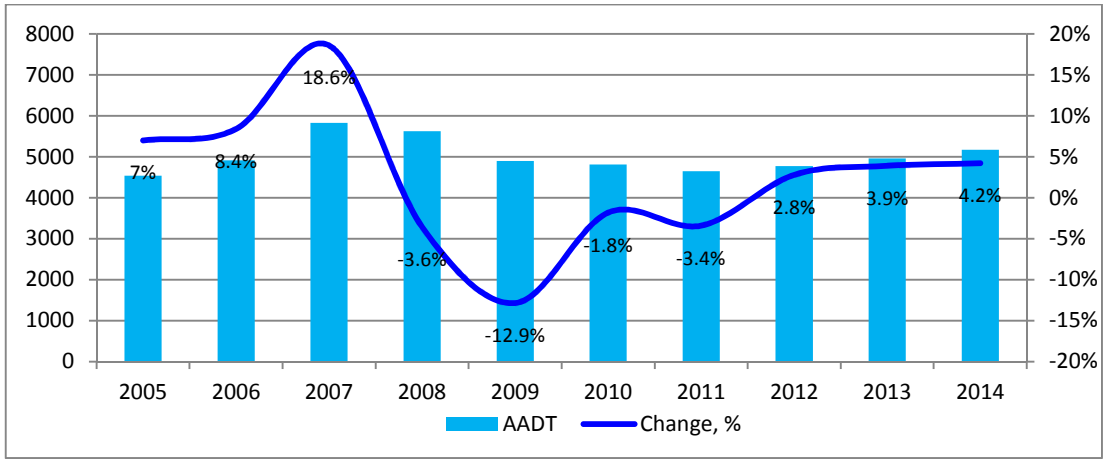


Chart 3.3. Traffic volume trend on Latvian main roads 2005-2015

The change in average traffic volume on Latvia’s E67 route sections over the last five years is shown on Charts 3.4 and 3.5. The traffic volume has increased steadily in Latvia, and the proportion of heavy trucks continues to rise.

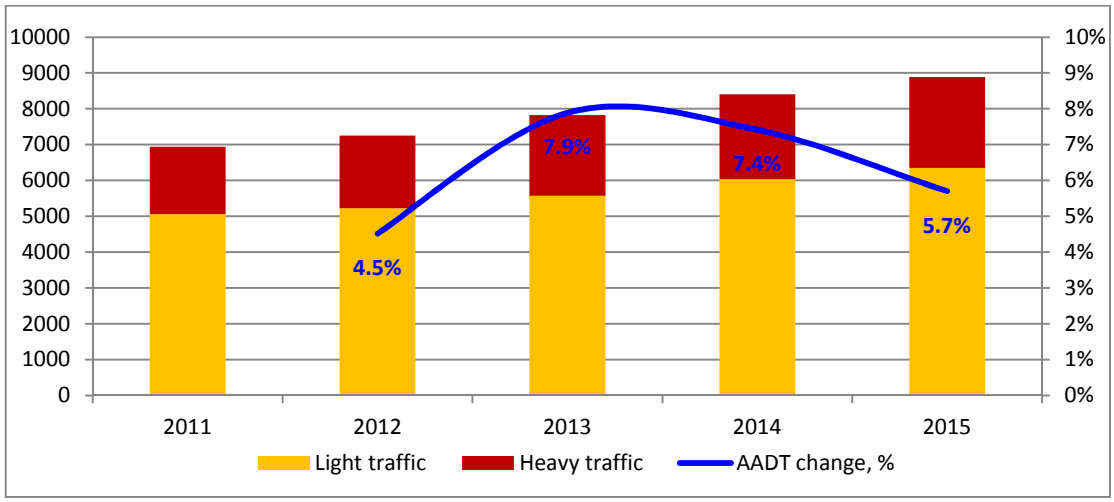


Chart 3.4. Traffic volume trend on E67 Via Baltica Latvian sections 2011-2015

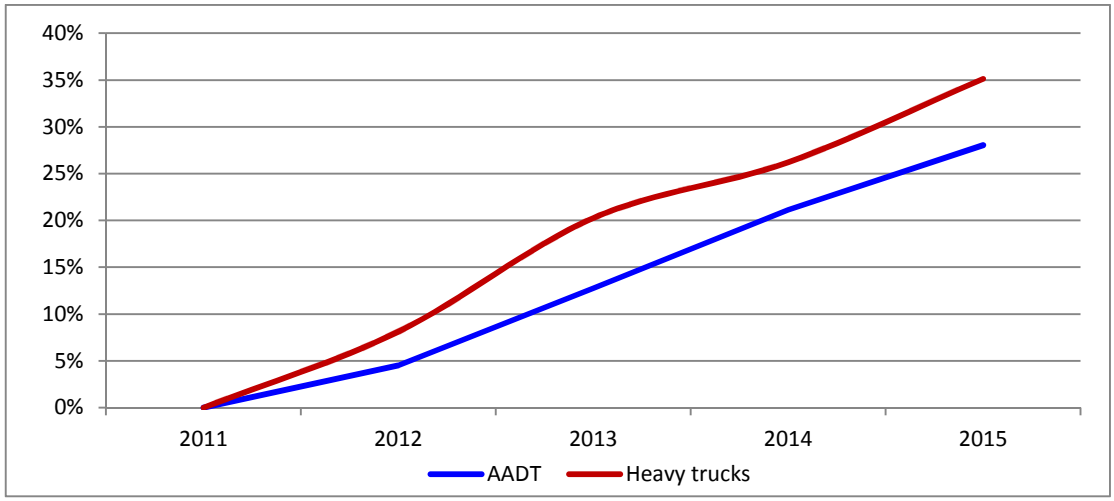


Chart 3.5. Annual average daily traffic and trucks volume trend 2011-2015 on E67 Via Baltica Latvian sections

Table 3.2. Annual average daily traffic in E67 Via Baltica route Latvian sections

Road no	Start km	End km	Length, km	E67 secton	AADT, veh/day	Heavy trucks	
						%	vehicle
A1	83,9	101,7	17,9	LAT_9-11	4478	45	2015
	57,1	83,9	26,8	LAT_11	4399	41	1804
	40,4	57,1	16,7	LAT_12	5805	33	1916
	31,6	40,4	8,8	LAT_12	6913	29	2005
	21,3	31,6	10,3	LAT_12	8353	22	1838
	13,0	21,3	8,3	LAT_13	12371	19	2350
	6,9	13,0	6,1	LAT_13	12920	14	1809
	0,0	6,9	6,9	LAT_14	23343	17	3968
A4	0,0	4,9	4,9	LAT_15	13886	25	3471
	4,9	9,4	4,5	LAT_16	8914	26	2318
	9,4	14,3	4,9	LAT_17	9258	26	2407
	14,3	20,5	6,2	LAT_17	9214	29	2672
A5	0,0	7,0	7,0	LAT_19-20	9380	28	2626
	7,0	8,6	1,6	LAT_19-20	11105	25	2776
A6	17,3	19,1	1,8	LAT_18	22370	15	3356
	19,1	23,0	3,8	LAT_18	19865	18	3576
A7	19,4	44,6	25,2	LAT_22	11883	30	3565
	44,6	65,4	20,8	LAT_23	9215	32	2949
	65,4	85,1	19,7	LAT_24-25	4990	52	2595

3.2. Traffic volume data from permanent traffic measuring points

The recent data on traffic volume change is based on the data collected from permanent traffic measuring points and can be found in Table 3.3.

Table 3.3. Traffic volume according to permanent traffic measuring points on the E67 Via Baltica route Estonia sections and the trend

Road no	Location km	Traffic volume 2015, veh/day				Trend 2016 vs 2015 (I-II quarter)			
		AADT	SAPA	VAAB	AR	AADT	SAPA	VAAB	AR
4	15,6	20 022	19 101	508	413	6%	6%	4%	9%
4	21,1	15 136	13 123	464	1 549	7%	7%	0%	9%
4	57,4	7 417	5 819	245	1 352	5%	5%	0%	9%
4	107,8	7 720	5 977	290	1 454	6%	6%	1%	9%
4	123,7	11 639	9 742	410	1 487	5%	5%	-2%	10%
4	151,0	4 408	2 914	167	1 327	9%	10%	5%	9%
4	189,2	3 220	1 795	114	1 312	12%	12%	21%	10%

3.3. Traffic prognosis

The traffic prognosis has been prepared based on the values given in base prognosis report. Traffic growth factors are partially corrected according to the latest data. Three different prediction levels are described in base prognosis report – high, medium and low. Latest changes in the traffic growth trend are taken into account for every factor and the appropriate prediction level is selected. For Estonia, traffic growth factor is calculated separately for each vehicle class. The calculated changes in traffic volumes for E67 Via Baltica route sections in Estonia can be found in Table 3.4 and Chart 3.6. Latvia has three different traffic prognosis scenarios in use – moderate, realistic and optimistic (Chart 3.7). In this study, realistic traffic growth scenario values are used.

Table 3.4. Traffic prognosis for E67 Via Baltica route sections in Estonia and in Latvia

ESTONIA				Latvia			
Year	Vehicle class			Year	Prognosis scenarios		
	SAPA	VAAB	AR		Moderate	Realistic	Optimistic
2015-2020	3,9%	3,1%	6,8%	2015-2016	2,5%	3,0%	3,5%
2021-2030	2,1%	1,8%	3,2%	2017-2024	1,5%	2,0%	2,5%
2031-2035	1,2%	0,7%	1,9%	2025-2035	1,5%	2,0%	2,0%

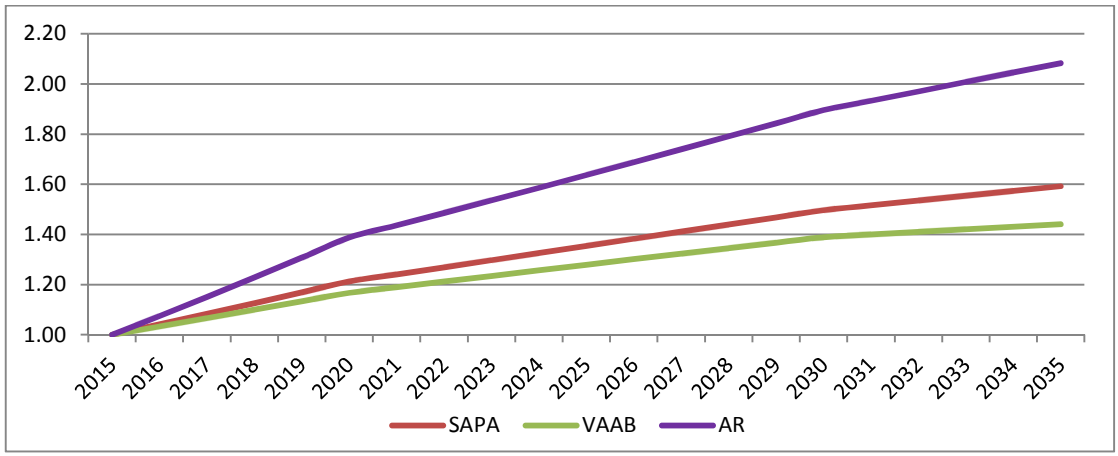


Chart 3.6. Traffic prognosis 2015-2035 in Estonia

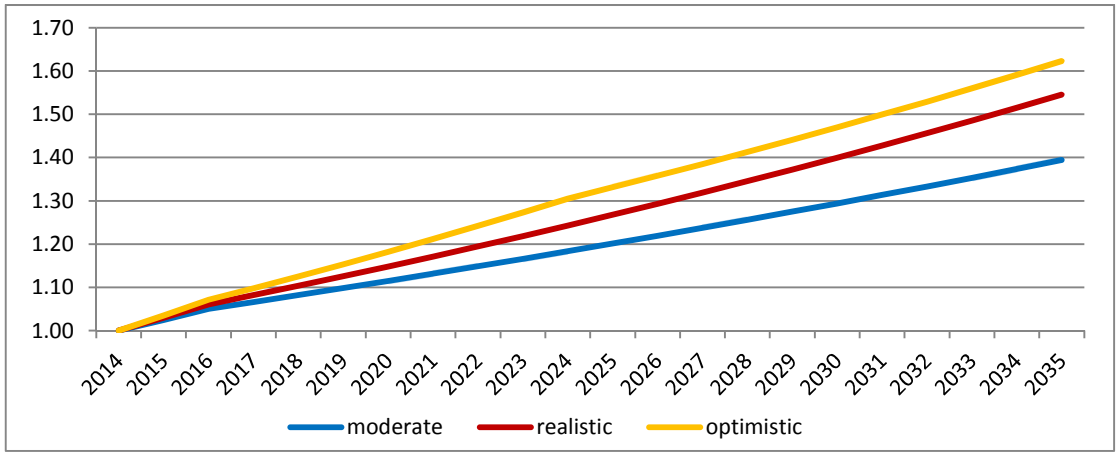


Chart 3.7. Traffic prognosis 2014-2035 in Latvia

3.4. Traffic flow details

For the HDM-4 analysis, a traffic flow pattern is prepared according to traffic flow types. The analysis is prepared in accordance with traffic flow data collected from permanent traffic measuring points in Estonia.

Table 3.5. Hourly distribution of the different periods of the day of the year, h (year=8760h)

	Annual average daily traffic, AADT veh/day		
	> 10 000	**5 000 - 10 000**	**< 5 000**
Peak hour	795	807	794
Day	3618	3497	2967
Evening	1522	1622	1865
Night	2826	2836	3136

Table 3.6. Distribution of traffic frequency between different periods of the day of the year, %

	Annual average daily traffic, AADT veh/day		
	>10000	**5000-10000**	**<5000**
Peak hour	20,0%	20,6%	19,4%
Day	61,3%	57,4%	48,2%
Evening	12,0%	13,8%	19,1%
Night	6,7%	8,2%	13,3%

As the differences between traffic classes in different periods of the day are not that significant, it was decided to use average values for each traffic volume class.

Table 3.7. Traffic flow details

	Peak hour	**Day**	**Evening**	**Night**
Hourly distribution of the different periods of the day of the year, h (year=8760 h)	798	3360	1669	2932
Distribution of traffic frequency between different periods of the day of the year, %	20,0%	55,6%	15,0%	9,4%

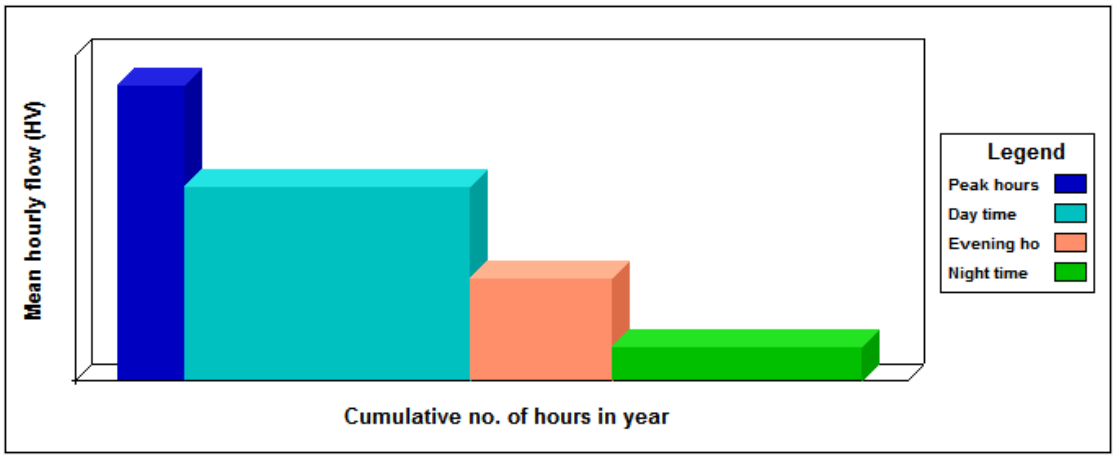


Chart 3.8. Histogram showing traffic flow data distribution on E67 Via Baltica route specified in Table 3.7.

4. TRAVEL TIME

On the analysed E67 Via Baltica route, two different methods were used to define road users travel time and cost:

- Waze data analysis;
- In-site car trips travel time analysis.

In order to ensure the reliability and accessibility of data, data on road users travel time was collected by using two different methods. In addition, the travel time data has been compared to the results of a study conducted on the Pärnu bypass in 2015 (“Travel time study from the E67 Pärnu ring road area”).

4.1. Road users’ travel costs

The basis that defines road users’ travel costs and is needed for the economic analysis, is the average gross wage in Estonia and Latvia. According to the Statistics Estonia, the average gross wage in 2015 was 1065 euros/month. The average gross wage in 2015 in Latvia was 818 euros/month. Assuming that there are 160 work hours in one month, the hourly price in Estonia is 6,66 euros and in Latvia 5,88 euros (Chart 4.1.).

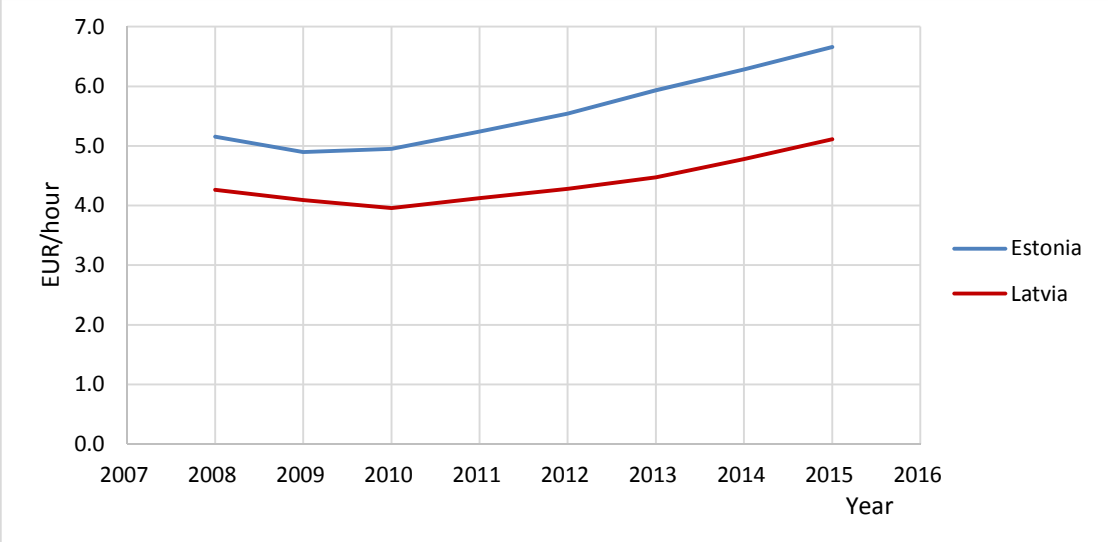


Chart 4.1. Change of average salary unit cost in Estonia and in Latvia

According to the time cost calculation methodology (used in Europe)[1]:

- Time cost for work related trips is a sum of 1,3 times salary value and employer’s expences (33,5%);
- Time cost for trips to and from work (estimated to be 1/3 of total trips) are considered to be 35% of average gross wage;
- Time cost for non-work related trips is considered to be 20% of average gross wage.

[1] „Tieliikenteen ajokustannusten yksikköarvot 2010“, Liikennevirasto, Helsinki 2010

According to a study conducted by the Road Institute at the Tallinn University of Technology in 2003, on highways (all vehicle types combined) there are work-related trips 45,8% and leisure trips 54,2%. Based on the described calculation method, in this analysis the main parameters of the time spent can be found in Table 4.1.

Table 4.1. The average time values used in the analysis (2015 data)

State	The average cost value of passanger working time	The average cost value of passanger non-working time	The cost of cargo delay
Estonia	4,66 euro/h	1,33 euro/h	0,24 euro/h
Latvia	3,58 euro/h	1,02 euro/h	0,19 euro/h
Total	4,12 euro/h	1,18 euro/h	0,22 euro/h

4.2. Waze users travel time and speed data

Waze is a free navigation software that is designed for GPS-equipped mobile phones. Waze is manufactured by the Waze Mobile Company, and is mainly intended to be used with small portable navigation devices. The main big difference amongst all other navigation softwares is the development work being done by the online community as well as the manufacture of maps. In addition, Waze allows to share real-time traffic and road information between users travelling in the same area, like traffic jams, roundabouts and other information regarding travelling plans.

Estonia and Latvia’s Road Agencies have signed an agreement to use Waze data, and as a result of this agreement, the data on road users of Via Baltica was used to prepare this analysis. Data is presented in packs of 15 minutes for the period of 21.07.2016 until 25.08.2016. The following fields are contributed in the data:

- Updated – including the date and time of the 15 minute pack;
- Path – including the start and end description of the road section;
- Name – road section’s name;
- Nowtime – average time in seconds that it takes to cover the road section in the given 15 minute period;
- Historictime – average time in seconds that it takes to cover the road section up until now;
- Length – length of the road section.

Based on that data it is possible to calculate the average speed that it takes for road users to cover a road section. In addition it is possible to analyse the change in driving speed seasonally, on different weekdays, on different hours of the day etc. The problem in the data, however, is that it is not known how many vehicles are in this 15 minute pack or what type of vehicles they are (car, truck, bus etc.). Given the novelty of the Waze app, it can be assumed that the recorded data includes mostly single vehicles, and taking into account their average driving speeds, the vehicles are cars. This was also confirmed by control observations of the Waze Live Map. However, active users on the Via Baltica route were still only a few.

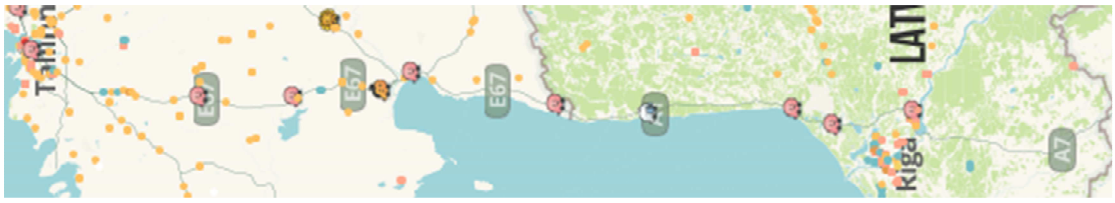


Chart 4.2. Waze Live Map data from 27.08.2016 16:30

A summary on average driving speeds on the Via Baltica route that is based on the data attained from Waze can be found in Table 4.2 and Chart 4.3. Data is presented for separate driving directions as well as for both directions together. The data reveals that the average driving speed on the E67 Via Baltica route is significantly higher in Estonia than in Latvia (89,3 km/h vs. 81,1 km/h). The relatively high average driving speed in Estonia indicates that its increase for the whole route, with the help of different ITS-solutions, may no longer be possible. It is, however, possible on separate road sections.

Table 4.2. Average driving speed in the Via Baltica route based on the Waze data

SEC_ID	SEC name	State	SEC (in chart)	Average speed, km/h			Difference DIR1 vs DIR2
				DIR1	DIR2	Total	
E67(4)_1_s1	Laagri-Ääsmäe	EST	EST_1	101,06	101,25	101,16	0,2%
E67(4)_1_s2	Ääsmäe-Märjamaa	EST	EST_2	90,19	89,13	89,66	1,2%
E67(4)_1_s3	Märjamaa-Halinga	EST	EST_3	94,21	93,56	93,89	0,7%
E67(4)_1_s4	Halinga-Jänesselja	EST	EST_4	89,52	89,34	89,43	0,2%
E67(4)_1_s5	Jänesselja-Uulu	EST	EST_5	66,49	69,77	68,13	4,7%
E67(4)_1_s6	Uulu-Ikla (Border area)	EST	EST_6	93,76	93,55	93,65	0,2%
EST Total				**89,21**	**89,43**	**89,32**	**0,3%**
E67(A1)_2_s9	Ainaži (Border area)-Salacgriva city border	LAT	LAT_9	83,77	84,87	84,32	1,3%
E67(A1)_2_s11	Salacgriva city border-Jelgavkrasti (P11)	LAT	LAT_11	93,35	95,88	94,61	2,6%
E67(A1)_2_s12	Jelgavkrasti (P11)-Lilaste (V101)	LAT	LAT_12	100,52	100,28	100,40	0,2%
E67(A1)_2_s13	Lilaste (V101)-Adaži	LAT	LAT_13	91,51	89,56	90,54	2,2%
E67(A1)_2_s14	Adaži-Ryga bypass (A4)	LAT	LAT_14	74,18	73,60	73,89	0,8%
E67(A4)_1_s15	Ryga bypass (A4)-Amatnieki (P2)	LAT	LAT_15	81,97	79,14	80,56	3,6%
E67(A4)_1_s16	Amatnieki (P2)-Ulupij (P4)	LAT	LAT_16	79,92	82,63	81,28	3,3%
E67(A4)_1_s17	Ulupij (P4)-Saulkalne (A6)	LAT	LAT_17	78,18	78,75	78,46	0,7%
E67(A6)_2_s18	Saulkalne (A4)-Salaspils (A5)	LAT	LAT_18	74,45	69,61	72,03	7,0%
E67(A5)_1_s19	Salaspils (A6)-Hydropower plant	LAT	LAT_19	62,50	51,29	56,89	21,9%
E67(A5)_1_s21	Hydropower plant-Kekava (A7)	LAT	LAT_21	71,92	76,28	74,10	5,7%
E67(A7)_1_s22	Kekava (A5)-Iecava (P93)	LAT	LAT_22	76,33	80,02	78,17	4,6%
E67(A7)_1_s23	Iecava (P93)-Bauska City border	LAT	LAT_23	88,39	89,90	89,14	1,7%
E67(A7)_1_s25	Bauska City border-LV border area	LAT	LAT_25	80,85	80,58	80,71	0,3%
LAT Total				**81,27**	**80,88**	**81,08**	**0,5%**
Grand Total				**83,71**	**83,51**	**83,61**	**0,2%**

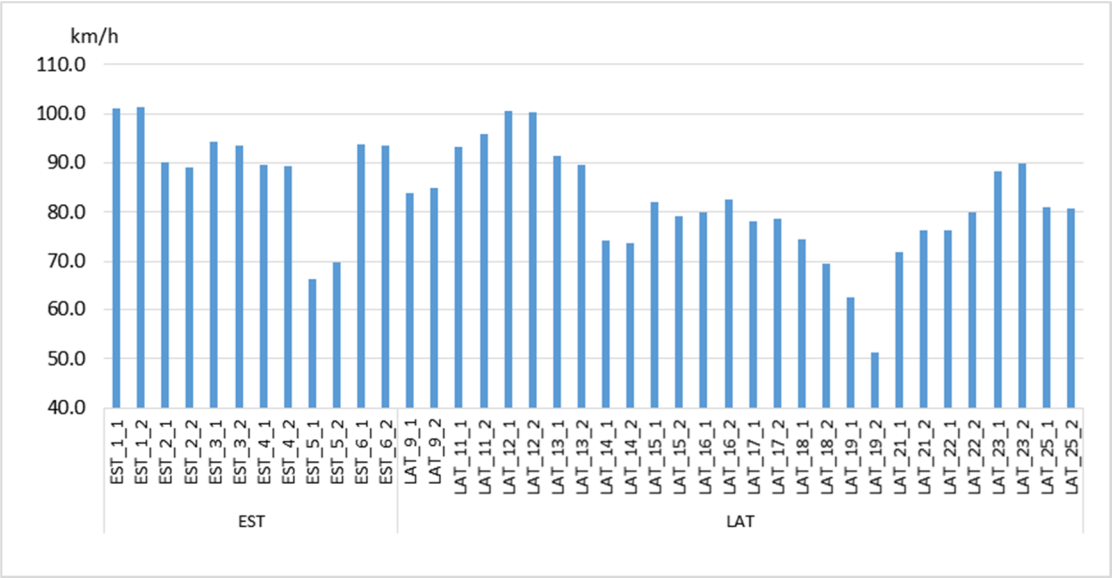


Chart 4.3. Average driving speed on the E67 Via Baltica route sections, DIR1 and DIR2

On Chart 4.4 an average driving speed variation during different weekdays on the E67 Via Baltica route sections in Estonia (EST) and Latvia (LAT) is presented. Slightly higher driving speed values during weekends could be observed both in Estonia and in Latvia. Between weekdays no major difference in average driving speed can be noticed.

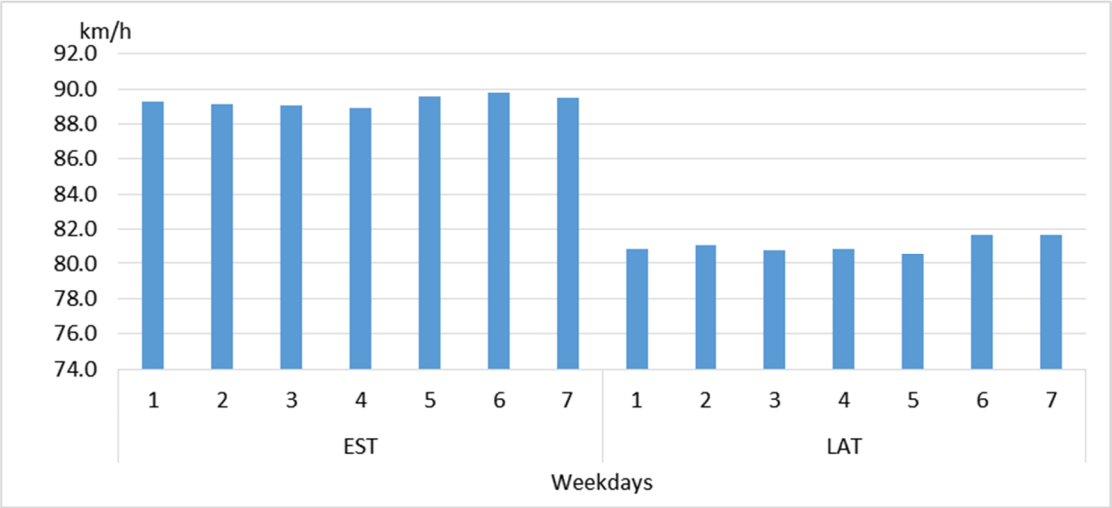


Chart 4.4. Average driving speed variation on weekdays on the E67 Via Baltica route sections

Variation in average driving speed during weekday’s hours on the E67 Via Baltica route sections in Estoania and in Latvia, based on the Waze data, is presented in Chart 4.5. It can be noticed, that variations in average driving speed are wider in Latvia. Both in Estonia and in Latvia lowest average speed values are registered during midday (between 11:00 and 15:00) and highest average speed values are recorded early in the morning (between 04:00 and 07:00). There is a clear indication of traffic jam possibility in Latvia sections on Friday afternoon between 17:00 and 19:00.

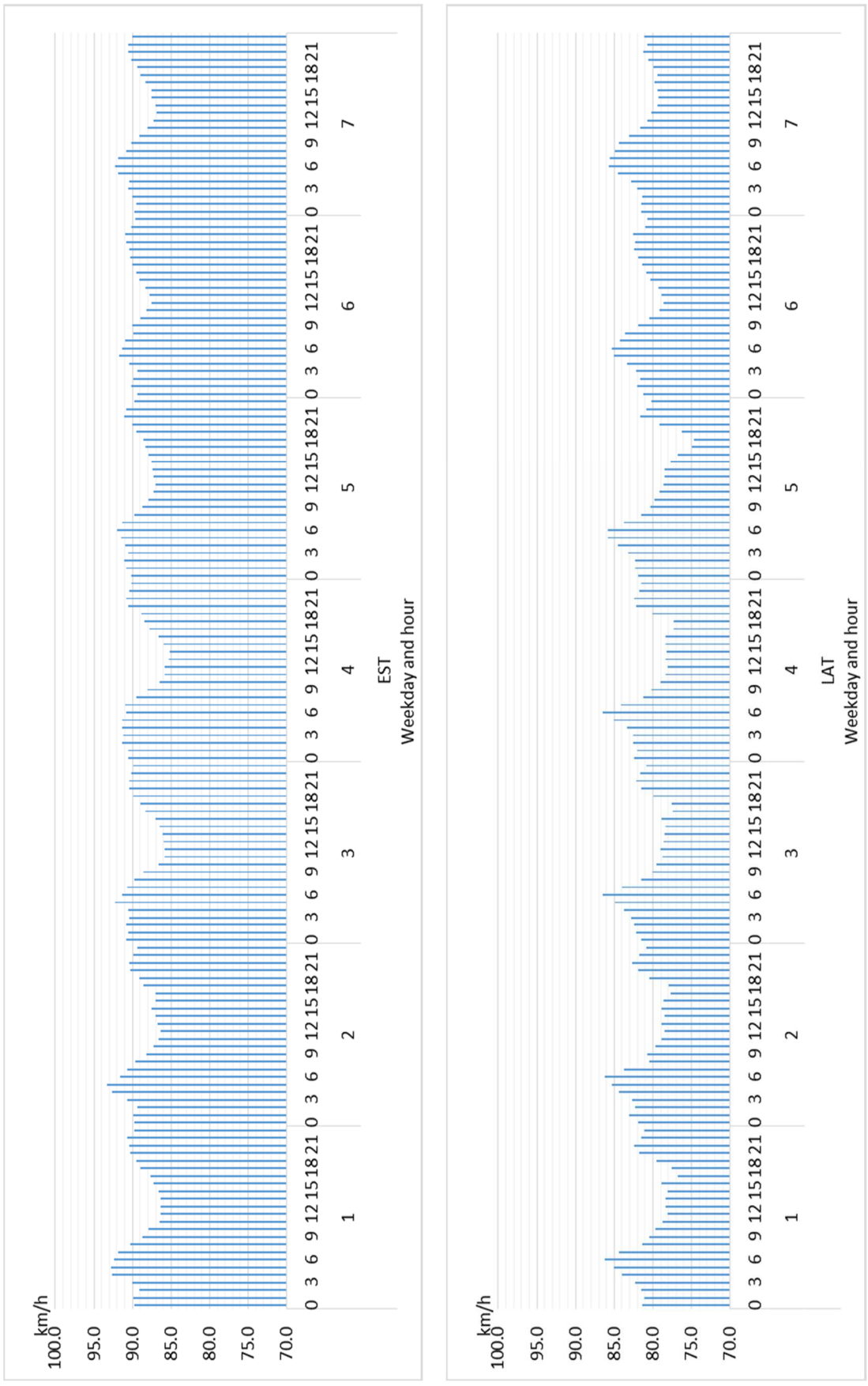


Chart 4.5. Average driving speed variation on weekday hours on the E67 Via Baltica route in Estonia and in Latvia

4.3. Travel time and speed data of In-site car trips

In-site car trips are made on the Via Baltica route as part of travel time surveys. Individual driving along the route has been done on a regular basis (once a month). Traffic rules and normal speed flow has been followed when driving on the route. The data has been registered and saved using GPSLogger[2] mobile phone application. Data collection frequency during the driving times has been high (1-2 seconds). That ensures accurate and precise data for analysing travel time and driving speeds.

In-site car trips during the period of May – August were made four times on the E67 Via Baltica route:

- On the direction Estonia – Latvia, direction 1
  - Wednesday, 25.05.2016
  - Thursday, 09.06.2016
  - Monday, 04.07.2016
  - Friday, 12.08.2016
- On the direction Latvia – Estonia, direction 2
  - Sunday, 29.05.2016
  - Sunday, 12.06.2016
  - Tuesday, 19.07.2016
  - Tuesday, 16.08.2016

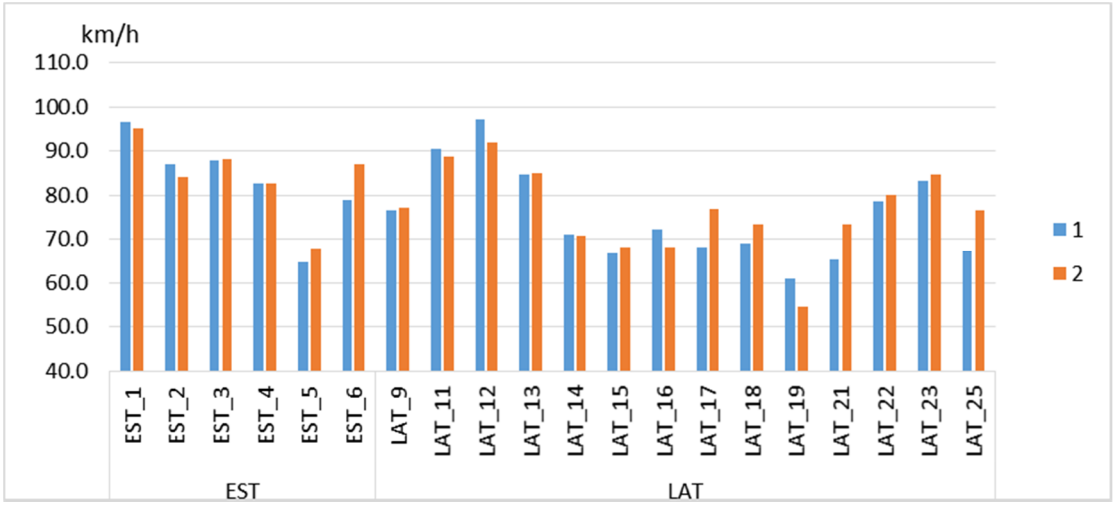


Chart 4.6. Average driving speed in the E67 Via Baltica route sections based on the In-site car trips data, DIR 1 and DIR 2

The summary of the results on average driving speeds during the In-site car trip on the Via Baltica route can be found in Table 4.3 and Chart 4.6. The results show that, similarly to Waze data results, the average driving speed on Via Baltica is higher in Estonia than in Latvia. However, the difference is not as significant as it was with Waze data results, staying within the extent of 3 km/h, or 3,75%. It must be taken into account that changes in driving times in large quantitives of data level out for Waze data results, and are not as visible. The In-site

[2] http://code.mendhak.com/gpslogger/

car trips are much more affected by those changes (for example stopping due to the road construction works, at the traffic lights, etc.).

Table 4.3. Average driving speed in the E67 Via Baltica route based on the In-site car trips data

SEC_ID	SEC name	State	SEC (in chart)	Average speed, km/h			Difference DIR1 vs DIR2
				DIR1	DIR2	Total	
E67(4)_1_s1	Laagri-Ääsmäe	EST	EST_1	96,6	95,2	95,9	1,5%
E67(4)_1_s2	Ääsmäe-Märjamaa	EST	EST_2	86,4	84,2	85,3	2,6%
E67(4)_1_s3	Märjamaa-Halinga	EST	EST_3	88,1	88,3	88,2	0,2%
E67(4)_1_s4	Halinga-Jänesselja	EST	EST_4	82,7	82,8	82,8	0,2%
E67(4)_1_s5	Jänesselja-Uulu	EST	EST_5	64,9	67,8	66,3	4,4%
E67(4)_1_s6	Uulu-Ikla (Border area)	EST	EST_6	78,8	87,0	82,7	9,4%
EST Total				**82,0**	**84,3**	**83,1**	**2,7%**
E67(A1)_2_s9	Ainaži (Border area)-Salacgriva city border	LAT	LAT_9	76,6	77,2	76,9	0,9%
E67(A1)_2_s11	Salacgriva city border-Jelgavkrasti (P11)	LAT	LAT_11	90,5	88,7	89,6	2,0%
E67(A1)_2_s12	Jelgavkrasti (P11)-Lilaste (V101)	LAT	LAT_12	97,2	83,8	90,0	15,9%
E67(A1)_2_s13	Lilaste (V101)-Adaži	LAT	LAT_13	84,7	85,0	84,8	0,4%
E67(A1)_2_s14	Adaži-Ryga bypass (A4)	LAT	LAT_14	71,3	70,9	71,1	0,5%
E67(A4)_1_s15	Ryga bypass (A4)-Amatnieki (P2)	LAT	LAT_15	66,9	68,1	67,5	1,8%
E67(A4)_1_s16	Amatnieki (P2)-Ulupij (P4)	LAT	LAT_16	72,2	68,3	70,2	5,8%
E67(A4)_1_s17	Ulupij (P4)-Saulkalne (A6)	LAT	LAT_17	68,2	77,0	72,4	11,4%
E67(A6)_2_s18	Saulkalne (A4)-Salaspils (A5)	LAT	LAT_18	69,0	73,5	71,2	6,0%
E67(A5)_1_s19	Salaspils (A6)-Hydropower plant	LAT	LAT_19	61,1	54,7	57,7	11,7%
E67(A5)_1_s21	Hydropower plant-Kekava (A7)	LAT	LAT_21	65,2	73,5	69,2	11,3%
E67(A7)_1_s22	Kekava (A5)-Iecava (P93)	LAT	LAT_22	78,7	80,0	79,4	1,6%
E67(A7)_1_s23	Iecava (P93)-Bauska City border	LAT	LAT_23	83,4	84,9	84,1	1,7%
E67(A7)_1_s25	Bauska City border-LV border area	LAT	LAT_25	67,3	76,7	71,7	12,2%
LAT Total				**80,2**	**80,2**	**80,2**	**0,1%**
Grand Total				**80,9**	**82,1**	**81,5**	**1,3%**

4.4. Traffic speed data from the permanent traffic measuring points

The velocity at which a road section is passed through is not completely comparable with the driving speed measured at a specific point, but the speed data received from permanent traffic measuring points can still give a valid indication. The average speeds and V85 speed in 2015 are shown in Table 4.4. Since the speed limit on 2+2 roads during the summer is increased to 110 km/h, both the summer and winter periods' driving speed data have been added into the Table 4.4.

Table 4.4. V85 and average speed based on the permanent traffic measuring points data on E67_EST in 2015

Road no	Section	Location, km	Annual			Summer period			Winter period		
			AADT	V85 km/h	V_{ave} km/h	AADT	V85 km/h	V_{ave} km/h	AADT	V85 km/h	V_{ave} km/h
4	EST_1	15,6	20 022	104,5	96,6	20 452	113,1	103,3	19 902	102,6	95,2
4	EST_1	21,1	15 136	111,3	102,6	17 200	116,8	107,1	12 551	103,1	96,0
4	EST_2	57,4	7 417	100,0	91,7						
4	EST_4	107,8	7 720	98,4	89,9						
4	EST_5	123,7	11 639	79,1	71,6						
4	EST_6	151,0	4 408	97,9	89,1						
4	EST_6	189,2	3 220	100,2	90,9						

4.5. Speed camera statistical speed data

The automatic speed cameras on road sections also provide vehicles' velocity. Road users, however, tend to change their behaviour in the vicinity of those speed cameras, thus, it is not possible to analyse the impact of additional ITS equipment, and therefore, that data has not been used for this study.

Chart 4.7. Speed camera in Libatse on E67 Via Baltica route

4.6. Travel time study (2015) from the E67 Pärnu ring road

Due to the need to optimise traffic conditions on the road section of Pärnu bypass, European Union’s TEN-T road network road E67 Tallinn-Pärnu-Ikla, a complex monitoring of driving speeds and stopping times was conducted on that road section during autumn, 2015. The obtained data made it possible to analyse how feasible is it to increase the service levels of through-traffic on the given road section, using both road-constructional as well as traffic management and technical notification resources.

During the monitoring process, the same Via Baltica route (km 123,2 – 134,4) was covered repeatedly (altogether 144 passes) on four different days of the week, and every time it was passed the travel time and speed were recorded.

The monitoring results (Chart 4.8) showed that on the studied road section the transit time was longer and average speed was lower on direction 1 (Tallinn-Ikla). The difference between average speeds for driving directions was 5 km/h, which is significant enough, considering the average speed for both directions was 58,0 km/h. The average travel speeds as a result of the study were the following (those days and times when road maintenance works were taking place on the road section were excluded from the results):

- Driving direction 1 Tallinn-Ikla, average travel speed 55,0 km/h;
- Driving direction Ikla-Tallinn, average travel speed 60,1 km/h;
- Combined average for both driving directions, average travel speed 58,0 km/h.

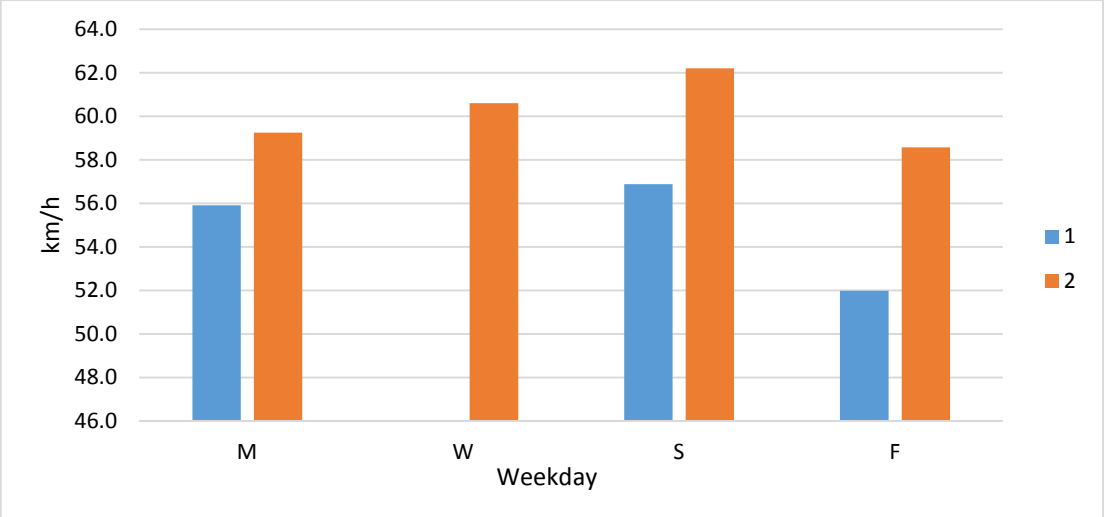


Chart 4.8. Average driving speed on the E67 Via Baltica route Pärnu ringroad section according to the travel time study (2015)

Chart 4.9 shows the comparison between average travel speed measurement results for the Pärnu bypass road section on the Via Baltica route in 2015 and the Waze data results from July-August in 2016. The data shows that according to Waze the average speeds on both directions were higher than what were registered with the monitoring process the year before. The difference of average values for driving directions is between 4 and 6 %. This difference seems to be following the same trend that was observed with Waze data and In-site car trip data (see Chapter 3.7).

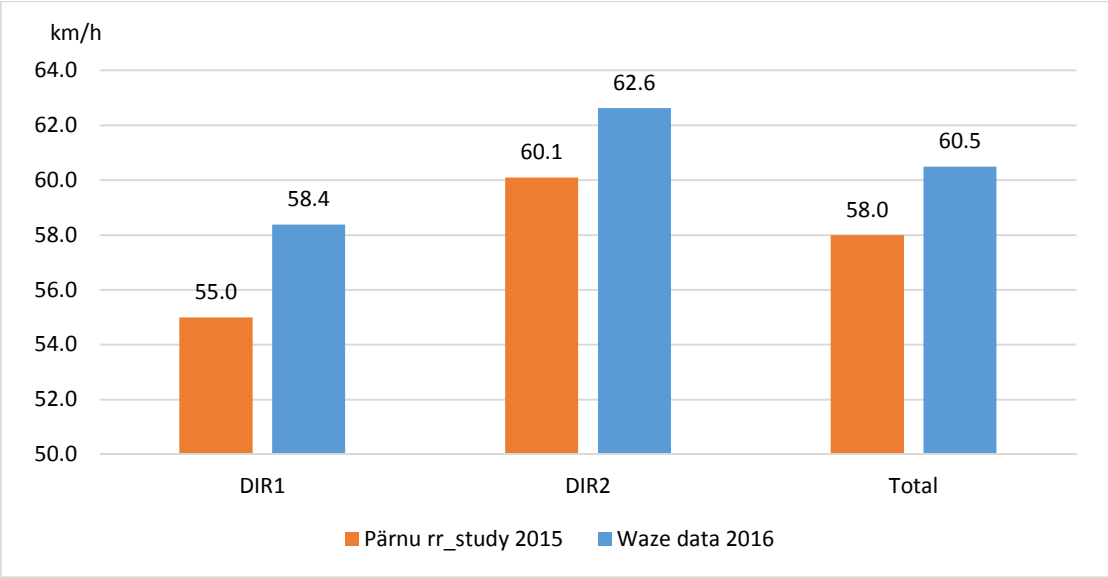


Chart 4.9. Comparison of average driving speed on the E67 Via Baltica route Pärnu ringroad section

4.7. Comparison of travel times

For this study, the data on travel times and speeds has been collected using different methods. To find out how the data correlates with each other, a comparison was made. Table 4.5 and Chart 4.10 show the comparison data of average travel speeds on the analysed road sections. The data shows that the results collected with Waze method demonstrate the average travel speed to be slightly higher than compared to results collected with In-site car trips method.

Table 4.5. Comparison of the average driving speed in the E67 Via Baltica route

State	SEC	WAZE data				In-site car trips data				Difference Waze vs In-site car trips
		DIR1	DIR2	Total	Difference DIR1 vs DIR2	DIR1	DIR2	Total	Difference DIR1 vs DIR2	
EST	EST_1	101,1	101,3	101,2	0,2%	96,6	95,2	95,9	1,5%	5,5%
EST	EST_2	90,2	89,1	89,7	1,2%	87,1	84,2	85,6	3,5%	4,7%
EST	EST_3	94,2	93,6	93,9	0,7%	88,1	88,3	88,2	0,2%	6,5%
EST	EST_4	89,5	89,3	89,4	0,2%	82,7	82,8	82,8	0,2%	8,1%
EST	EST_5	66,5	69,8	68,1	4,7%	64,9	67,8	66,3	4,4%	2,7%
EST	EST_6	93,8	93,5	93,7	0,2%	78,8	87,0	82,7	9,4%	13,2%
EST Total		**89,2**	**89,4**	**89,3**	**0,3%**	**82,1**	**84,3**	**83,2**	**2,6%**	**7,4%**
LAT	LAT_9	83,8	84,9	84,3	1,3%	76,6	77,2	76,9	0,9%	9,6%
LAT	LAT_11	93,3	95,9	94,6	2,6%	90,5	88,7	89,6	2,0%	5,6%
LAT	LAT_12	100,5	100,3	100,4	0,2%	97,2	92,0	94,5	5,6%	6,2%
LAT	LAT_13	91,5	89,6	90,5	2,2%	84,7	85,0	84,8	0,4%	6,7%
LAT	LAT_14	74,2	73,6	73,9	0,8%	71,3	70,9	71,1	0,5%	4,0%
LAT	LAT_15	82,0	79,1	80,6	3,6%	66,9	68,1	67,5	1,8%	19,4%
LAT	LAT_16	79,9	82,6	81,3	3,3%	72,2	68,3	70,2	5,8%	15,7%
LAT	LAT_17	78,2	78,7	78,5	0,7%	68,2	77,0	72,4	11,4%	8,4%
LAT	LAT_18	74,5	69,6	72,0	7,0%	69,0	73,5	71,2	6,0%	1,1%
LAT	LAT_19	62,5	51,3	56,9	21,9%	61,1	54,7	57,7	11,7%	1,4%
LAT	LAT_21	71,9	76,3	74,1	5,7%	65,2	73,5	69,2	11,3%	7,1%
LAT	LAT_22	76,3	80,0	78,2	4,6%	78,7	80,0	79,4	1,6%	1,5%
LAT	LAT_23	88,4	89,9	89,1	1,7%	83,4	84,9	84,1	1,7%	5,9%
LAT	LAT_25	80,9	80,6	80,7	0,3%	67,3	76,7	71,7	12,2%	12,6%
LAT Total		**81,3**	**80,9**	**81,1**	**0,5%**	**80,2**	**81,5**	**80,8**	**1,6%**	**0,3%**
Grand Total		**83,7**	**83,5**	**83,6**	**0,2%**	**81,1**	**82,8**	**81,9**	**2,1%**	**2,0%**

The difference in travel speeds varies for road sections. On road sections where the difference in travel speeds is significant (over 10%), the reason tends to be some sort of a traffic obstruction. For example, there were summer-time road maintenance works on road section EST_6, thus, during the In-site car trips on that section, certain stoppages were registered. This, however, affects the data collected with In-site car trip method significantly, as the actual passages were few. Throughout the whole Via Baltica route the average travel speed collected with the Waze method differs 2,0% from the data collected with In-site car trip method.

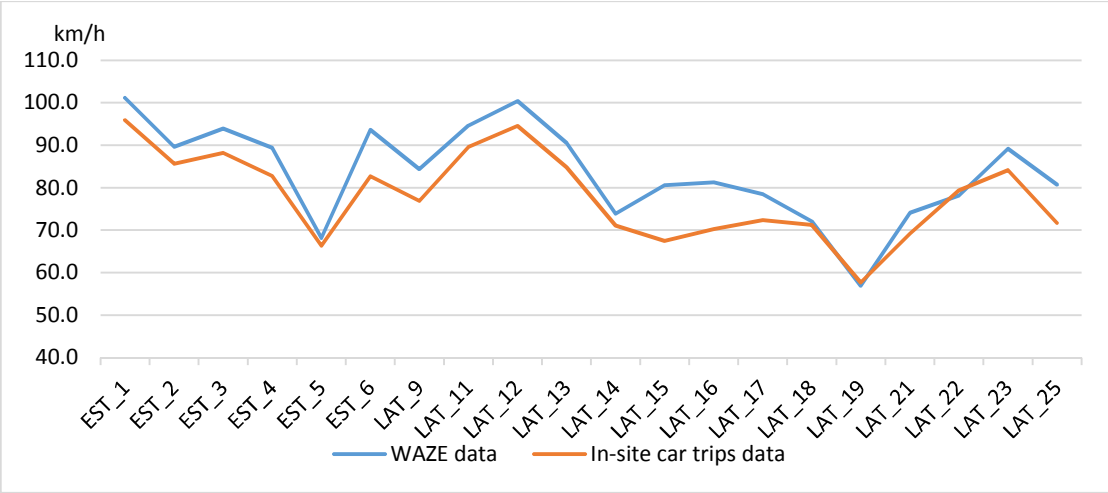


Chart 4.10. Comparison of average driving speed on the Via Baltica route Pärnu ringroad section

It is still unknown why travel speeds are faster according to the Waze data. The Consultants suggest, as one of the possible reasons, that the Waze data was mostly transmitted by younger road users who adapt to technological changes better.

Younger road users' travel speeds are faster than older users' speeds. The correlation between a driver's age and the average travel speed has not been studied in Estonia or Latvia (at least not to the Consultants' knowledge). However, in Norway, a study[3] on that subject was conducted in 2016, and the conclusion was that in the age group of 35-44 years travel speeds were the highest, from that age on the travel speeds decrease (Chart 4.11).

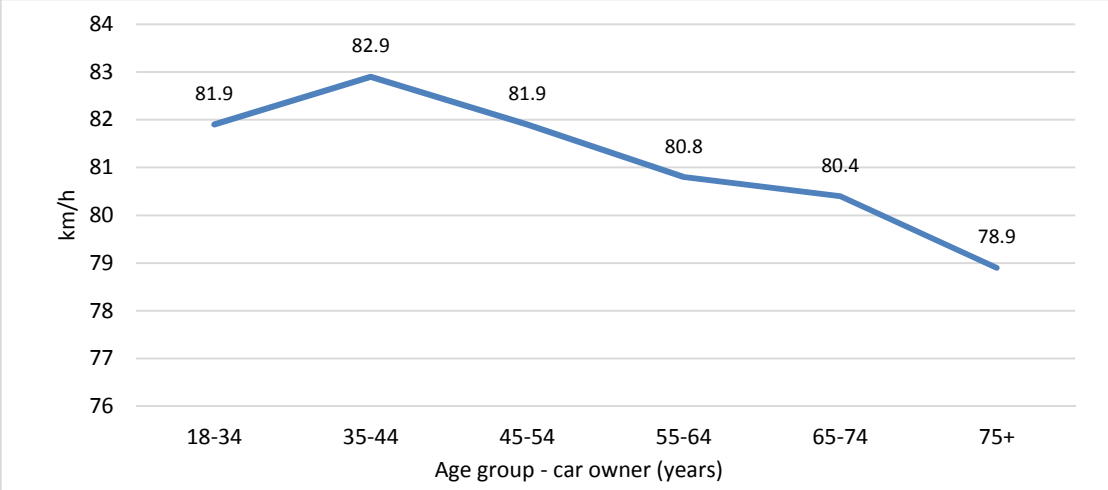


Chart 4.11. Mean speed (km/h) for cars at the site with the highest speed level, by age group of car owner

For this study, the conductors of In-site car trips were in age groups of 45-54 and 55-64 years. The average travel speed of those age groups was different from the age group with the highest travel speed (according to the study conducted in Norway) by 1,9%. This value is

[3] „Speed and age: Changes in speed level on Norwegian roads with 80 km/h limit“, F. Sagberg and T.Bjornskau, TØI Report 1462/2016, Oslo 2016

very similar to the difference recorded between the Waze and In-site car trips data, which was 2,0%.

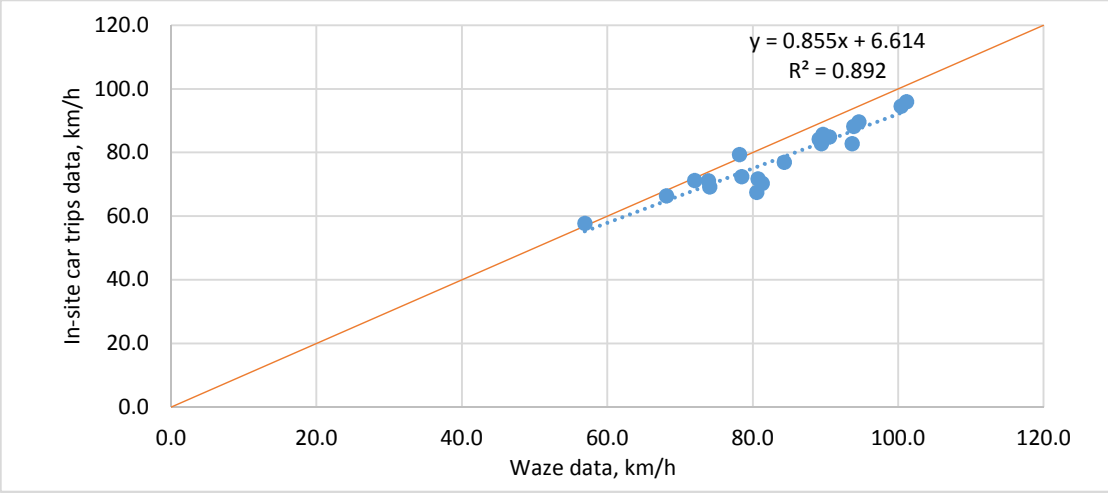


Chart 4.12. Comparison of average driving speed on the Via Baltica route Pärnu ringroad section

Chart 4.12 clearly indicates that as the speed limits increase so does the difference between Waze data and In-site car trips data. This tendency also seems to verify the aforementioned hypothesis of Waze data being mainly based on predominantly younger road users.

Due to the conclusions derived from the Waze data, for this study, the Consultants decided to focus on the travel time and speed data collected from In-site car trips, as those should reflect the average road user’s behaviour better.

5. TRAFFIC SAFETY LEVEL

Transportation planning decisions often affect crash risks. Therefore, it is important to identify the most cost-effective projects and solutions to evaluate decisions that involve trade-offs between safety and other planning objectives, such as travel speed and vehicle costs.

5.1. Traffic accidents

Safety impact analysis requires information on what is the current accident level and how a project will affect crash frequency and severity. Traffic accident data on Via Baltica route in Estonia is based on the information included into the national road data bank (Teeregister). Database peculiarity is that damage-only accidents might not be included there. E67 Via Baltica route Latvia section's traffic accident data is based on the statistics delivered by the Latvian road authorities and these include both damage-only and human related traffic accidents.

5.1.1. Accident unit costs

Internationally there are a number of different approaches and methodologies in use when calculating the unit prices of traffic accidents. Therefore, the calculation results can, in some cases, be very different. Table 5.1 shows the data on unit prices of traffic accidents in Estonia and Latvia, collected from different sources.

The unit prices of traffic accidents that have been used in Estonia so far are based on the research[4] findings done by the Logistics Institute at the Tallinn University of Technology. In accordance with the researcher's recommendations, to maintain continuity, data with risk value was used for the unit prices of traffic accidents.

Latvian traffic accident unit costs are based on national methodology of traffic accident costs assumption (general economical losses). Compared to the data received from other sources, those values seem to be strongly underestimated.

For comparison use, Tabel 5.1 shows the unit prices of traffic accidents data presented in RICARDO-AEA[5] report in 2014. These are average social accident costs in euros at market prices (based on 2010).

Since the information attained from various sources on unit prices of traffic accidents is very different, and to ensure the continuity of the comparison, the Consultants have decided to use the research results from the Tallinn University of Technology paper for the economic calculations.

[4] „Liiklusõnnetustest ühiskonnale põhjustatud kahjude määramise metoodika täiustamine, kahjude suuruse hindamine ja prognoosimine“ Tallinna Tehnikaülikooli Logistikainstituut, Tallinn 2012

[5] Update of the Handbook on External Costs of Transport, Final Report, Report of the European Comission, RICARDO-AEA, 2014

Table 5.1. Accident unit costs

Parameter	Accident unit costs
Estonia	
According to the study prepared by Tallinn University of Technology (2015 prognosis)	
Fatality	1 995 458 euro/fatality
Severe injury	674 248 euro/ injury
Slight injury	26 078 euro/injury
Damage only	9 623 euro/accident
According to the report Update of the Handbook on External Costs of Transport (2010)	
Fatality	1 163 000 euro/fatality
Severe injury	155 800 euro/severe injury
Slight injury	11 200 euro/slight injury
Damage only	-
Latvia	
Fatality	323 400 euro/fatality
Injury	3 800 euro/injury
Severe accident	29 185 euro/accident
Slight accident	2 400 euro/accident
According to the report Update of the Handbook on External Costs of Transport (2010)	
Fatality	1 034 000 euro/fatality
Severe injury	140 000 euro/severe injury
Slight injury	10 000 euro/slight injury
Damage only	-
Accident unit costs used in the analysis	
Fatality	1 995 500 euro/fatality
Injury	60 000 euro/injury
Damage only	10 000 euro/accident

Traffic accidents with severe injuries cannot be clearly distinguished from accidents with lighter injuries on the HDM-4 traffic accident model. Neither can the model take into account the cost on the society that traffic accidents cause. In addition, the severity levels of traffic accidents and injured people are not registered into Estonian databases. Thus, the losses for both severe and not so severe accidents have been combined on a principle where the damages attained from traffic accidents make up 5% for the disabled and 95% for the injured.

5.1.2. Accident level

A summary on the traffic accidents as well as the number of fatalities and injuries that took place on the E67 Via Baltica route over the last few years can be seen in Table 5.2. For the Via Baltica Estonian sections, the traffic accident data is given for the last 10 years (period 2006-2015). For the Via Baltica Latvian sections, the traffic data is given for the last 8 years (period 2008-2015).

Although the traffic accident data was given on a longer period for Estonian section, the number of accidents is clearly higher in Latvia. It is partly influenced by the fact that in the Estonian database damage-only traffic accidents are partially lacking (not known to what scale). It is also somewhat influenced by the fact that the Via Baltica route is longer on the Latvian territory by 20 km (178,750 km in Estonia vs 196,340 km in Latvia).

It is, however, possible to compare the human losses at road accidents. On the Via Baltica route in Estonia there have been 55 fatalities and 472 injuries over the last 10 years. On the Via Baltica route in Latvia there have been 96 fatalities and 1018 injuries over the last 8 years, almost twice as much compared to Estonia’s data.

Table 5.2. Summary of traffic accident data on E67 Via Baltica route sections

State	Section	Section name	Fatalities	Injuries	Accidents
EST	EST_1	Laagri - Ääsmäe	5	55	129
EST	EST_2	Ääsmäe - Märjamaa	6	93	97
EST	EST_3	Märjamaa - Halinga	18	109	117
EST	EST_4	Halinga - Jänesselja	9	87	104
EST	EST_5	Jänesselja - Uulu	11	56	81
EST	EST_6	Uulu - Ikla (Border area)	6	72	111
EST Total*			**55**	**472**	**639**
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	1	13	51
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	9	65	166
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	18	138	308
LAT	LAT_13	Lilaste (V101) - Adazi	4	115	187
LAT	LAT_14	Adazi - Ryga bypass (A4)	10	113	260
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	9	136	212
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	3	41	77
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	2	51	114
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	2	11	108
LAT	LAT_19	Salaspils (A6) - Hydropower plant	3	67	231
LAT	LAT_21	Hydropower plant - Kekava (A7)	1	12	57
LAT	LAT_22	Kekava (A5) - Iecava (P93)	17	115	314
LAT	LAT_23	Iecava (P93) - Bauska City border	15	100	140
LAT	LAT_25	Bauska City border - LV border area	2	41	80
LAT Total*			**96**	**1018**	**2305**

*** REMARK – Traffic accident data from Estonia is from 2006-2015 and from Latvia from 2008-2015**

Charts 5.1 and 5.2 demonstrate the changes over the last few years (10 years in Estonia, 8 years in Latvia) between the number of injured people and fatalities. In Estonia, a clear downtrend is noticeable for the number of traffic accidents, injuries and fatalities until 2013. After that the number of traffic accidents has increased slightly. The more important changes – human injuries – both the number of fatalities and injuries have increased. Therefore, the severity level for traffic accidents has clearly grown over the last few years.

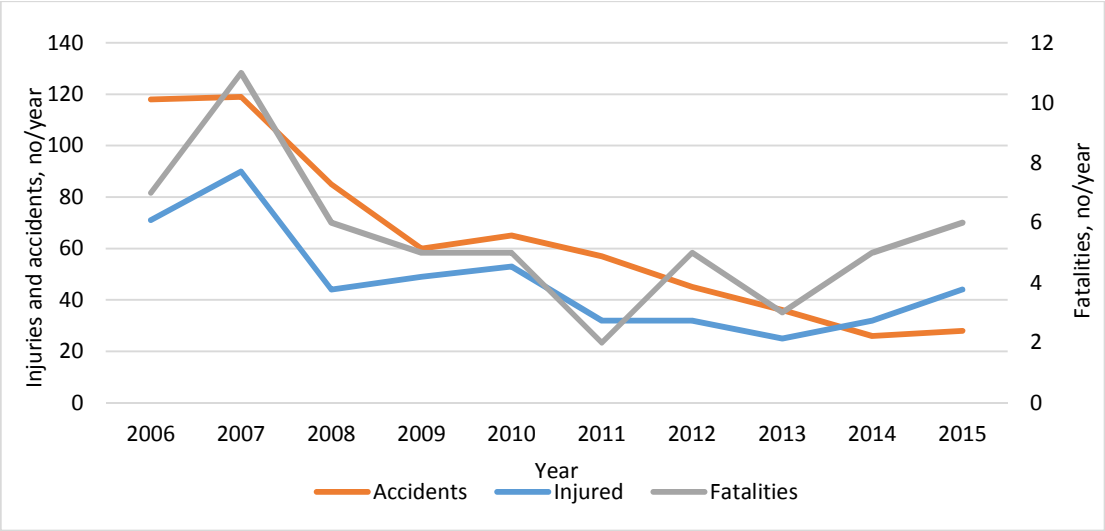


Chart 5.1. The number of fatalities, injuries and accidents on the E67 Via Baltica route Estonia sections

The number of traffic accidents as well as the number of injuries on the Via Baltica Latvian section decreased up to 2011. After that, the values stayed relatively constant. The number of fatalities throughout the eight-year period has remained on a high level. The number of fatalities has not dropped below 10 people on any of those analysed year, on some years the number of fatalitites has actually increased to 17 people.

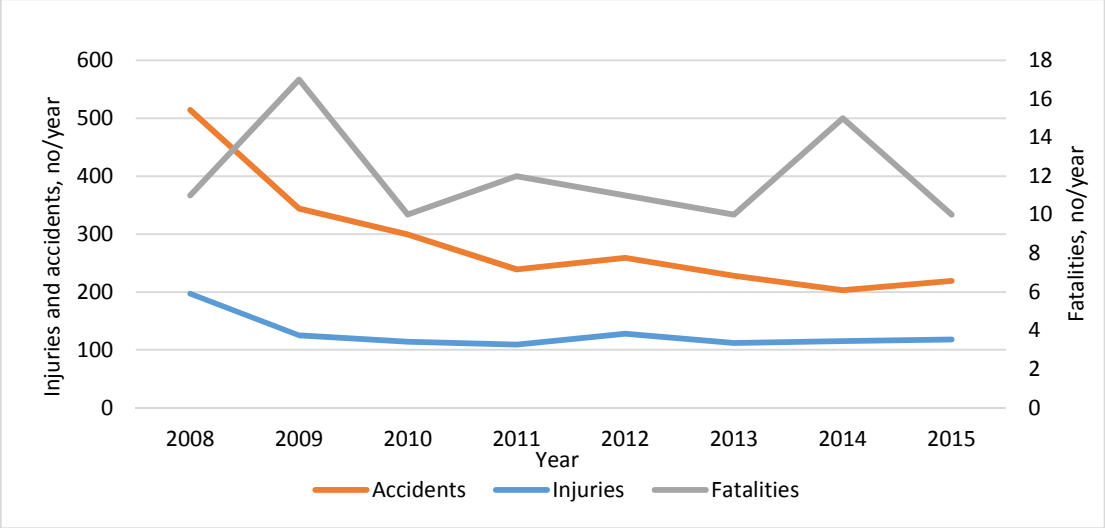


Chart 5.2. The number of fatalities, injuries and accidents on the E67 Via Baltica route Latvia sections

More detailed data on the analysed traffic accidents for E67 Via Baltica road sections can be found in Appendix 3.

5.1.3. Accident rates

The surveyed E67 Via Baltica route sections' accident rate values (number per 100 million veh-km) used in the analysis are presented in Table 5.3 and in Charts 5.3, 5.4 and 5.5.

Table 5.3. Summary of accident rate data on E67 Via Baltica route sections

State	Section	Section name	Accident rate in number per 100 million veh-km		
			Fatalities	Injuries	Accidents
EST	EST_1	Laagri - Ääsmäe	1,077	11,847	27,787
EST	EST_2	Ääsmäe - Märjamaa	0,581	9,011	9,398
EST	EST_3	Märjamaa - Halinga	1,932	11,701	12,559
EST	EST_4	Halinga - Jänesselja	1,538	14,870	17,776
EST	EST_5	Jänesselja - Uulu	2,095	10,663	15,424
EST	EST_6	Uulu - Ikla (Border area)	0,877	10,524	16,224
EST TOTAL			**1,261**	**10,820**	**14,649**
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	0,646	8,400	32,954
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	2,261	16,328	41,699
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	2,449	18,773	41,900
LAT	LAT_13	Lilaste (V101) - Adazi	0,777	22,330	36,310
LAT	LAT_14	Adazi - Ryga bypass (A4)	2,114	23,888	54,965
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	4,842	73,171	114,061
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	2,573	35,160	66,032
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	0,669	17,055	38,124
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	0,592	3,257	31,981
LAT	LAT_19	Salaspils (A6) - Hydropower plant	4,564	101,924	351,411
LAT	LAT_21	Hydropower plant - Kekava (A7)	0,599	7,186	34,132
LAT	LAT_22	Kekava (A5) - Iecava (P93)	1,946	13,166	35,949
LAT	LAT_23	Iecava (P93) - Bauska City border	2,660	17,735	24,829
LAT	LAT_25	Bauska City border - LV border area	0,832	17,060	33,287
LAT TOTAL			**1,889**	**20,030**	**45,352**
Grand Total			**1,633**	**16,281**	**32,853**

As it can be seen, there is a major difference between sections for accident rates. Highest accident rate on fatalities (4,84 fatalities per 100 million veh-km) is on the section LAT_15 (Ryga bypass (A4) – Amatnieki (P2)). This is more than 2,5 times higher compared to the average on E67 Via Baltica route Latvia sections.

Highest accident rate on injuries and accident numbers is on the section LAT_19 (Salaspils (A6) – Hydropower plant).

Also, a major difference between E67 Via Baltica route Estonia and Latvia road sections accident rates is clearly visible.

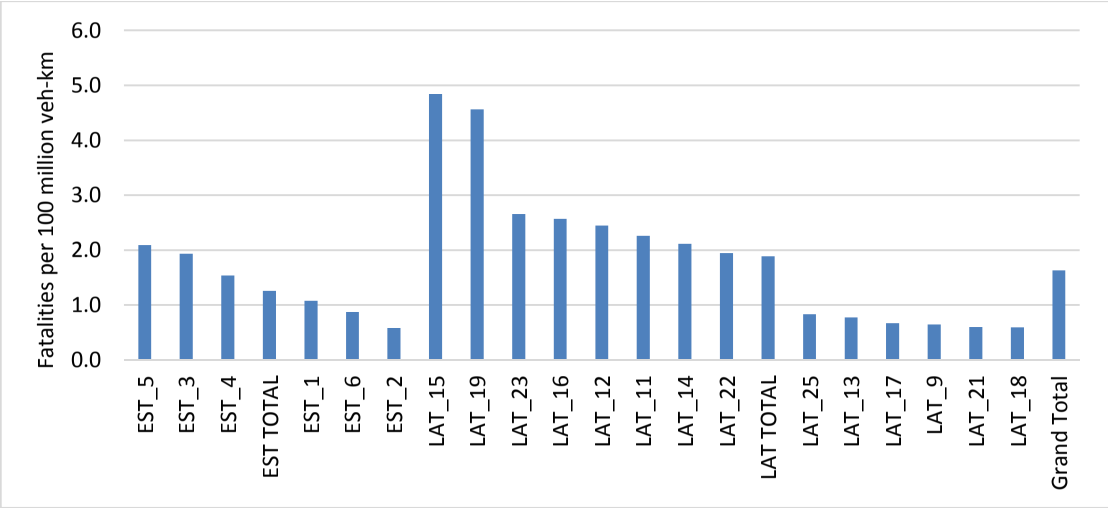


Chart 5.3. The number of fatalities per year per 100 million veh-km on E67 Via Baltica route sections

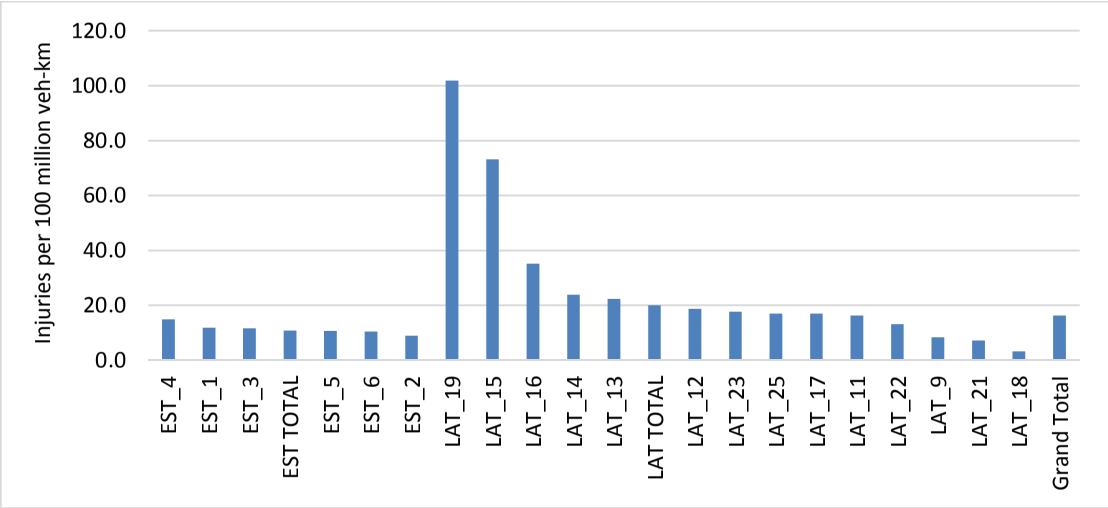


Chart 5.4. The number of injuries per year per 100 million veh-km on E67 Via Baltica route sections

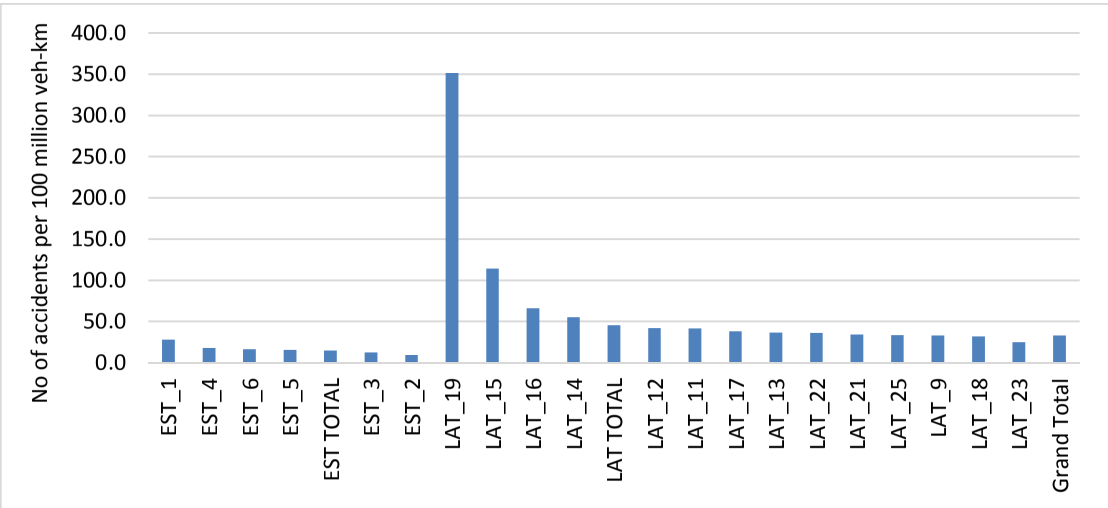


Chart 5.5. The number of accidents per year per 100 million veh-km on E67 Via Baltica route sections

5.2. Speed deviation

One of the project’s main goal is to reduce travel time and at the same reduce traffic accidents.

In Estonia it is quite common that drivers exceed the posted speed limits. Estonian Road Administration has ordered for many years corresponding studies/polls related to drivers’ driving speed behaviour. The poll shows that a significant amount of drivers presume that exceeding speed limits about +10 km/h is allowable. The same result can be seen in permanent traffic counting stations (*Chart 5.6*).

Road no 1 Tallinn-Narva (place – Varja) is an exception due the reason that there is a nearby automated speed control device (camera). As it can be seen from the chart, about 34% of drivers exceed speed limits up to 10 km/h and about 9% exceed the permitted speed limit more than 10 km/h.

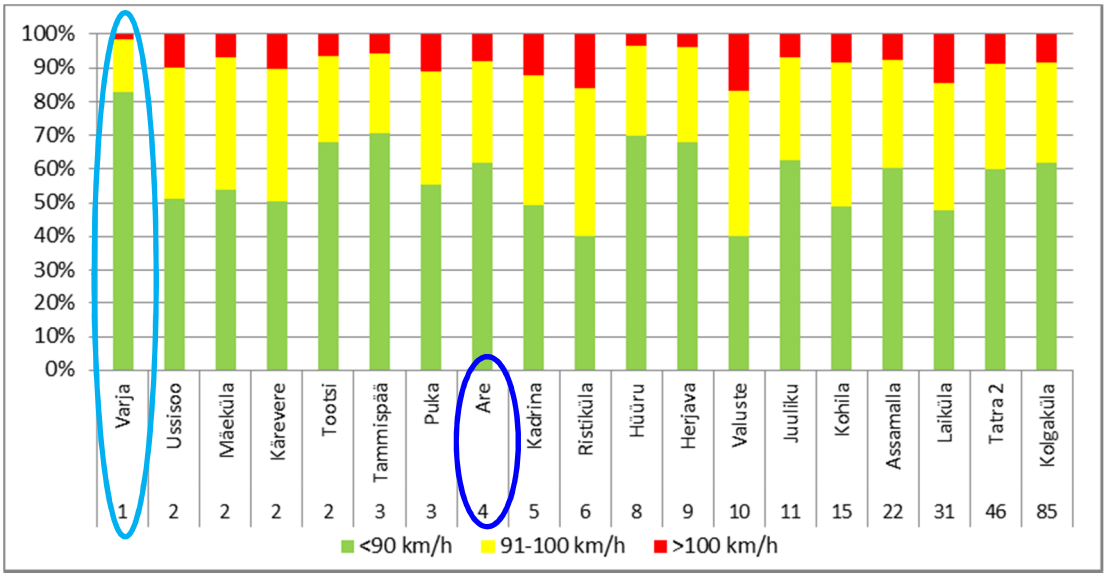


Chart 5.6. Percentage of driving speed (in chart – road number and place; permitted speed limit is 90 km/h)

Chart 5.7 shows four main types of speed distribution on Estonian main roads:

- 1-146,1 Varja (road no 1 Tallinn-Narva, km 146,1) – speed distribution is influenced by an automated speed control device located nearby;
- 2-69,7 Ussisoo (road no 2 Tallinn-Tartu-Võru-Luhamaa, km 69,7) – most common speed distribution on main roads;
- 4-107,8 Are (road no 4 Tallinn-Pärnu-Ikla, km 107,8) – influenced by high percentage of heavy traffic;
- 10-46,6 Valuste (road no 10 Risti-Virtsu-Kuivastu-Kuressaare, km 46,6) – the road to Estonia’s biggest island Saaremaa, slightly influenced by ferry traffic (drivers speed to catch the next ferry).

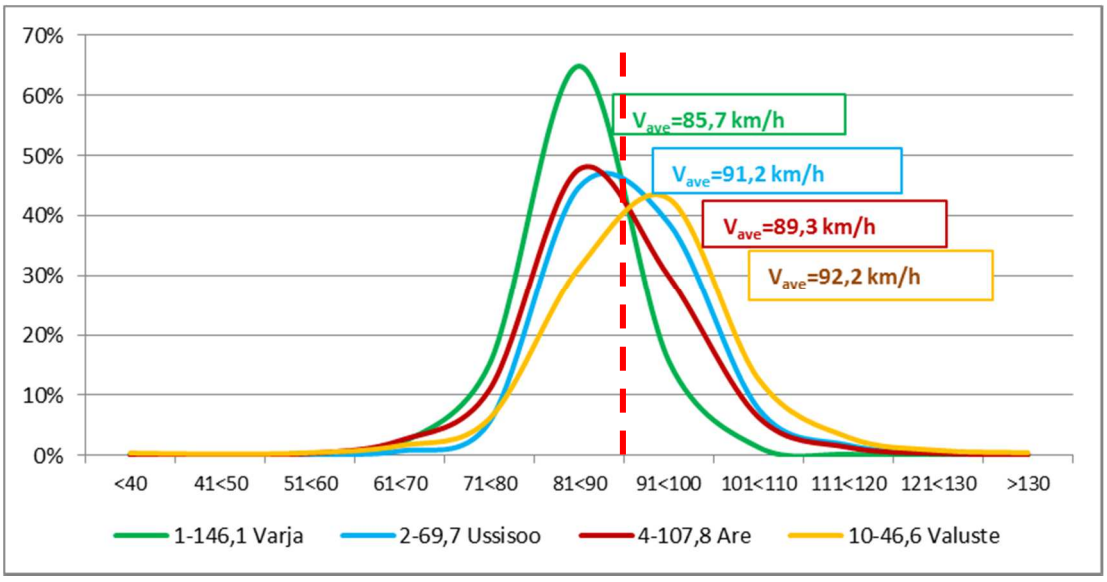


Chart 5.7. Distribution of driving speeds

Many researches have pointed out that the narrower the speed distribution, the higher the traffic safety level (traffic flow is more homogeneous, less passing over situations, less dangerous situations). If travel time is reduced, one of the reasons might be that more drivers are exceeding the permitted speed limit, and on another side this might lower the actual traffic safety level (and vice versa) on that road section. If the traffic flow is more smooth and homogeneous, it increases traffic capacity and should also improve the traffic safety.

The travel speed distribution curves below are calculated based on the permanent counting point’s data from year 2015. Consultants have used for analysis data available at that moment (E67 Via Baltica route Estonia sections). For Latvia E67 Via Baltica route sections speed data from permanent counting points was not available during ex-Ante surveys, but this information will be included to the analysis during ex-Post analysis.

The travel speed distribution curves are calculated separately for each driving direction. In addition, the summer period (June-August) data compared to the yearly average is also provided. The following Charts 5.8, 5.9 and 5.10 show the data collected from one of the permanent traffic counting points (road no 4, km 57,4). Data collected from other permanent traffic counting points can be found in Appendix 4.

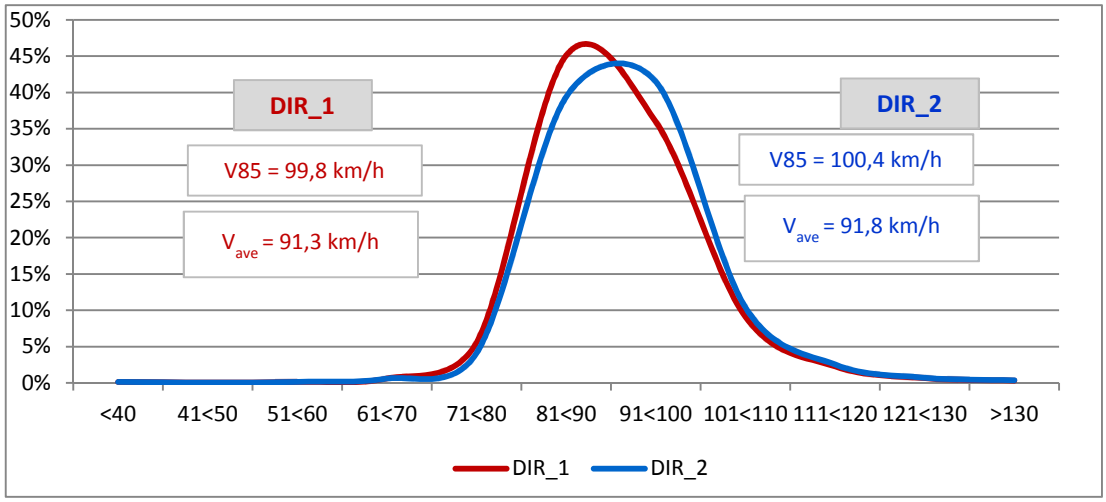


Chart 5.8. Distribution of driving speed E67_EST (road no 4 km 57,4 Vaimõisa)

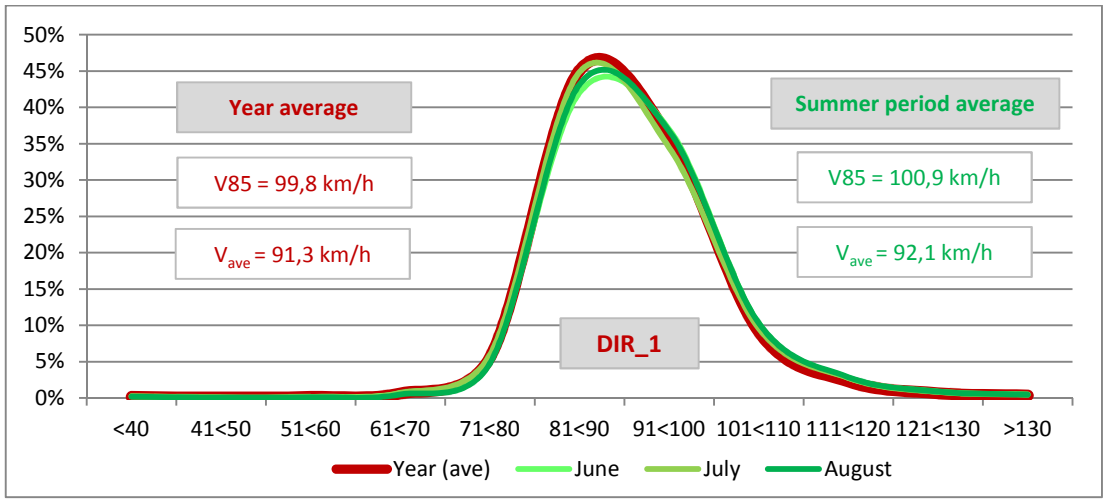


Chart 5.9. Distribution of driving speed E67_EST (road no 4 km 57,4 Vaimõisa) direction 1 annual and summer period average

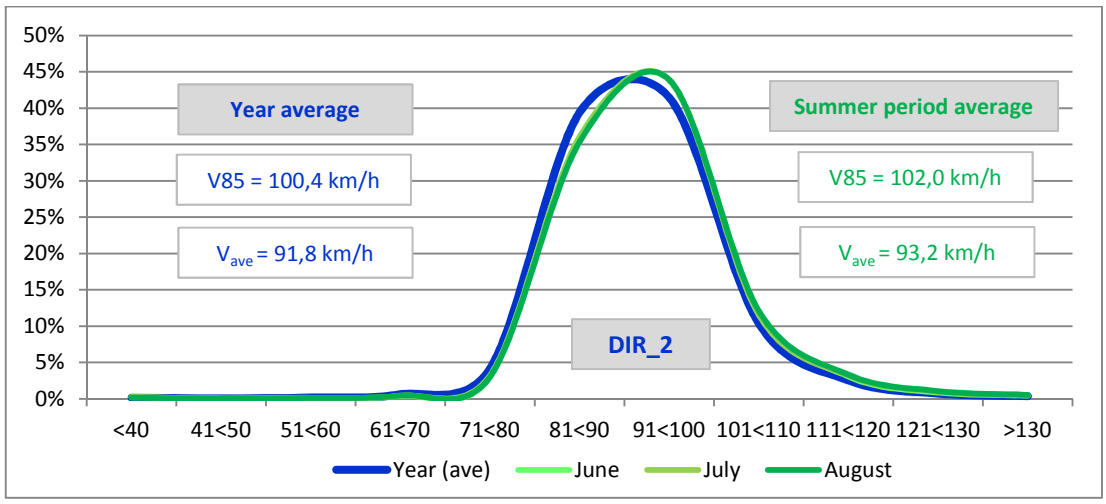


Chart 5.10. Distribution of driving speed E67_EST (road no 4 km 57,4 Vaimõisa) direction 2 annual and summer period average

6. ENVIRONMENTAL ISSUES

Vehicles emit exhaust fumes which in turn cause various damages to health, building materials, agriculture and on the environment in general. Health-related costs are regarded as one of the biggest expenses. Changes in vehicle speeds affect the amount of emissions discharged into the air by the vehicles. As the average speed decreases/increases, so does the amount of emissions.

Environmental effect modelling is based on vehicle emission modelling principles used in HDM-4 software[6].

6.1. Reduction of emissions

It is widely recognised that environmental effects need to be considered in the assessment of alternative investment policies and projects. By adopting projects and policies that minimise vehicle exhaust emissions, related benefits such as reduced pollution can be maximised.

The objective of modelling vehicle emissions is to assess the effects in terms of pollutant quantities and changes in the following:

- Road characteristics;
- Traffic congestion;
- Vehicle technology.

Table 6.1. The vehicle emission components modelled

Emission	Description	Sources	Harmful Effects	Scale
VOC, volatile organic hydrocarbons	Various hydrocarbon (HC) gasses	Fuel production, storage & tailpipes	Human health, ozone precursor	Local and Regional
Carbon monoxide (CO)	A toxic gas caused by incomplete combustion	Tailpipes	Human health, climate change	Very local
Nitrous oxide (NO_X)	Various compounds, some are toxic, all contribute to ozone	Tailpipes	Human health, ozone precursor, ecological damage	Local and Regional
Sulphur dioxide (SO_2)	Lung irritant and acid rain	Diesel vehicle tailpipes	Human health and ecological damage	Local and Regional
Carbon dioxide (CO_2)	A product of combustion	Fuel production and tailpipes	Climate change	Global
Fine particulates (PM10; PM2.5)	Inhalable particles	Tailpipes, brake lining, road dust, etc.	Human health, aesthetics	Local and Regional
Lead (Pb)	Element used in older fuel additives	Fuel additives and batteries	Human health, ecological damages	Local

[6] Volume 4. Analytical Framework and Model Description, The Highway Development and Management Series

The model used in HDM-4 predicts the different components of vehicle exhaust emissions as a function of fuel consumption. Fuel consumption is a function of vehicle speed, which in turn depends on road characteristics and the characteristics of the vehicle itself. The different components of emissions modelled and their descriptions, sources and impact effects are described in Table 6.1.

The relationships and model coefficients have been adjusted in the model so that all emissions predictions are in terms of grammes per vehicle-kilometre.

The following primary data is required for modelling vehicle emissions:

- Traffic volume of the road section (the annual traffic volume during each flow period);
- Length of road section;
- Vehicle speeds;
- Fuel consumption;
- Vehicle service life and model parameters;
- Operating conditions (emissions per mile increase under hilly and stop-and-go conditions, and at low and high speeds).

For each analysed section option and for each analysis year, the quantities of each component of exhaust emissions are computed separately for each vehicle type and for each traffic flow period. The annual total quantities of emissions are obtained by summing over all the vehicle types.

The comparison of each pair of investment options is based on the changes in the annual net difference in the predicted quantities of emissions (by component).

Still, there are several issues that may arise when estimating emissions and gained benefits from the investments. Current models are not yet very accurate at predicting how factors such as changes in driving cycles and congestion impacts will affect overall emissions, nor how human health is affected exactly where people are exposed, and who is affected. There is still a lot that is not understood about the relationship between emissions and human health. It is unclear whether the combined effect of several pollutants is worse than the effect of a single pollutant. Other pollutants may only affect human health once their ambient concentration is above a certain threshold.

6.2. Unit costs of emissions

The unit costs of different emission components which were used for this analysis are based on the research results of RICARDO-AEA (2014)[7] paper. In addition, the data presented in Jüssi et al. (2008)[8] research report was taken into account. CO_2 unit costs are based on the results described in the Synapse Energy Economics Inc study[9] (Chart 6.1).

Table 6.2 shows the different emission components and their unit costs which were taken into account in this study.

Table 6.2. Damage costs of main pollutants from transport, in € per tonne (2015)

Emission	Unit cost, euro/t			Remarks
	Estonia	Latvia	Total	
VOC, volatile organic hydrocarbons (HC)	1 243	1 671	1 457	
Carbon monoxide (CO)	-	-	-	Based on the literature amounts are considered to be so small that they are not calculated
Nitrous oxide (NO_X)	5 820	9 040	7 430	
Sulphur dioxide (SO_2)	9 410	11 148	10 279	
Carbon dioxide (CO_2)*	15	15	15	
Fine particulates (PM10; PM2.5), rural	17 122	21 769	19 446	
Fine particulates (PM10; PM2.5), suburban	55 681	59 794	57 737	
Lead (Pb)	-	-	-	Unit cost of the component could not be defined from the literature

*** CO_2 unit cost is the 10 year average value of Mid case scenario**

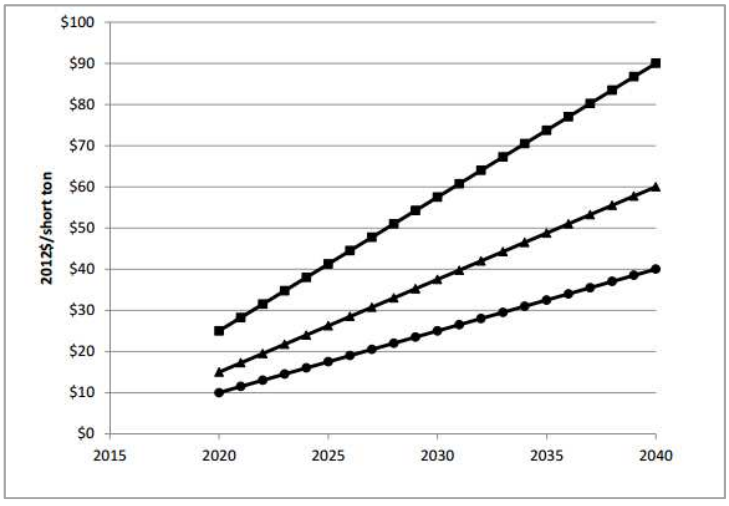


Chart 6.1. Synapse 2013 CO_2 Price Trajectors, Low case, Mid case and High case

[7] Update of the Handbook on External Costs of Transport, Final Report, Report of the European Comission, RICARDO-AEA, 2014

[8] Jüssi, M., Anspal, S., Kallaste, E., Transpordi väliskulude hindamine: hindamismetoodika ja sisendandmete kaardistus. 2008

[9] CO_2 Price Report, Spring 2014, Synapse Energy Economics Inc

7. ANALYSIS RESULTS

In order to assess the impact that the ITS-equipment will have on the behaviour of road users, once it is installed onto the E67 Via Baltica route road sections, and the resulting economic effectiveness and if the expected travel time savings for passangers and cargos has been decreased in the amount (0,57%) defined in the project Smart E67 objectives, the made investments' impacts must be taken into account on a longer period of time. Considering the ITS-equipments' life span which will be installed along the E67 Via Baltica route sections, the Consultant estimates that a reasonable analysis period for Ex-Ante and Ex-Post analyses is 10 years. The discount rate[10] to be used for the analysis is 4,0% (comparison between Ex-Ante and Ex-Post).

A summary of the Ex-Ante analysis results of the E67 Via Baltica route's Estonia and Latvia's road sections can be viwed in the following Tables and Charts. Tabel 7.1 and Charts 7.1 and 7.2 show the total cost of road users during the analysed period of 10 years. Costs are shown separately for every road section, for Estonia and Latvia, and for the whole E67 Via Baltica route. The values shown in Tables and Charts have not been discounted.

Table 7.1. Road user costs over 10 year period on E67 Via Baltica route, in million €

Section	Section name	Total costs over 10 year period, million euro					
		MT Vehicle Operation	Travel Time	Accidents	Emissions	Total (TrT, Acc, Emi)	Grand Total
EST_1	Laagri - Ääsmäe	203,7	21,6	18,3	17,9	57,8	261,5
EST_2	Ääsmäe - Märjamaa	670,7	59,1	23,7	72,0	154,7	825,4
EST_3	Märjamaa - Halinga	673,4	54,4	56,3	76,1	186,8	860,3
EST_4	Halinga - Jänesselja	398,2	35,1	31,1	43,0	109,2	507,4
EST_5	Jänesselja - Uulu	316,2	34,3	33,4	50,8	118,5	434,6
EST_6	Uulu - Ikla (Border area)	686,3	45,2	23,0	86,6	154,8	841,1
EST TOTAL		**2 948,4**	**249,7**	**185,8**	**346,4**	**781,9**	**3 730,3**
LAT_9	Ainazi (Border area) - Salacgriva City border	174,1	12,0	4,8	29,8	46,7	220,7
LAT_11	Salacgriva City border - Jelgavkrasti (P11)	409,2	30,4	34,4	68,3	133,0	542,2
LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	604,8	51,0	69,1	92,8	212,8	817,6
LAT_13	Lilaste (V101) - Adazi	347,6	36,3	24,4	46,8	107,5	455,0
LAT_14	Adazi - Ryga bypass (A4)	331,0	46,3	42,8	40,0	129,2	460,1
LAT_15	Ryga bypass (A4) - Amatnieki (P2)	147,1	15,4	41,2	20,6	77,2	224,2
LAT_16	Amatnieki (P2) - Ulupji (P4)	93,2	9,1	13,4	13,5	36,1	129,2
LAT_17	Ulupji (P4) - Saulkalne (A6)	246,7	23,3	11,9	36,7	71,9	318,6
LAT_18	Saulkalne (A4) - Salaspils (A5)	222,2	27,4	8,4	40,1	75,8	298,0
LAT_19	Salaspils (A6) - Hydropower plant	57,4	6,2	17,9	7,6	31,8	89,2
LAT_21	Hydropower plant - Kekava (A7)	135,6	13,4	4,8	19,7	37,9	173,5
LAT_22	Kekava (A5) - Iecava (P93)	746,5	68,0	64,2	112,1	244,4	990,9
LAT_23	Iecava (P93) - Bauska City border	508,2	42,1	54,6	79,5	176,2	684,4
LAT_25	Bauska City border - LV border area	292,2	20,3	10,6	50,5	81,4	373,6
LAT TOTAL		**4 315,7**	**401,3**	**402,5**	**658,0**	**1 461,8**	**5 777,5**
Grand Total		**7 264,1**	**651,0**	**588,3**	**1 004,4**	**2 243,7**	**9 507,8**

[10] Komisjoni delegeeritud määrus (EL) nr 480/2014, Artikkel 19 Rahavoogude diskonteerimine

In the summary table for the Ex-Ante analysis results vehicle operation costs (VOC) are included in addition to road users' costs (travel time, accidents, emissions), as it is an important expense component, accounting for almost ¾ (or 76%) of all the road users' expenses. Travel time costs make up 7% of all the road users' expenses, traffic accidents account for 6%, and emissions make up 11%. During the period of 10 years, the total cost of road users on the E67 Via Baltica route Estonia and Latvia's road sections is 9,5 billion euros. On the Estonian road sections the road users cost 3,7 billion euros, and on the Latvian road sections the users cost 5,8 billion euros.

The expense components (travel time, accidents, emissions) taken into account for this project account for 2,24 billion euros over the period of 10 years. That distributes between Estonia and Latvia for 0,78 and 1,46 billion euros respectively. Thus, the cost of road users in Estonia, within the given parameters, is almost two times lower than in Latvia.

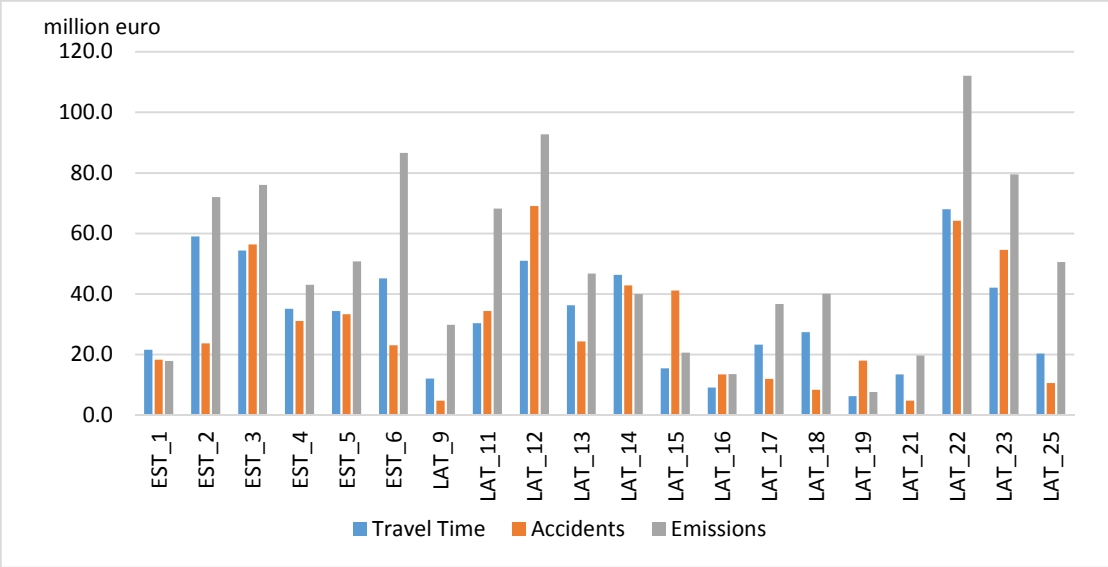


Chart 7.1. Travel time, accident and emission costs on E67 Via Baltica route sections, million €

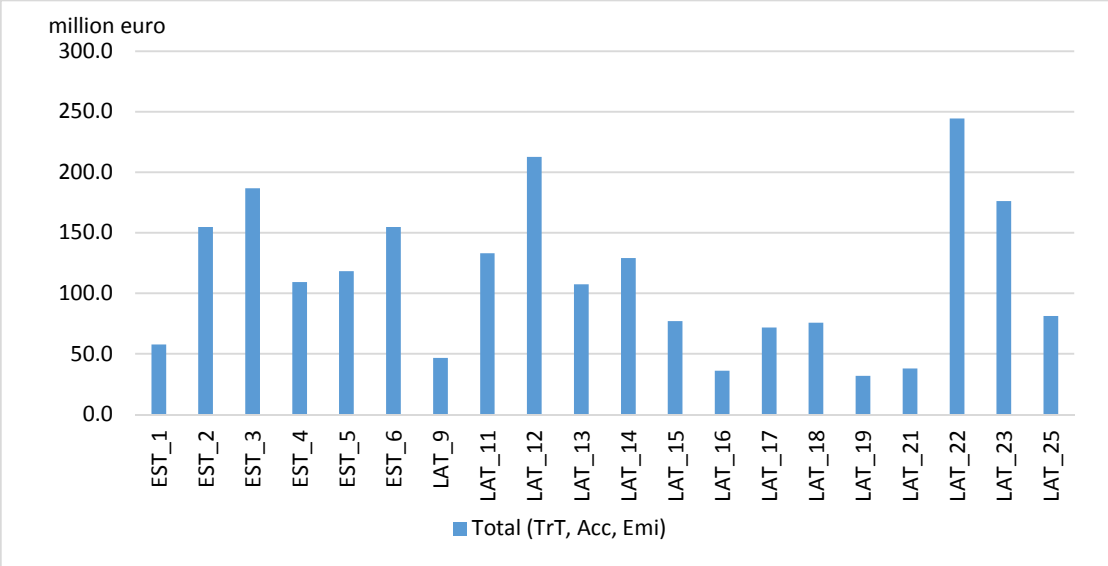


Chart 7.2. Total costs (travel time, accident and emission) on E67 Via Baltica route sections, million €

Table 7.2 and Charts 7.3 and 7.4 demonstrate the cost comparison of an average 1 km coverage by road users on the E67 Via Baltica route over a period of 10 years.

Table 7.2. Road user costs over 10 year period on E67 Via Baltica route, in € per year/km

Section	Section name	Average costs per year/km, euro					Grand Total
		MT Vehicle Operation	Travel Time	Accidents	Emissions	Total (TrT, Acc, Emi)	
EST_1	Laagri - Ääsmäe	1 441 549	152 898	129 334	126 814	409 046	1 850 596
EST_2	Ääsmäe - Märjamaa	1 812 906	159 633	64 052	194 618	418 304	2 231 210
EST_3	Märjamaa - Halinga	1 747 193	141 143	146 147	197 427	484 717	2 231 910
EST_4	Halinga - Jänesselja	1 996 170	176 145	155 878	215 607	547 630	2 543 800
EST_5	Jänesselja - Uulu	1 687 750	183 267	178 030	271 022	632 319	2 320 069
EST_6	Uulu - Ikla (Border area)	1 361 657	89 594	45 705	171 867	307 166	1 668 823
EST TOTAL		**1 649 474**	**139 685**	**103 934**	**193 797**	**437 416**	**2 086 890**
LAT_9	Ainazi (Border area) - Salacgriva City border	1 470 541	101 697	40 507	251 985	394 188	1 864 729
LAT_11	Salacgriva City border - Jelgavkrasti (P11)	1 336 057	99 249	112 212	222 856	434 316	1 770 374
LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	1 690 745	142 543	193 132	259 298	594 974	2 285 719
LAT_13	Lilaste (V101) - Adazi	2 420 433	252 908	169 781	325 625	748 314	3 168 747
LAT_14	Adazi - Ryga bypass (A4)	4 768 914	667 649	616 976	576 465	1 861 090	6 630 004
LAT_15	Ryga bypass (A4) - Amatnieki (P2)	3 016 833	315 987	844 665	422 310	1 582 962	4 599 795
LAT_16	Amatnieki (P2) - Ulupji (P4)	2 079 277	203 751	300 120	301 806	805 677	2 884 954
LAT_17	Ulupji (P4) - Saulkalne (A6)	2 223 772	209 933	107 520	330 589	648 042	2 871 814
LAT_18	Saulkalne (A4) - Salaspils (A5)	3 976 548	489 712	149 970	717 471	1 357 153	5 333 702
LAT_19	Salaspils (A6) - Hydropower plant	2 392 153	259 598	747 842	316 452	1 323 892	3 716 044
LAT_21	Hydropower plant - Kekava (A7)	2 360 655	233 423	83 515	343 241	660 178	3 020 833
LAT_22	Kekava (A5) - Iecava (P93)	2 965 542	270 021	255 209	445 510	970 739	3 936 281
LAT_23	Iecava (P93) - Bauska City border	2 425 252	201 145	260 331	379 455	840 931	3 266 183
LAT_25	Bauska City border - LV border area	1 771 608	123 108	64 041	306 263	493 411	2 265 020
LAT TOTAL		**2 198 069**	**204 405**	**204 992**	**335 116**	**744 514**	**2 942 582**
Grand Total		**1 936 635**	**173 562**	**156 833**	**267 771**	**598 166**	**2 534 801**

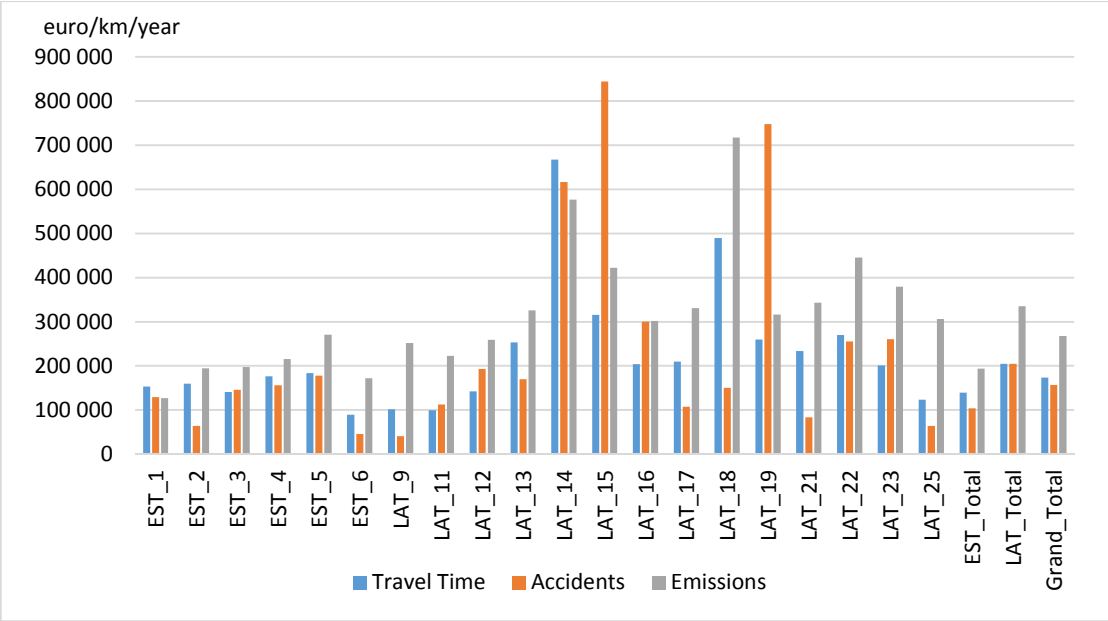


Chart 7.3. Travel time, accident and emission costs on E67 Via Baltica route sections, €/km/year

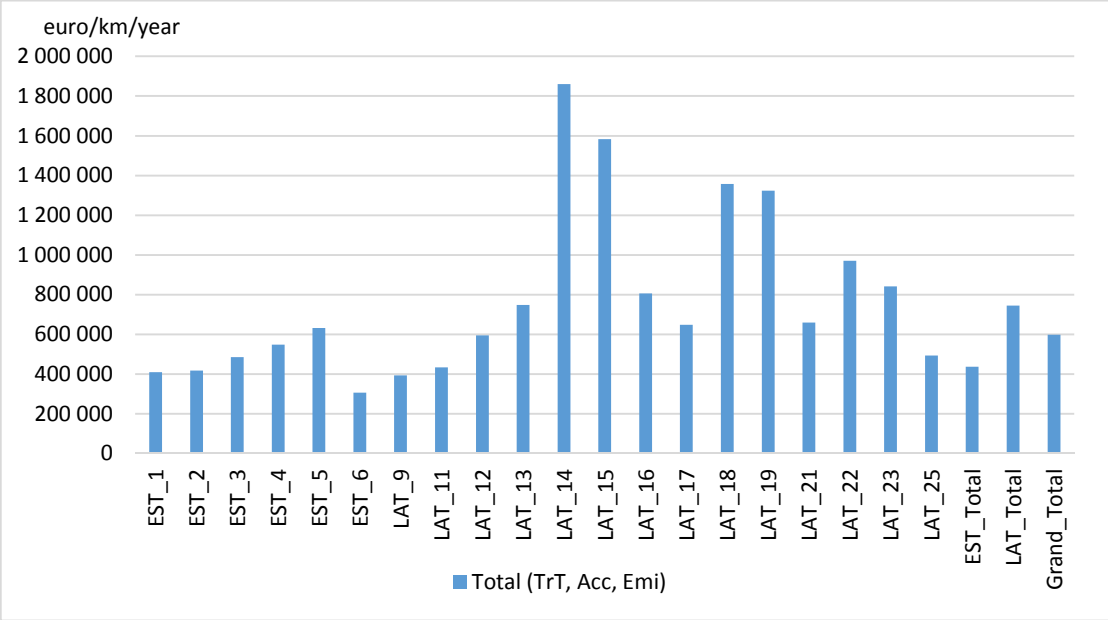


Chart 7.4. Total costs (travel time, accident and emission) on E67 Via Baltica route sections, €/km/year

APPENDIX 1. Minutes of meetings

SMART E 67 Project CB241 "Advanced traffic management on E67 transport corridor"

INTERREG Central Baltic Region Programme 2014 -2020
Project CB 241**Advanced traffic management on E67 transport corridor/ SMART E67**

Smart E67 Ex-Ante/ Ex Poste study
Kick-off meeting memo
03 May 2016, Tallinn, Estonia

Minutes of the meeting

1. Two meetings have taken place with consultant before the official kick-off meeting. The first meeting was in Maanteeamet 09.05.16, after the procurement winner was selected. Maanteeamet representative K. Duubas introduced the survey tasks and objective. Several data sets were identified and delivered to consultant.

2. Second meeting (Skype) with consultant was held in the Smart E67 project meeting 25.06.2016. Consultant introduced himself to both project teams to LV and EE. The contract has been signed by all three parties on 30 May 2016, and has come in force with this date, the works has started. During the skype meeting the approach and methodology as well as data gathering process was discussed. ERC CONSULTING LTD will carry out Ex-ante/ex-post analysis (www.ercc.ee). For the analysis WAZE data will be used for ex-ante/ex-post analysis. The consultant will send data request (script, what kind of data are necessary) to ERA and LSR within 1-2 weeks. Start recording data as soon as possible when LV sections of E67 are clarified. Make arrangements to start recording. Partners will inform the contractor about the responsible contact persons for the task from partner organizations. LSR will confirm E67 sections included in evaluation within 2 weeks. Seasonal road repair sections on E67 should be considered. WAZE data will be recorded 90 days (30 days methodology and 90 data record days).

3. Official Kick-Off Skype meeting was held in 03.06.2016 Tallinn with consultant and clients representative K. Duubas. The data gathering status was looked over and final selection of road sections will be sent to client after LSR confirmed the sections of E67 in LV. Before that Waze recordings are not needed. Consultant shall have LV E67 site inspections and meeting with LSR in week 23. Road work (restriction) information is needed, from client public systems www.tarktee.ee the road work section are identifiable. ERA can deliver also historical csv data (Road no, start date/ end date) from restrictions database, consultant must give the exact request to ERA.

4. Next status meeting will be held week 26 (29 or 30.06.16)

Composed by Kristjan Duubas
Maanteeamet

EUROPEAN UNION Interreg Central Baltic

SMART E 67 Project CB241 "Advanced traffic management on E67 transport corridor"

INTERREG Central Baltic Region Programme 2014 - 2020
Project CB 241**Advanced traffic management on E67 transport corridor/ SMART E67**

Smart E67 Ex-Ante/ Ex Poste study

Minutes of the meeting

Location: LRA, Riga, Latvia

Time: June 09, 2016

Participants:

Mr. Borisa Jelisejevs – LRA, Head of TIC, project manager of "Smart E67" (methodology, common contact person for ERCC);

Mr. Lauris Vilnitis – LRA, Manager of TIC, communication specialist (Waze data, shp file, municipality stretches within the route, seasonal speed limits);

Mr. Martins Liepins – LRA, Senior specialist, ITS expert (instrumental traffic counting data, average speeds, MSVisio file of road equipment/permanent signs etc);

Mr. Lauris Naumovs – LRA, Senior specialist, ITS expert (have no direct involvement in ex/ante activity)

Mr. Tiit Kaal – ERC Consulting Ltd., consultant/project manager of "Smart E67"

Mrs. Luule Kaal – ERC Consulting Ltd., consultant/traffic expert

Purpose of the meeting was to have a direct contact between the Consultant and the Employer (LRA) representatives and to clarify the Employer expectations and to discuss about the detailed performance data listing.

As a part of the visit the Consultant had also a site visit to the whole project area (road E67), from Tallinn to Latvian/Lithuanian border.

Agenda

Following project related issues and items were discussed and decided:

- Waze sections – draft list of sections has been prepared by the Consultant (based on the traffic counting data) and sent to the Employer (LRA). Based on the local conditions there will be made some changes, also municipality owned sections will be separated. It was agreed that the Employer (LRA) will review the Waze sections and send final version to the Consultant during week 24, after what Waze data registration can be started both in Estonia and in Latvia;
- The route of E67 in Latvia will be described in detail, all Waze sections and Municipality sections (not included to the study) will have precise road address (start and end kilometre);
- Description of activities and devices to be installed to the route E67 under this project in Latvia was explained by the Employer (LRA). Major effort will be contributed to the installation of VMS. Additional information can be delivered to the Consultant based on the detailed request;

EUROPEAN UNION Interreg Central Baltic

- Traffic counting data and location of the actual traffic counting points is available and data will be delivered to the Consultant based on the detailed request;
- Traffic accident data is available and data will be delivered to the Consultant based on the detailed request;
- Pavement condition data is available and data will be delivered to the Consultant based on the detailed request;
- Speed limit data and information of the construction sites will be delivered to the Consultant based on the detailed request;
- Traffic prognosis data for the route E67 (Latvian sections) will be delivered to the Consultant based on the detailed request.

Prepared by Mr. Tiit Kaal
ERC Consulting Ltd.

Accepted by Mr. Boriss Jelisejevs
LRA, Head of TIC, project manager of "Smart E67"

INTERREG Central Baltic Region Programme 2014 - 2020
Project CB 241**Advanced traffic management on E67 transport corridor/ SMART E67**

Smart E67 Ex-Ante/ Ex Poste study

Minutes of the meeting

Location: ERA, Estonia, Tallinn

Time: June 27, 2016

Participants:

Mr. Kristjan Duubas – ERA, ITS project manager, EE project coordinator of "Smart E67" (contact person for ERCC);

Mr. Tiit Kaal – ERC Consulting Ltd., consultant/project manager of "Smart E67"

Mrs. Luule Kaal – ERC Consulting Ltd., consultant/traffic expert

Purpose of the meeting was to introduce the key performance indicators and methodology of Ex Ante/ Ex Poste study.

Agenda

Following project related issues and items were discussed and decided:

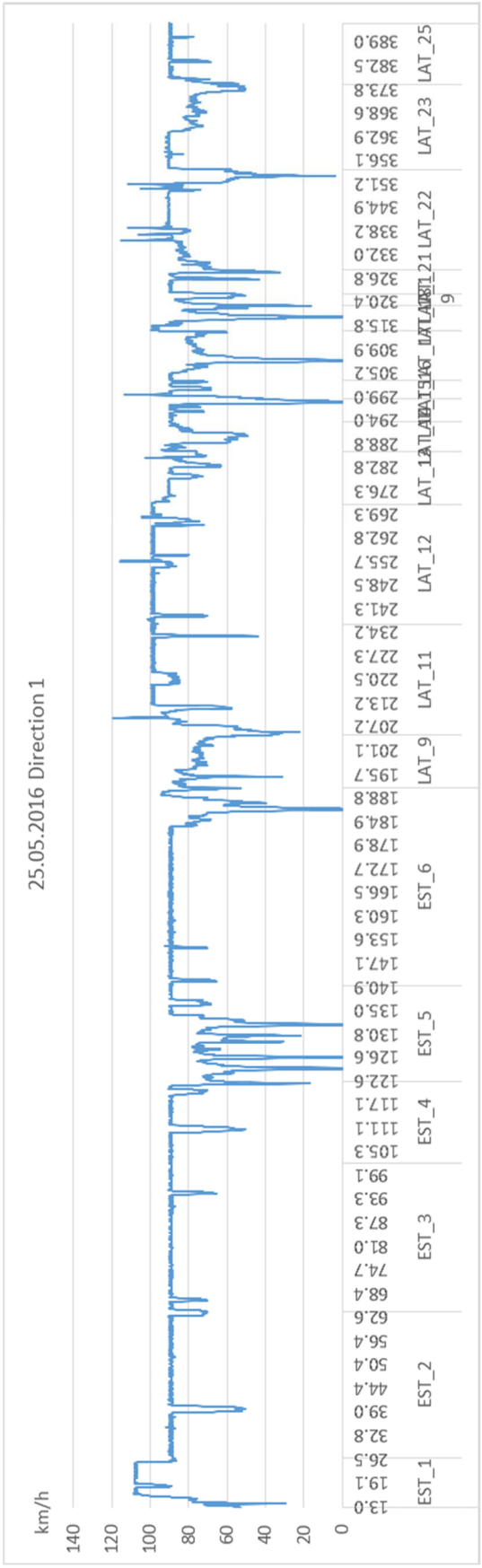
- Consultant introduced key performance indicators and methodology, main component is HDM module. Client accepted the indicators and methodology. Methodology is described in Annex 1

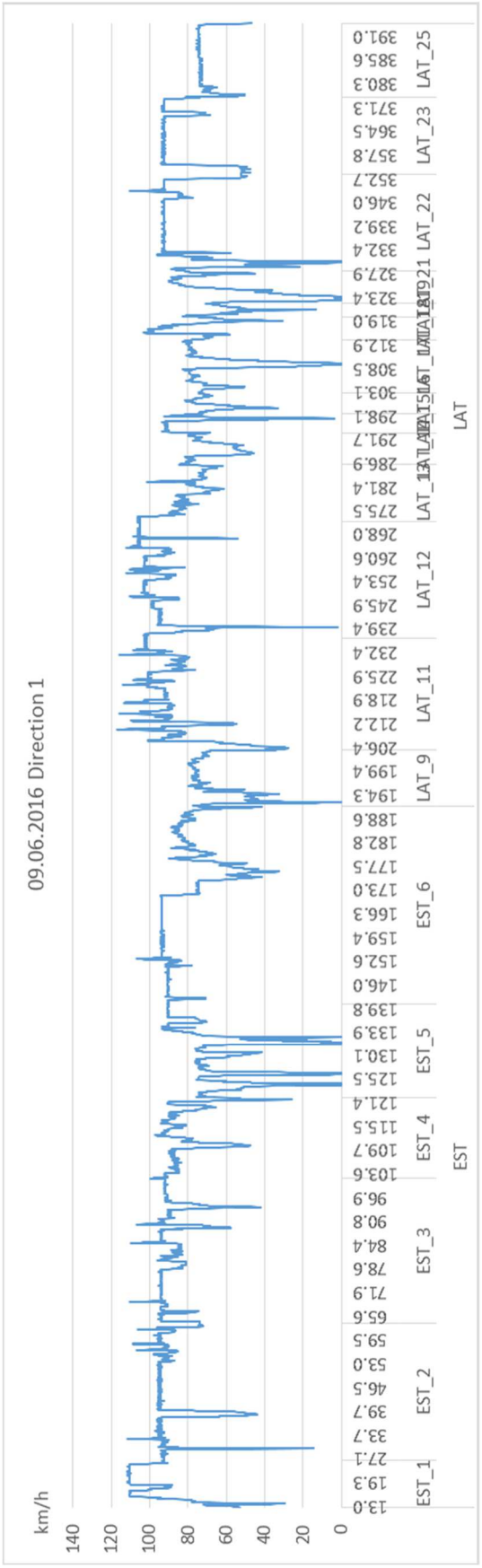
- Waze sections are ready for data recording. Client will forward section data to Waze.

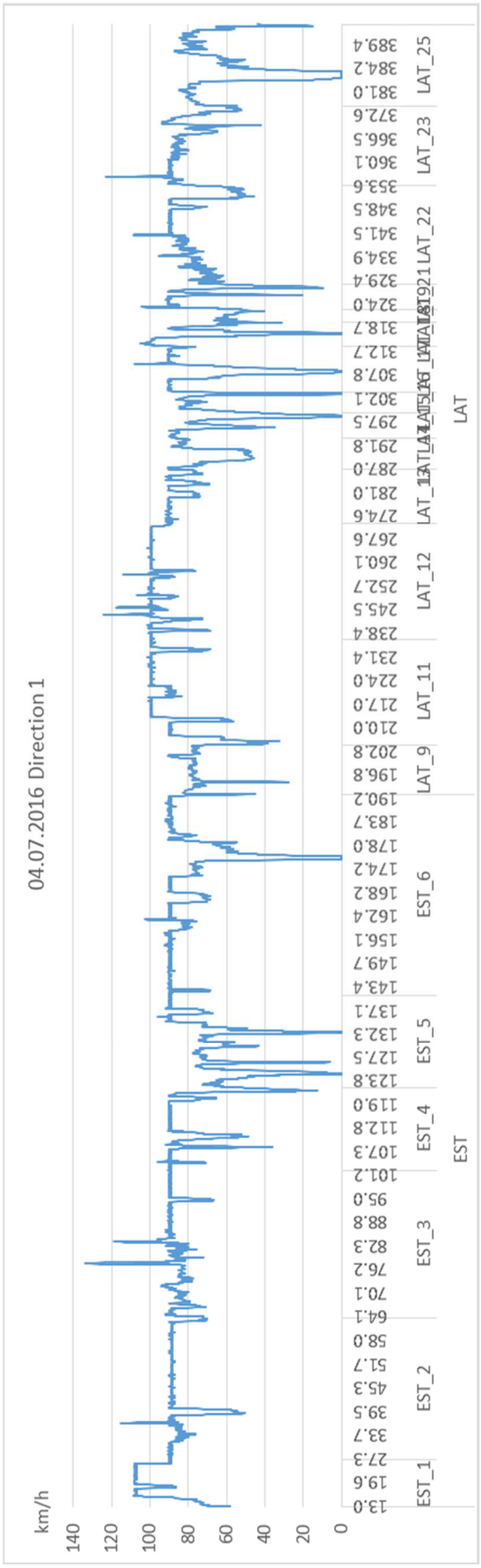
Prepared by Mr. Tiit Kaal
ERC Consulting Ltd.

Accepted by Mr. Kristjan Duubas
ERA, EE project coordinator of "Smart E67"

APPENDIX 2. In–site car trips driving speed data



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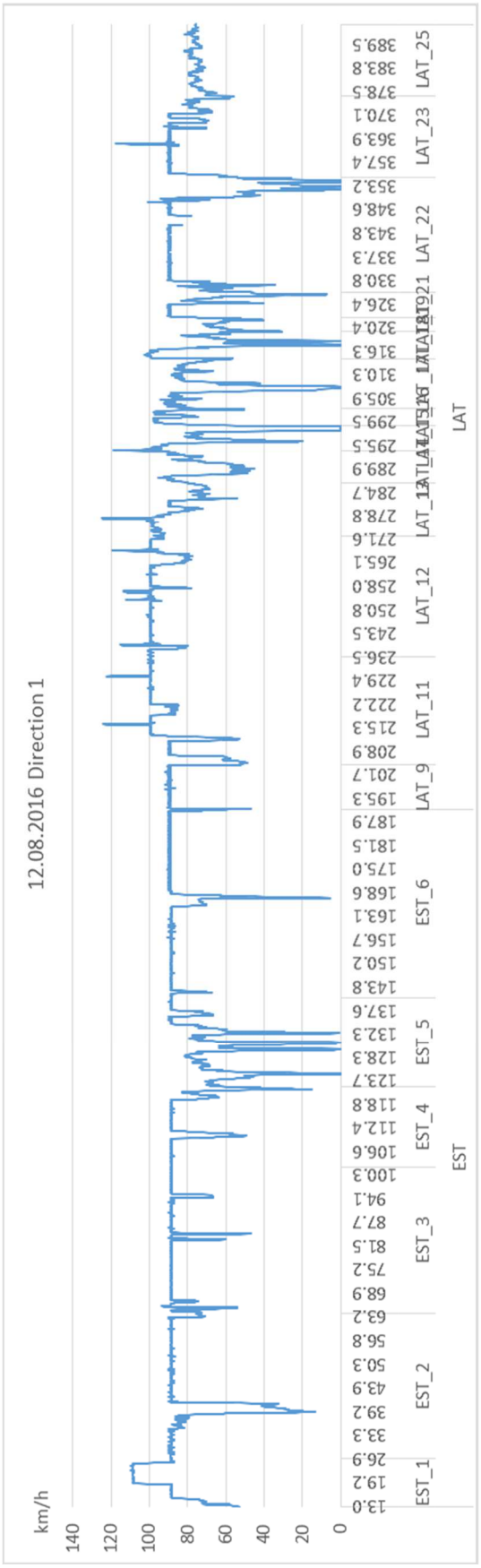
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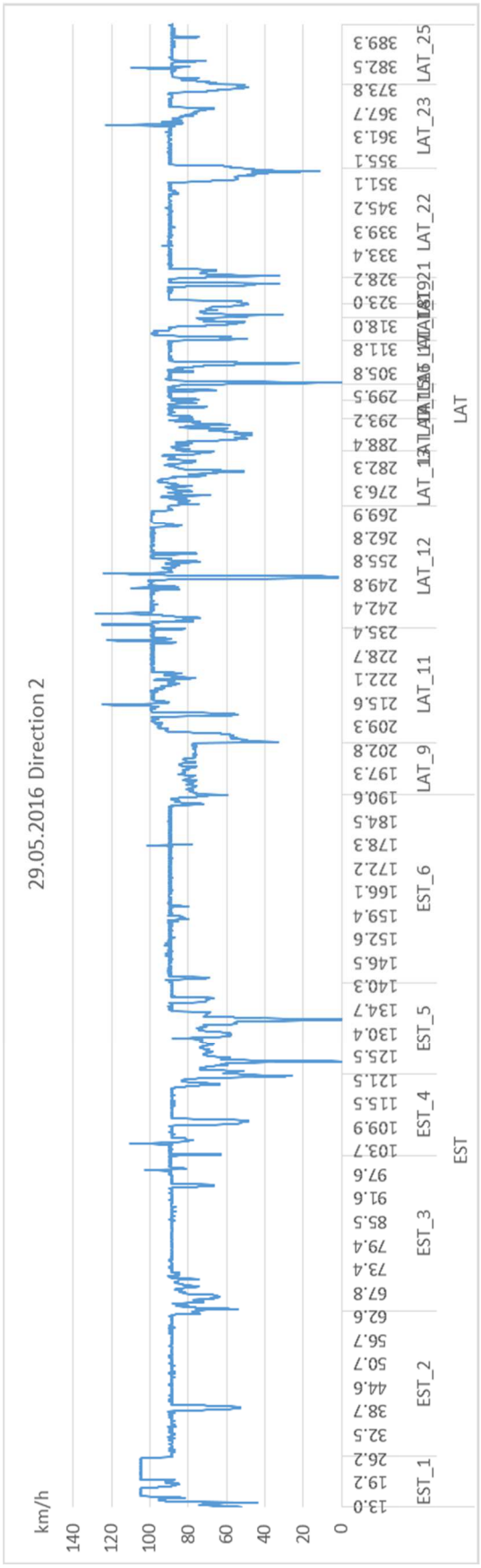
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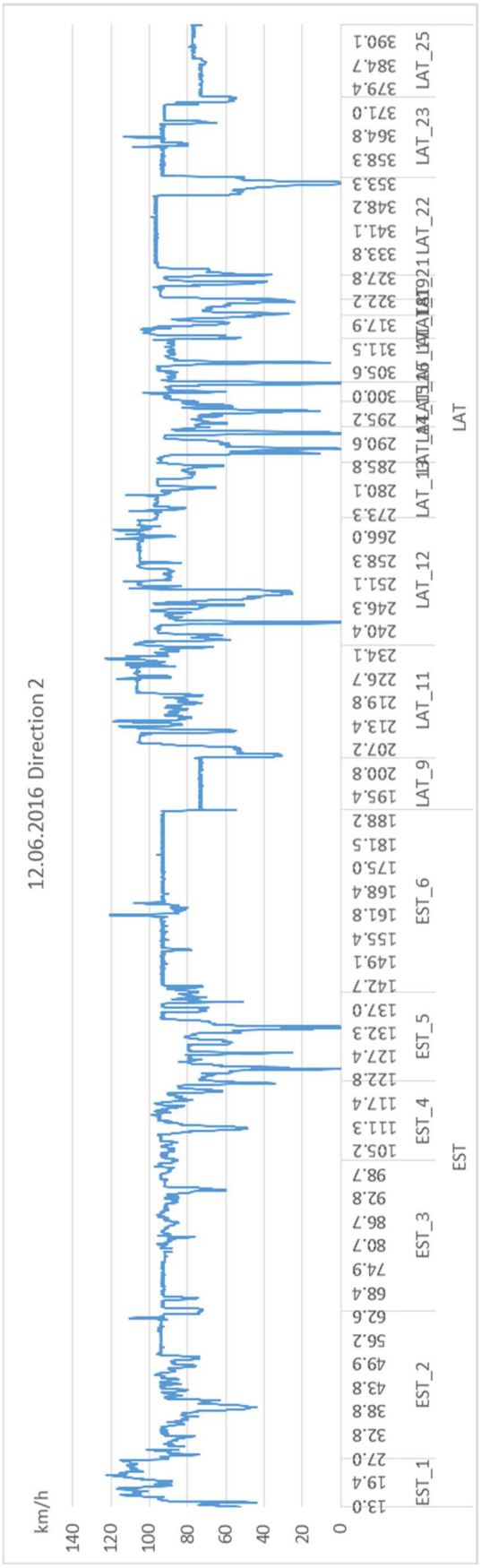
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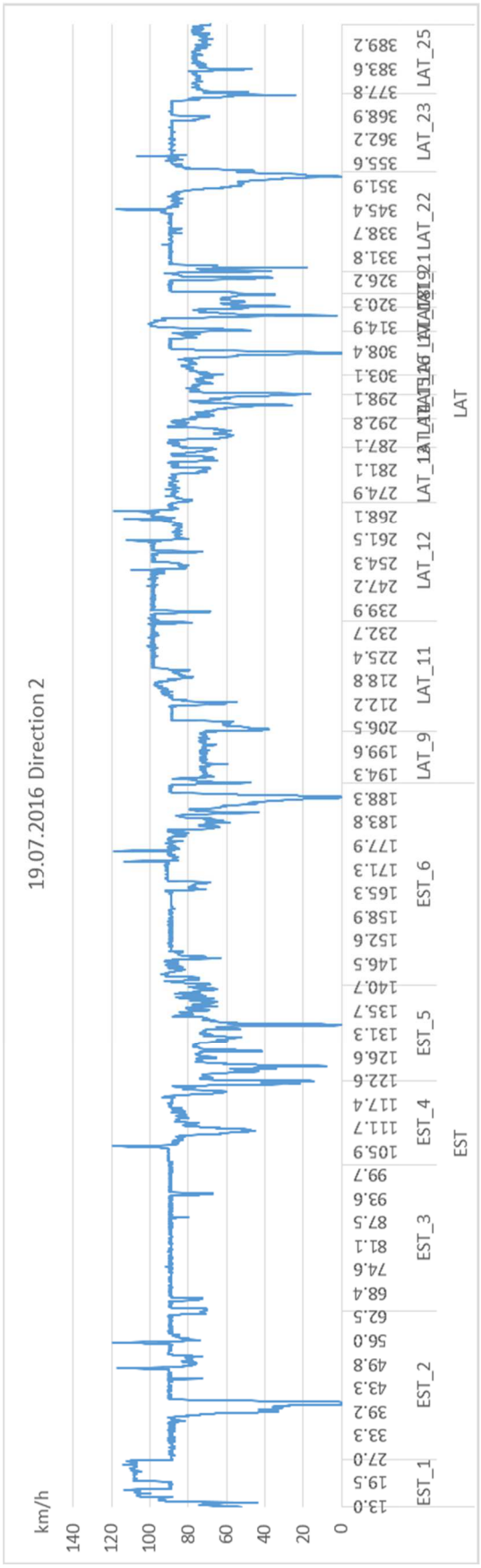
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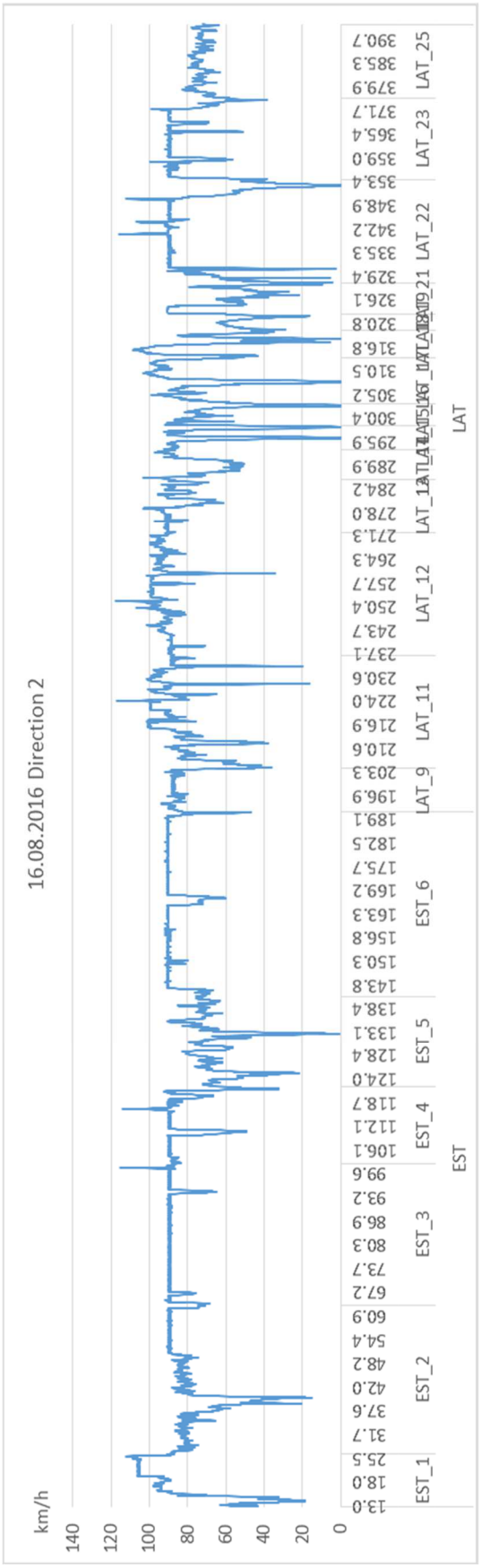
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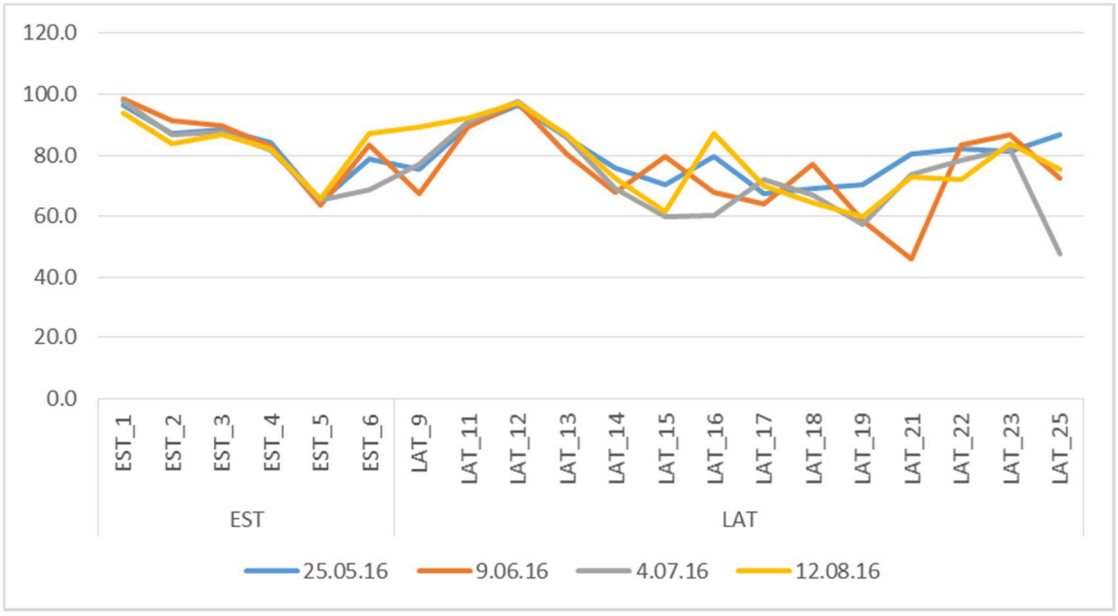

Chart A.2.1. Average driving speed variation on the E67 Via Baltica route sections based on the In-site car trips, DIR1

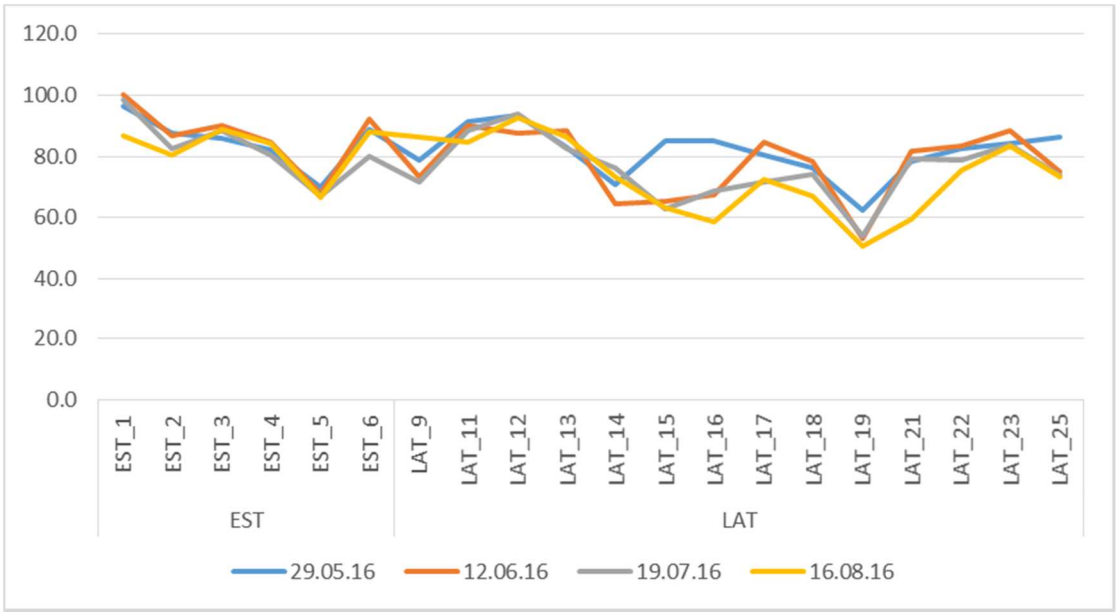

Chart A.2.2. Average driving speed variation on the E67 Via Baltica route sections based on the In-site car trips, DIR2

APPENDIX 3. Traffic accident data

State	Section	Section name	Accident type	Fatalities	Injuries	Accidents
EST	EST_1	Laagri - Ääsmäe	Collision with other obstacle	0	1	56
EST	EST_1	Laagri - Ääsmäe	Side-impact collision	1	10	20
EST	EST_1	Laagri - Ääsmäe	Rear-end collision	0	20	17
EST	EST_1	Laagri - Ääsmäe	Vehicle driving off the road	1	7	9
EST	EST_1	Laagri - Ääsmäe	Collision with pedestrian	2	5	8
EST	EST_1	Laagri - Ääsmäe	Collision with stopped vehicle	0	3	6
EST	EST_1	Laagri - Ääsmäe	Other accident	0	2	6
EST	EST_1	Laagri - Ääsmäe	Collision with an animal	0	4	3
EST	EST_1	Laagri - Ääsmäe	Collision with obstacle	0	0	2
EST	EST_1	Laagri - Ääsmäe	Head-on collision	1	4	2
EST	EST_1	Laagri - Ääsmäe	Vehicle rollover	0	0	1
EST	**EST_1 Total**			**5**	**56**	**130**
EST	EST_2	Ääsmäe – Märjamaa	Head-on collision	1	34	21
EST	EST_2	Ääsmäe – Märjamaa	Side-impact collision	0	17	19
EST	EST_2	Ääsmäe – Märjamaa	Vehicle driving off the road	2	18	17
EST	EST_2	Ääsmäe – Märjamaa	Collision with other obstacle	0	6	15
EST	EST_2	Ääsmäe – Märjamaa	Rear-end collision	2	10	12
EST	EST_2	Ääsmäe – Märjamaa	Other accident	0	7	9
EST	EST_2	Ääsmäe – Märjamaa	Collision with stopped vehicle	0	2	2
EST	EST_2	Ääsmäe – Märjamaa	Collision with an animal	1	1	2
EST	EST_2	Ääsmäe – Märjamaa	Collision with obstacle	0	0	2
EST	EST_2	Ääsmäe – Märjamaa	Vehicle rollover	0	1	1
EST	**EST_2 Total**			**6**	**96**	**100**
EST	EST_3	Märjamaa - Halinga	Vehicle driving off the road	4	48	32
EST	EST_3	Märjamaa - Halinga	Side-impact collision	1	22	23
EST	EST_3	Märjamaa - Halinga	Head-on collision	10	17	19
EST	EST_3	Märjamaa - Halinga	Rear-end collision	2	11	12
EST	EST_3	Märjamaa - Halinga	Collision with an animal	0	1	12
EST	EST_3	Märjamaa - Halinga	Collision with other obstacle	0	2	7
EST	EST_3	Märjamaa - Halinga	Collision with stopped vehicle	0	4	4
EST	EST_3	Märjamaa - Halinga	Collision with obstacle	0	1	3
EST	EST_3	Märjamaa - Halinga	Collision with pedestrian	0	2	2
EST	EST_3	Märjamaa - Halinga	Other accident	0	1	2
EST	EST_3	Märjamaa - Halinga	Vehicle rollover	1	0	1
EST	**EST_3 Total**			**18**	**109**	**117**
EST	EST_4	Halinga - Jänesselja	Collision with an animal	0	11	32
EST	EST_4	Halinga - Jänesselja	Vehicle driving off the road	1	27	23
EST	EST_4	Halinga - Jänesselja	Side-impact collision	0	9	14
EST	EST_4	Halinga - Jänesselja	Head-on collision	5	27	13
EST	EST_4	Halinga - Jänesselja	Rear-end collision	0	15	11
EST	EST_4	Halinga - Jänesselja	Collision with pedestrian	3	1	4
EST	EST_4	Halinga - Jänesselja	Other accident	0	1	3
EST	EST_4	Halinga - Jänesselja	Vehicle rollover	0	2	2
EST	EST_4	Halinga - Jänesselja	Collision with obstacle	0	0	2
EST	EST_4	Halinga - Jänesselja	Collision with other obstacle	0	1	2
EST	EST_4	Halinga - Jänesselja	Collision with stopped vehicle	0	0	1
EST	**EST_4 Total**			**9**	**94**	**107**
EST	EST_5	Jänesselja - Uulu	Side-impact collision	2	13	18
EST	EST_5	Jänesselja - Uulu	Rear-end collision	0	20	15
EST	EST_5	Jänesselja - Uulu	Collision with obstacle	0	0	10
EST	EST_5	Jänesselja - Uulu	Head-on collision	3	8	9
EST	EST_5	Jänesselja - Uulu	Collision with pedestrian	5	2	7
EST	EST_5	Jänesselja - Uulu	Collision with an animal	0	0	6
EST	EST_5	Jänesselja - Uulu	Vehicle driving off the road	0	7	6
EST	EST_5	Jänesselja - Uulu	Collision with other obstacle	0	2	4
EST	EST_5	Jänesselja - Uulu	Vehicle rollover	1	2	3
EST	EST_5	Jänesselja - Uulu	Collision with stopped vehicle	0	1	2

State	Section	Section name	Accident type	Fatalities	Injuries	Accidents
EST	EST_5	Jänesselja - Uulu	Other accident	0	2	2
EST	**EST_5 Total**			**11**	**57**	**82**
EST	EST_6	Uulu - Ikla (Border area)	Collision with an animal	0	0	49
EST	EST_6	Uulu - Ikla (Border area)	Side-impact collision	3	15	15
EST	EST_6	Uulu - Ikla (Border area)	Vehicle driving off the road	0	12	14
EST	EST_6	Uulu - Ikla (Border area)	Head-on collision	1	28	12
EST	EST_6	Uulu - Ikla (Border area)	Collision with other obstacle	1	10	9
EST	EST_6	Uulu - Ikla (Border area)	Rear-end collision	1	7	7
EST	EST_6	Uulu - Ikla (Border area)	Collision with obstacle	0	0	3
EST	EST_6	Uulu - Ikla (Border area)	Other accident	0	0	1
EST	EST_6	Uulu - Ikla (Border area)	Collision with stopped vehicle	0	0	1
EST	EST_6	Uulu - Ikla (Border area)	Collision with pedestrian	0	1	1
EST	**EST_6 Total**			**6**	**73**	**112**
EST Total				**55**	**485**	**648**
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Vehicle collision	0	3	21
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Other accident	0	3	12
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Collision with animal	0	0	8
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Vehicle rollover	0	0	3
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Collision with pedestrian	1	2	3
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Collision with an obstacle	0	0	2
LAT	LAT_9	Ainazi (Border area) - Salacgriva City border	Collision with an bicycle	0	5	2
LAT	**LAT_9 Total**			**1**	**13**	**51**
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Vehicle collision	6	27	53
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Collision with animal	0	4	42
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Other accident	1	14	35
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Vehicle rollover	1	19	25
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Collision with an obstacle	0	1	7
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Collision with a stopped vehicle	0	0	2
LAT	LAT_11	Salacgriva City border - Jelgavkrasti (P11)	Collision with pedestrian	1	0	2
LAT	**LAT_11 Total**			**9**	**65**	**166**
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Vehicle collision	9	73	101
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Collision with animal	0	2	66
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Other accident	1	13	46
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Collision with an obstacle	0	12	39
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Vehicle rollover	0	14	28
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Collision with pedestrian	7	10	18
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Collision with a stopped vehicle	1	12	8
LAT	LAT_12	Jelgavkrasti (P11) - Lilaste (V101)	Collision with an bicycle	0	2	2
LAT	**LAT_12 Total**			**18**	**138**	**308**
LAT	LAT_13	Lilaste (V101) - Adazi	Vehicle collision	1	85	87
LAT	LAT_13	Lilaste (V101) - Adazi	Other accident	0	2	30
LAT	LAT_13	Lilaste (V101) - Adazi	Collision with an obstacle	0	2	22
LAT	LAT_13	Lilaste (V101) - Adazi	Collision with animal	0	2	17
LAT	LAT_13	Lilaste (V101) - Adazi	Vehicle rollover	0	13	14
LAT	LAT_13	Lilaste (V101) - Adazi	Collision with a stopped vehicle	0	5	7
LAT	LAT_13	Lilaste (V101) - Adazi	Collision with pedestrian	3	4	6

State	Section	Section name	Accident type	Fatalities	Injuries	Accidents
LAT	LAT_13	Lilaste (V101) - Adazi	Collision with an bicycle	0	2	4
LAT	**LAT_13**	**Total**		**4**	**115**	**187**
LAT	LAT_14	Adazi - Ryga bypass (A4)	Vehicle collision	1	79	140
LAT	LAT_14	Adazi - Ryga bypass (A4)	Collision with an obstacle	1	3	40
LAT	LAT_14	Adazi - Ryga bypass (A4)	Other accident	0	7	39
LAT	LAT_14	Adazi - Ryga bypass (A4)	Vehicle rollover	0	13	11
LAT	LAT_14	Adazi - Ryga bypass (A4)	Collision with pedestrian	6	4	10
LAT	LAT_14	Adazi - Ryga bypass (A4)	Collision with animal	0	1	8
LAT	LAT_14	Adazi - Ryga bypass (A4)	Collision with a stopped vehicle	0	3	7
LAT	LAT_14	Adazi - Ryga bypass (A4)	Collision with an bicycle	2	3	5
LAT	**LAT_14**	**Total**		**10**	**113**	**260**
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Vehicle collision	6	113	144
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Collision with an obstacle	0	2	16
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Other accident	0	2	15
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Collision with animal	0	0	13
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Vehicle rollover	1	14	11
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Collision with a stopped vehicle	0	0	7
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Collision with pedestrian	2	4	5
LAT	LAT_15	Ryga bypass (A4) - Amatnieki (P2)	Collision with an bicycle	0	1	1
LAT	**LAT_15**	**Total**		**9**	**136**	**212**
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Vehicle collision	1	36	49
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Other accident	0	3	12
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Collision with an obstacle	0	0	4
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Collision with animal	0	1	4
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Collision with a stopped vehicle	0	0	3
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Vehicle rollover	0	1	3
LAT	LAT_16	Amatnieki (P2) - Ulupji (P4)	Collision with pedestrian	2	0	2
LAT	**LAT_16**	**Total**		**3**	**41**	**77**
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Vehicle collision	1	37	58
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Collision with animal	0	2	23
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Collision with an obstacle	0	3	10
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Other accident	0	0	8
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Vehicle rollover	0	7	7
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Collision with a stopped vehicle	0	1	5
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Collision with an bicycle	0	1	2
LAT	LAT_17	Ulupji (P4) - Saulkalne (A6)	Collision with pedestrian	1	0	1
LAT	**LAT_17**	**Total**		**2**	**51**	**114**
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Vehicle collision	1	8	56
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Other accident	0	0	22
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Collision with an obstacle	0	0	16
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Vehicle rollover	0	1	4
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Collision with a stopped vehicle	0	0	4
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Collision with pedestrian	0	1	2
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Collision with an bicycle	1	0	2
LAT	LAT_18	Saulkalne (A4) - Salaspils (A5)	Collision with animal	0	1	2
LAT	**LAT_18**	**Total**		**2**	**11**	**108**
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Vehicle collision	0	35	121
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Collision with an obstacle	1	8	45
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Other accident	0	5	23
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Vehicle rollover	0	11	15
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Collision with animal	0	3	14
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Collision with a stopped vehicle	0	1	6
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Collision with an bicycle	0	3	4
LAT	LAT_19	Salaspils (A6) - Hydropower plant	Collision with pedestrian	2	1	3
LAT	**LAT_19**	**Total**		**3**	**67**	**231**
LAT	LAT_21	Hydropower plant - Kekava (A7)	Vehicle collision	0	4	24
LAT	LAT_21	Hydropower plant - Kekava (A7)	Other accident	0	1	14
LAT	LAT_21	Hydropower plant - Kekava (A7)	Collision with an obstacle	0	0	6
LAT	LAT_21	Hydropower plant - Kekava (A7)	Vehicle rollover	1	5	5

State	Section	Section name	Accident type	Fatalities	Injuries	Accidents
LAT	LAT_21	Hydropower plant - Kekava (A7)	Collision with animal	0	0	5
LAT	LAT_21	Hydropower plant - Kekava (A7)	Collision with a stopped vehicle	0	1	2
LAT	LAT_21	Hydropower plant - Kekava (A7)	Collision with pedestrian	0	1	1
LAT	**LAT_21 Total**			**1**	**12**	**57**
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Vehicle collision	8	71	147
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Other accident	0	0	39
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Collision with an obstacle	0	4	38
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Collision with animal	0	4	27
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Vehicle rollover	1	16	26
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Collision with a stopped vehicle	0	4	16
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Collision with pedestrian	5	11	14
LAT	LAT_22	Kekava (A5) - Iecava (P93)	Collision with an bicycle	3	5	7
LAT	**LAT_22 Total**			**17**	**115**	**314**
LAT	LAT_23	Iecava (P93) – Bauska City border	Vehicle collision	8	59	70
LAT	LAT_23	Iecava (P93) – Bauska City border	Other accident	0	5	15
LAT	LAT_23	Iecava (P93) – Bauska City border	Collision with animal	0	1	13
LAT	LAT_23	Iecava (P93) – Bauska City border	Collision with an obstacle	0	2	12
LAT	LAT_23	Iecava (P93) – Bauska City border	Vehicle rollover	1	19	11
LAT	LAT_23	Iecava (P93) – Bauska City border	Collision with a stopped vehicle	0	9	9
LAT	LAT_23	Iecava (P93) – Bauska City border	Collision with pedestrian	5	5	9
LAT	LAT_23	Iecava (P93) – Bauska City border	Collision with an bicycle	1	0	1
LAT	**LAT_23 Total**			**15**	**100**	**140**
LAT	LAT_25	Bauska City border - LV border area	Vehicle collision	0	21	29
LAT	LAT_25	Bauska City border - LV border area	Other accident	0	6	15
LAT	LAT_25	Bauska City border - LV border area	Vehicle rollover	0	7	8
LAT	LAT_25	Bauska City border - LV border area	Collision with animal	0	0	8
LAT	LAT_25	Bauska City border - LV border area	Collision with an obstacle	0	0	7
LAT	LAT_25	Bauska City border - LV border area	Collision with a stopped vehicle	0	2	6
LAT	LAT_25	Bauska City border - LV border area	Collision with pedestrian	2	3	5
LAT	LAT_25	Bauska City border - LV border area	Collision with an bicycle	0	2	2
LAT	**LAT_25 Total**			**2**	**41**	**80**
LAT Total				**96**	**1018**	**2305**

APPENDIX 4. Driving speed distribution 2015

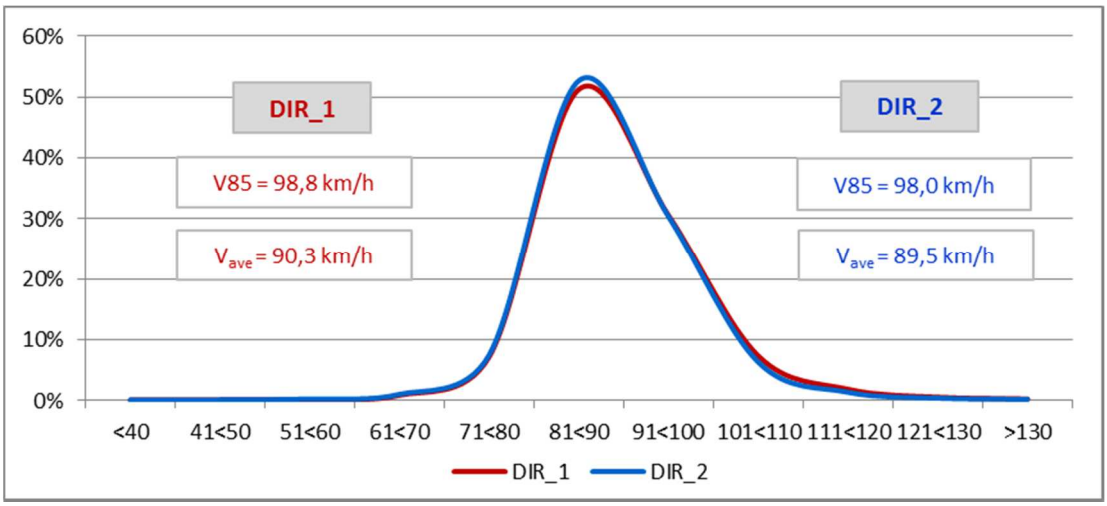

Chart A.4.1. Distribution of driving speed E67_EST (road no 4 km 107,8 Are)

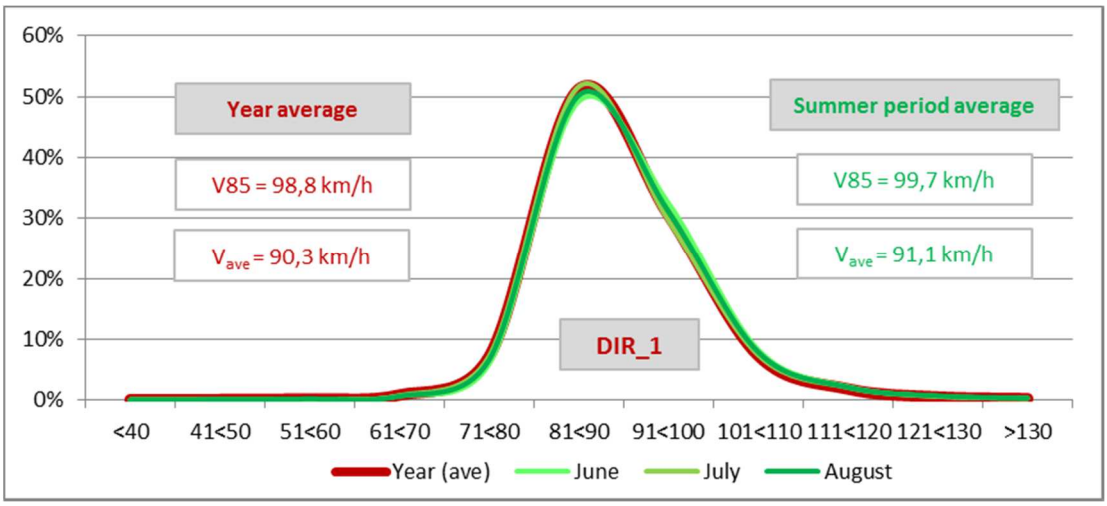

Chart A.4.2. Distribution of driving speed E67_EST (road no 4 km 107,8 Are) direction 1 annual and summer period average

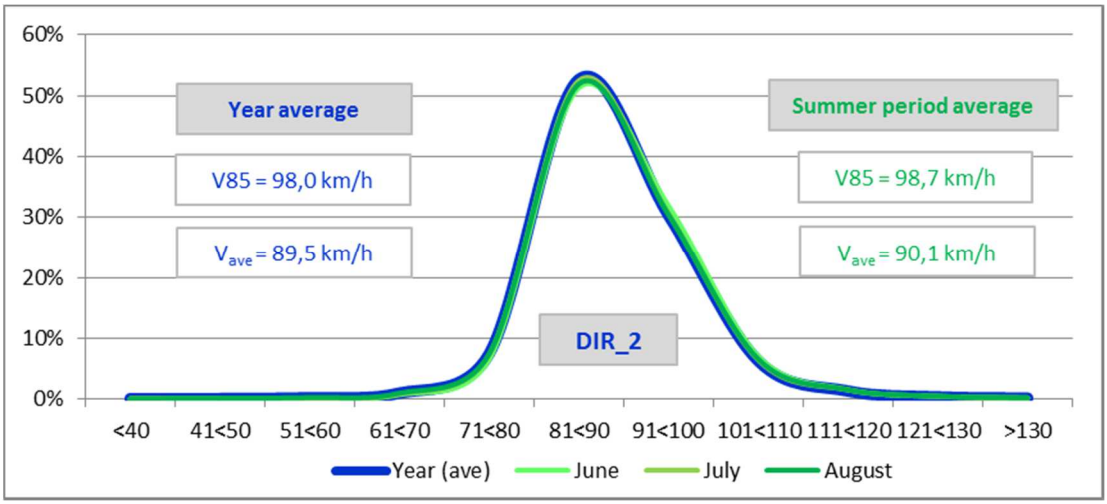

Chart A.4.3. Distribution of driving speed E67_EST (road no 4 km 107,8 Are) direction 2 annual and summer period average

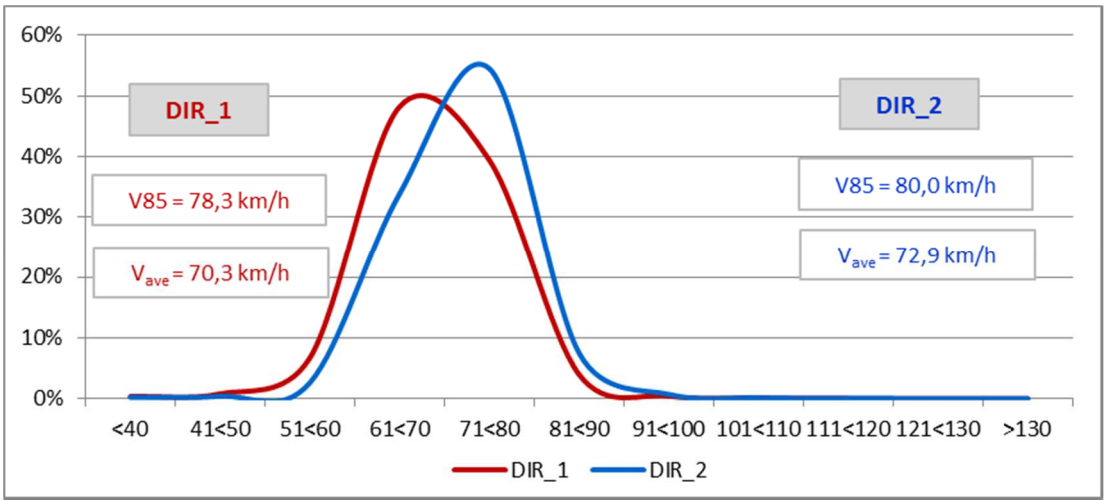

Chart A.4.4. Distribution of driving speed E67_EST (road no 4 km 123,7 Pärnu)

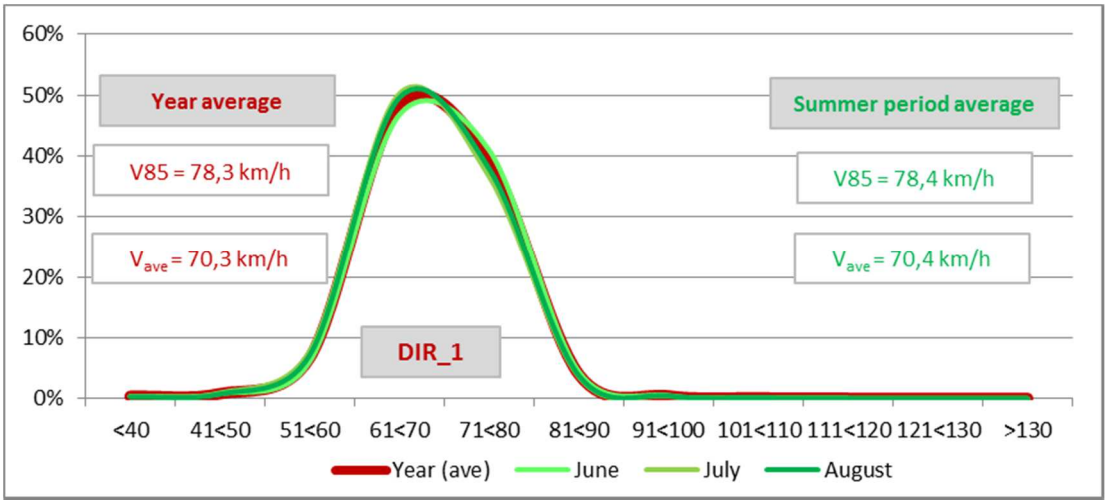

Chart A.4.5. Distribution of driving speed E67_EST (road no 4 km 123,7 Pärnu) direction 1 annual and summer period average

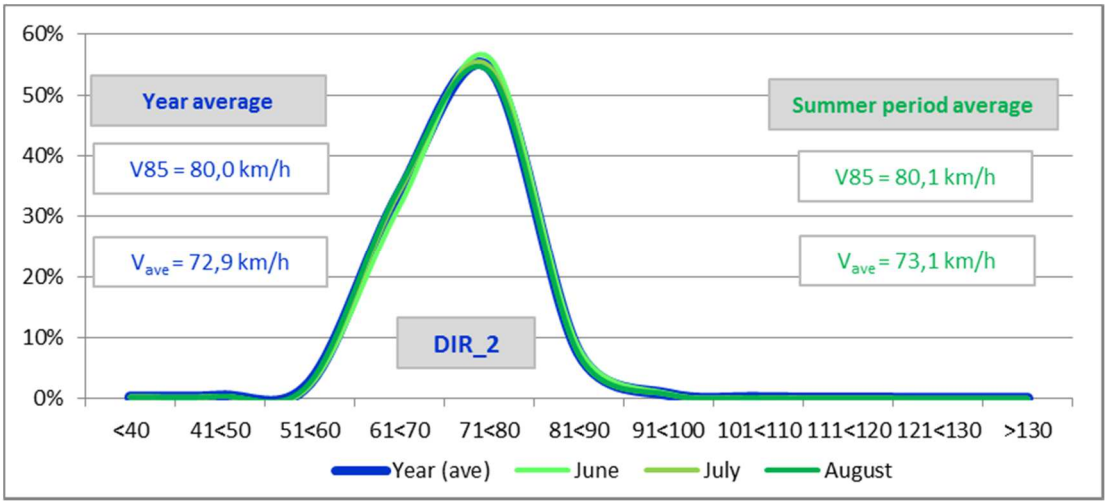

Chart A.4.6. Distribution of driving speed E67_EST (road no 4 km 123,7 Pärnu) direction 2 annual and summer period average

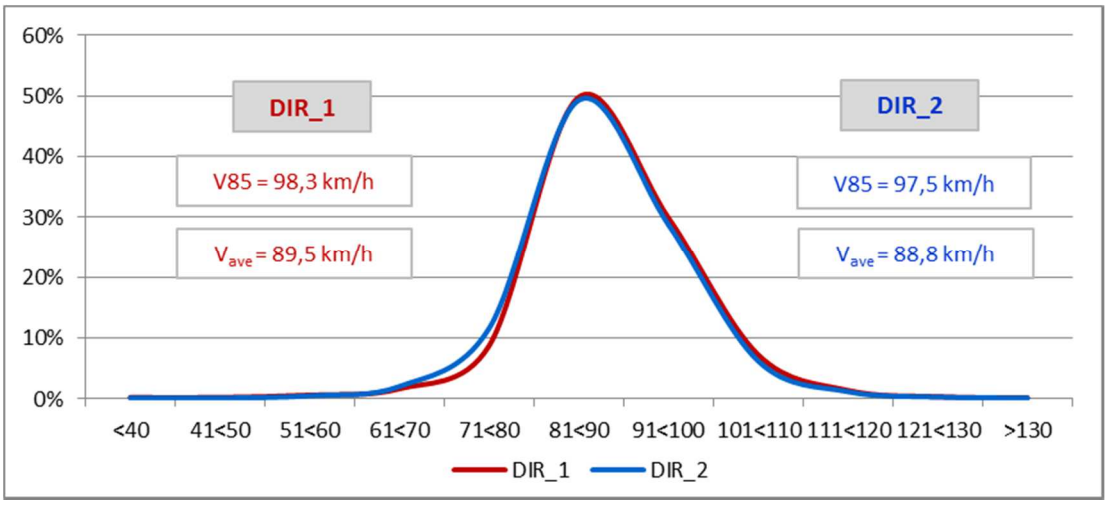

Chart A.4.7. Distribution of driving speed E67_EST (road no 4 km 151,0 Võiste)

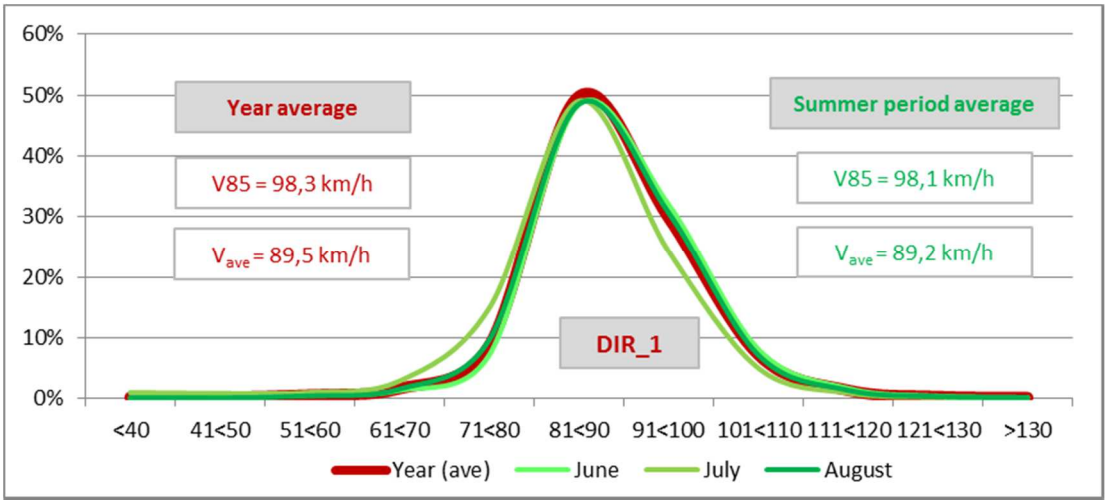

Chart A.4.8. Distribution of driving speed E67_EST (road no 4 km 151,0 Võiste) direction 1 annual and summer period average

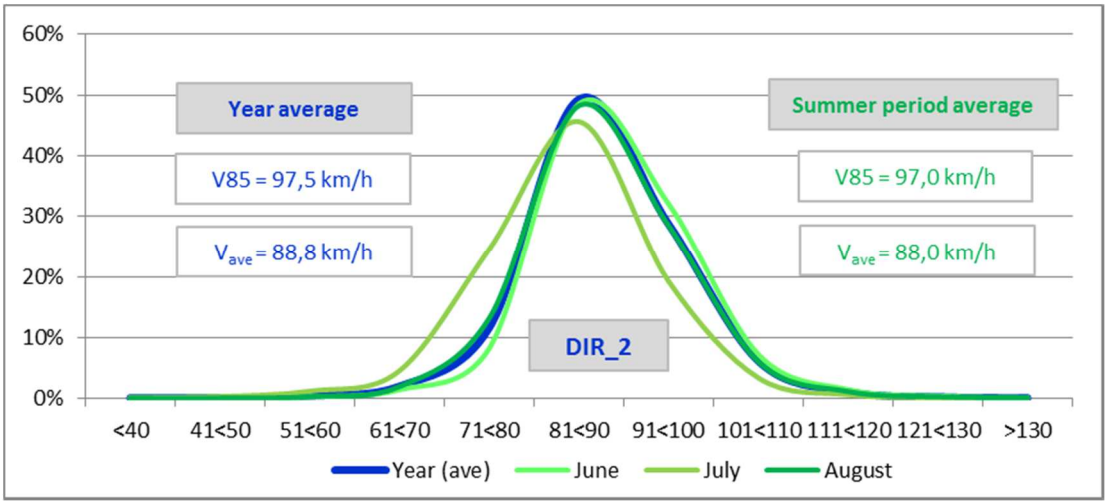

Chart A.4.9. Distribution of driving speed E67_EST (road no 4 km 151,0 Võiste) direction 2 annual and summer period average

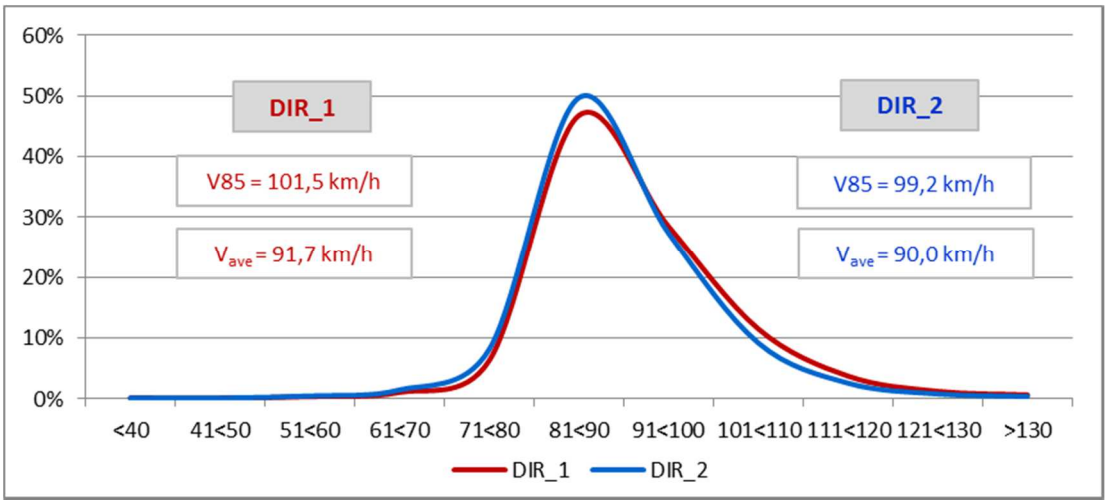

Chart A.4.10. Distribution of driving speed E67_EST (road no 4 km 189,2 Ikla)

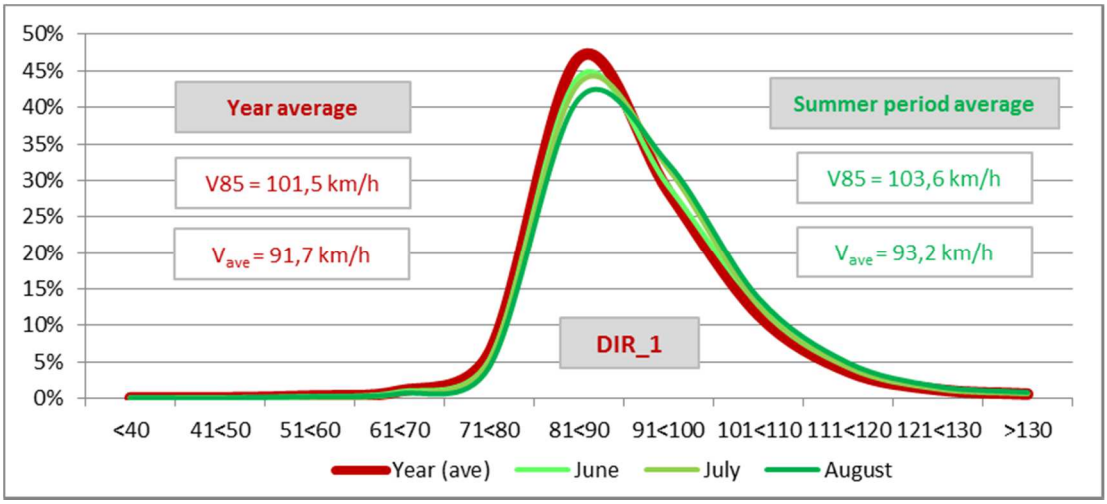

Chart A.4.11. Distribution of driving speed E67_EST (road no 4 km 189,2 Ikla) direction 1 annual and summer period average

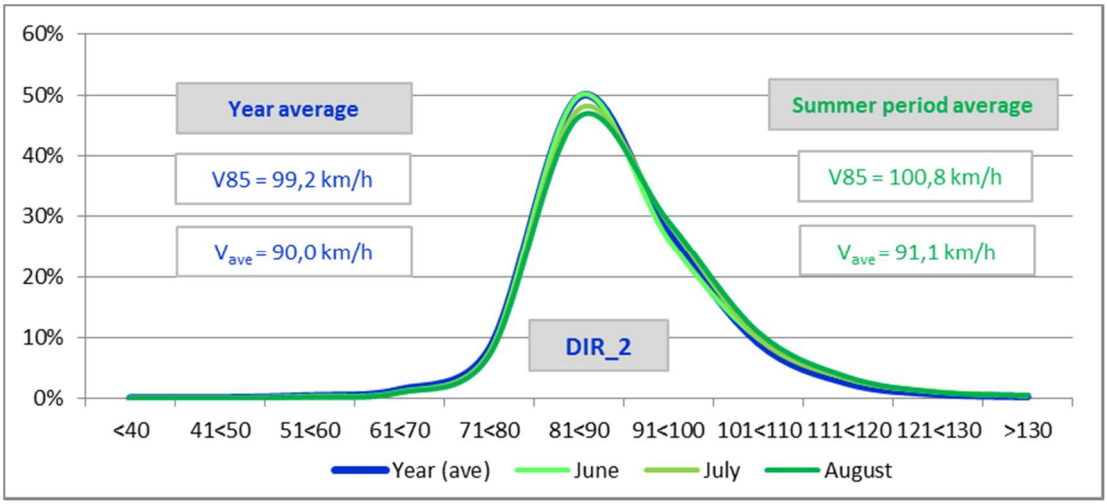

Chart A.4.12. Distribution of driving speed E67_EST (road no 4 km 189,2 Ikla) direction 2 annual and summer period average

APPENDIX 5. Road user cost data

H D M - 4
HIGHWAY DEVELOPMENT & MANAGEMENT

Road Agency and User Cost Streams (Undiscounted)

Study Name: **E67 Smart_project**
Run Date: **05-09-2016**
Currency: **Euro (millions)**

Section: EST_1_Laagri - Aasmae
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s1 Road Class: Main (Põhimaantee)
Length: 14.13 km Width: 12.05 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	17.291	1.854	0.000	1.569	20.714	0.000	20.714
2018	0.000	0.000	0.000	0.000	18.032	1.928	0.000	1.632	21.591	0.000	21.591
2019	0.000	0.000	0.000	0.000	18.806	2.005	0.000	1.697	22.508	0.000	22.508
2020	0.000	0.000	0.000	0.000	19.617	2.085	0.000	1.765	23.467	0.000	23.467
2021	0.000	0.000	0.000	0.000	20.464	2.169	0.000	1.835	24.468	0.000	24.468
2022	0.000	0.000	0.000	0.000	20.929	2.216	0.000	1.874	25.019	0.000	25.019
2023	0.000	0.000	0.000	0.000	21.404	2.264	0.000	1.914	25.582	0.000	25.582
2024	0.000	0.000	0.000	0.000	21.890	2.312	0.000	1.955	26.158	0.000	26.158
2025	0.000	0.000	0.000	0.000	22.388	2.362	0.000	1.997	26.747	0.000	26.747
2026	0.000	0.000	0.000	0.000	22.898	2.413	0.000	2.040	27.351	0.000	27.351
Total:	0.000	0.000	0.000	0.000	203.720	21.608	0.000	18.278	243.605	0.000	243.605

Section: EST_2_Aasmae - Marjamaa
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s2 Road Class: Main (Põhimaantee)
Length: 36.99 km Width: 9.67 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	54.919	4.912	0.000	2.006	61.837	0.000	61.837
2018	0.000	0.000	0.000	0.000	57.808	5.147	0.000	2.094	65.048	0.000	65.048
2019	0.000	0.000	0.000	0.000	60.861	5.395	0.000	2.185	68.442	0.000	68.442
2020	0.000	0.000	0.000	0.000	64.091	5.657	0.000	2.281	72.029	0.000	72.029
2021	0.000	0.000	0.000	0.000	67.506	5.934	0.000	2.381	75.821	0.000	75.821
2022	0.000	0.000	0.000	0.000	69.301	6.084	0.000	2.435	77.821	0.000	77.821
2023	0.000	0.000	0.000	0.000	71.146	6.239	0.000	2.491	79.876	0.000	79.876
2024	0.000	0.000	0.000	0.000	73.043	6.397	0.000	2.548	81.989	0.000	81.989
2025	0.000	0.000	0.000	0.000	74.993	6.561	0.000	2.607	84.161	0.000	84.161
2026	0.000	0.000	0.000	0.000	76.998	6.729	0.000	2.667	86.394	0.000	86.394
Total:	0.000	0.000	0.000	0.000	670.667	59.055	0.000	23.695	753.417	0.000	753.417

Section: EST_3_Marjamaa - Halinga
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s3 Road Class: Main (Põhimaantee)
Length: 38.54 km Width: 9.55 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	54.814	4.505	0.000	4.749	64.068	0.000	64.068
2018	0.000	0.000	0.000	0.000	57.790	4.726	0.000	4.961	67.477	0.000	67.477
2019	0.000	0.000	0.000	0.000	60.941	4.960	0.000	5.184	71.085	0.000	71.085
2020	0.000	0.000	0.000	0.000	64.277	5.207	0.000	5.417	74.901	0.000	74.901
2021	0.000	0.000	0.000	0.000	67.812	5.468	0.000	5.661	78.941	0.000	78.941
2022	0.000	0.000	0.000	0.000	69.657	5.609	0.000	5.794	81.060	0.000	81.060
2023	0.000	0.000	0.000	0.000	71.554	5.754	0.000	5.929	83.237	0.000	83.237
2024	0.000	0.000	0.000	0.000	73.505	5.903	0.000	6.068	85.476	0.000	85.476
2025	0.000	0.000	0.000	0.000	75.512	6.056	0.000	6.211	87.779	0.000	87.779
2026	0.000	0.000	0.000	0.000	77.577	6.214	0.000	6.356	90.147	0.000	90.147
Total:	0.000	0.000	0.000	0.000	673.438	54.402	0.000	56.331	784.171	0.000	784.171

Section: EST_4_Halinga - Janesselja
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s4 Road Class: Main (Põhimaantee)
Length: 19.95 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	32.557	2.918	0.000	2.629	38.105	0.000	38.105
2018	0.000	0.000	0.000	0.000	34.283	3.059	0.000	2.744	40.086	0.000	40.086
2019	0.000	0.000	0.000	0.000	36.108	3.208	0.000	2.865	42.181	0.000	42.181
2020	0.000	0.000	0.000	0.000	38.038	3.365	0.000	2.992	44.394	0.000	44.394
2021	0.000	0.000	0.000	0.000	40.081	3.530	0.000	3.124	46.735	0.000	46.735
2022	0.000	0.000	0.000	0.000	41.152	3.620	0.000	3.196	47.969	0.000	47.969
2023	0.000	0.000	0.000	0.000	42.254	3.713	0.000	3.270	49.237	0.000	49.237
2024	0.000	0.000	0.000	0.000	43.386	3.808	0.000	3.346	50.540	0.000	50.540
2025	0.000	0.000	0.000	0.000	44.550	3.906	0.000	3.423	51.879	0.000	51.879
2026	0.000	0.000	0.000	0.000	45.748	4.007	0.000	3.502	53.256	0.000	53.256
Total:	0.000	0.000	0.000	0.000	398.156	35.134	0.000	31.092	464.381	0.000	464.381

Section: EST_5_Janesselja - Uulu
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s5 Road Class: Main (Põhimaantee)
Length: 18.73 km Width: 10.10 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	26.068	2.888	0.000	2.834	31.789	0.000	31.789
2018	0.000	0.000	0.000	0.000	27.389	3.018	0.000	2.954	33.361	0.000	33.361
2019	0.000	0.000	0.000	0.000	28.784	3.154	0.000	3.081	35.019	0.000	35.019
2020	0.000	0.000	0.000	0.000	30.256	3.298	0.000	3.212	36.766	0.000	36.766
2021	0.000	0.000	0.000	0.000	31.810	3.449	0.000	3.350	38.609	0.000	38.609
2022	0.000	0.000	0.000	0.000	32.634	3.531	0.000	3.426	39.590	0.000	39.590
2023	0.000	0.000	0.000	0.000	33.479	3.616	0.000	3.503	40.598	0.000	40.598
2024	0.000	0.000	0.000	0.000	34.348	3.703	0.000	3.582	41.633	0.000	41.633
2025	0.000	0.000	0.000	0.000	35.241	3.792	0.000	3.663	42.695	0.000	42.695
2026	0.000	0.000	0.000	0.000	36.158	3.883	0.000	3.745	43.787	0.000	43.787
Total:	0.000	0.000	0.000	0.000	316.166	34.331	0.000	33.350	383.848	0.000	383.848

Section: EST_6_Uulu - Ikla (Border area)
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s6 Road Class: Main (Põhimaantee)
Length: 50.40 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	54.814	3.690	0.000	1.909	60.412	0.000	60.412
2018	0.000	0.000	0.000	0.000	58.082	3.885	0.000	2.003	63.970	0.000	63.970
2019	0.000	0.000	0.000	0.000	61.555	4.092	0.000	2.102	67.750	0.000	67.750
2020	0.000	0.000	0.000	0.000	65.249	4.312	0.000	2.207	71.768	0.000	71.768
2021	0.000	0.000	0.000	0.000	69.176	4.544	0.000	2.318	76.038	0.000	76.038
2022	0.000	0.000	0.000	0.000	71.196	4.667	0.000	2.376	78.239	0.000	78.239
2023	0.000	0.000	0.000	0.000	73.276	4.793	0.000	2.436	80.505	0.000	80.505
2024	0.000	0.000	0.000	0.000	75.418	4.923	0.000	2.498	82.839	0.000	82.839
2025	0.000	0.000	0.000	0.000	77.625	5.057	0.000	2.561	85.242	0.000	85.242
2026	0.000	0.000	0.000	0.000	79.898	5.194	0.000	2.626	87.718	0.000	87.718
Total:	0.000	0.000	0.000	0.000	686.289	45.157	0.000	23.036	754.481	0.000	754.481

Section: LAT_9_Ainazi - Salacgriva
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s9 Road Class: Main (Põhimaantee)
Length: 11.84 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	15.737	1.086	0.000	0.434	17.258	0.000	17.258
2018	0.000	0.000	0.000	0.000	16.214	1.120	0.000	0.447	17.780	0.000	17.780
2019	0.000	0.000	0.000	0.000	16.542	1.143	0.000	0.456	18.141	0.000	18.141
2020	0.000	0.000	0.000	0.000	16.878	1.166	0.000	0.465	18.509	0.000	18.509
2021	0.000	0.000	0.000	0.000	17.220	1.191	0.000	0.474	18.885	0.000	18.885
2022	0.000	0.000	0.000	0.000	17.569	1.215	0.000	0.484	19.268	0.000	19.268
2023	0.000	0.000	0.000	0.000	17.925	1.240	0.000	0.494	19.659	0.000	19.659
2024	0.000	0.000	0.000	0.000	18.288	1.266	0.000	0.503	20.057	0.000	20.057
2025	0.000	0.000	0.000	0.000	18.658	1.292	0.000	0.514	20.464	0.000	20.464
2026	0.000	0.000	0.000	0.000	19.036	1.319	0.000	0.524	20.879	0.000	20.879
Total:	0.000	0.000	0.000	0.000	174.068	12.038	0.000	4.795	190.901	0.000	190.901

Section: LAT_11_Salacgriva - Jelgavkrasti
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s11 Road Class: Main (Põhimaantee)
Length: 30.63 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	37.016	2.742	0.000	3.111	42.869	0.000	42.869
2018	0.000	0.000	0.000	0.000	38.132	2.827	0.000	3.204	44.163	0.000	44.163
2019	0.000	0.000	0.000	0.000	38.901	2.885	0.000	3.269	45.055	0.000	45.055
2020	0.000	0.000	0.000	0.000	39.686	2.945	0.000	3.334	45.965	0.000	45.965
2021	0.000	0.000	0.000	0.000	40.487	3.006	0.000	3.401	46.894	0.000	46.894
2022	0.000	0.000	0.000	0.000	41.303	3.069	0.000	3.469	47.840	0.000	47.840
2023	0.000	0.000	0.000	0.000	42.135	3.132	0.000	3.538	48.805	0.000	48.805
2024	0.000	0.000	0.000	0.000	42.983	3.197	0.000	3.609	49.789	0.000	49.789
2025	0.000	0.000	0.000	0.000	43.848	3.264	0.000	3.681	50.793	0.000	50.793
2026	0.000	0.000	0.000	0.000	44.731	3.332	0.000	3.755	51.817	0.000	51.817
Total:	0.000	0.000	0.000	0.000	409.221	30.399	0.000	34.369	473.989	0.000	473.989

Section: LAT_12_Jelgavkrasti - Lilaste
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s12 Road Class: Main (Põhimaantee)
Length: 35.77 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	54.709	4.586	0.000	6.254	65.548	0.000	65.548
2018	0.000	0.000	0.000	0.000	56.358	4.732	0.000	6.441	67.531	0.000	67.531
2019	0.000	0.000	0.000	0.000	57.494	4.832	0.000	6.570	68.896	0.000	68.896
2020	0.000	0.000	0.000	0.000	58.653	4.935	0.000	6.701	70.290	0.000	70.290
2021	0.000	0.000	0.000	0.000	59.837	5.040	0.000	6.835	71.712	0.000	71.712
2022	0.000	0.000	0.000	0.000	61.042	5.148	0.000	6.972	73.162	0.000	73.162
2023	0.000	0.000	0.000	0.000	62.270	5.258	0.000	7.112	74.640	0.000	74.640
2024	0.000	0.000	0.000	0.000	63.524	5.370	0.000	7.254	76.148	0.000	76.148
2025	0.000	0.000	0.000	0.000	64.803	5.485	0.000	7.399	77.687	0.000	77.687
2026	0.000	0.000	0.000	0.000	66.108	5.603	0.000	7.547	79.258	0.000	79.258
Total:	0.000	0.000	0.000	0.000	604.797	50.989	0.000	69.085	724.871	0.000	724.871

Section: LAT_13_Lilaste - Adazi
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s13 Road Class: Main (Põhimaantee)
Length: 14.36 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	31.429	3.252	0.000	2.207	36.888	0.000	36.888
2018	0.000	0.000	0.000	0.000	32.380	3.359	0.000	2.273	38.012	0.000	38.012
2019	0.000	0.000	0.000	0.000	33.035	3.434	0.000	2.319	38.787	0.000	38.787
2020	0.000	0.000	0.000	0.000	33.703	3.510	0.000	2.365	39.578	0.000	39.578
2021	0.000	0.000	0.000	0.000	34.385	3.588	0.000	2.412	40.385	0.000	40.385
2022	0.000	0.000	0.000	0.000	35.080	3.667	0.000	2.461	41.208	0.000	41.208
2023	0.000	0.000	0.000	0.000	35.790	3.749	0.000	2.510	42.049	0.000	42.049
2024	0.000	0.000	0.000	0.000	36.514	3.833	0.000	2.560	42.906	0.000	42.906
2025	0.000	0.000	0.000	0.000	37.252	3.919	0.000	2.611	43.782	0.000	43.782
2026	0.000	0.000	0.000	0.000	38.007	4.007	0.000	2.663	44.677	0.000	44.677
Total:	0.000	0.000	0.000	0.000	347.574	36.318	0.000	24.381	408.272	0.000	408.272

Section: LAT_14_Adazi - Riga bypass
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s14 Road Class: Main (Põhimaantee)
Length: 6.94 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	28.540	3.420	0.000	3.876	35.835	0.000	35.835
2018	0.000	0.000	0.000	0.000	29.602	3.682	0.000	3.992	37.276	0.000	37.276
2019	0.000	0.000	0.000	0.000	30.447	3.908	0.000	4.072	38.428	0.000	38.428
2020	0.000	0.000	0.000	0.000	31.461	4.203	0.000	4.153	39.817	0.000	39.817
2021	0.000	0.000	0.000	0.000	32.758	4.616	0.000	4.237	41.610	0.000	41.610
2022	0.000	0.000	0.000	0.000	34.283	5.117	0.000	4.321	43.721	0.000	43.721
2023	0.000	0.000	0.000	0.000	34.944	5.208	0.000	4.408	44.560	0.000	44.560
2024	0.000	0.000	0.000	0.000	35.617	5.299	0.000	4.496	45.413	0.000	45.413
2025	0.000	0.000	0.000	0.000	36.304	5.393	0.000	4.586	46.283	0.000	46.283
2026	0.000	0.000	0.000	0.000	37.006	5.488	0.000	4.677	47.171	0.000	47.171
Total:	0.000	0.000	0.000	0.000	330.963	46.335	0.000	42.818	420.116	0.000	420.116

Section: LAT_15_Ryga bypass - Amatnieki
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s15 Road Class: Main (Põhimaantee)
Length: 4.88 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	13.293	1.384	0.000	3.727	18.404	0.000	18.404
2018	0.000	0.000	0.000	0.000	13.696	1.428	0.000	3.839	18.964	0.000	18.964
2019	0.000	0.000	0.000	0.000	13.975	1.459	0.000	3.916	19.350	0.000	19.350
2020	0.000	0.000	0.000	0.000	14.259	1.490	0.000	3.994	19.743	0.000	19.743
2021	0.000	0.000	0.000	0.000	14.549	1.522	0.000	4.074	20.145	0.000	20.145
2022	0.000	0.000	0.000	0.000	14.844	1.555	0.000	4.156	20.555	0.000	20.555
2023	0.000	0.000	0.000	0.000	15.146	1.589	0.000	4.239	20.974	0.000	20.974
2024	0.000	0.000	0.000	0.000	15.454	1.623	0.000	4.324	21.400	0.000	21.400
2025	0.000	0.000	0.000	0.000	15.768	1.659	0.000	4.410	21.836	0.000	21.836
2026	0.000	0.000	0.000	0.000	16.088	1.695	0.000	4.498	22.281	0.000	22.281
Total:	0.000	0.000	0.000	0.000	147.071	15.404	0.000	41.177	203.652	0.000	203.652

Section: LAT_16_Amatnieki - Ulupji
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s16 Road Class: Main (Põhimaantee)
Length: 4.48 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	8.424	0.822	0.000	1.217	10.463	0.000	10.463
2018	0.000	0.000	0.000	0.000	8.679	0.848	0.000	1.254	10.780	0.000	10.780
2019	0.000	0.000	0.000	0.000	8.854	0.866	0.000	1.279	10.999	0.000	10.999
2020	0.000	0.000	0.000	0.000	9.033	0.884	0.000	1.304	11.221	0.000	11.221
2021	0.000	0.000	0.000	0.000	9.216	0.902	0.000	1.330	11.449	0.000	11.449
2022	0.000	0.000	0.000	0.000	9.402	0.921	0.000	1.357	11.680	0.000	11.680
2023	0.000	0.000	0.000	0.000	9.592	0.941	0.000	1.384	11.917	0.000	11.917
2024	0.000	0.000	0.000	0.000	9.785	0.961	0.000	1.412	12.158	0.000	12.158
2025	0.000	0.000	0.000	0.000	9.983	0.981	0.000	1.440	12.404	0.000	12.404
2026	0.000	0.000	0.000	0.000	10.184	1.002	0.000	1.469	12.655	0.000	12.655
Total:	0.000	0.000	0.000	0.000	93.152	9.128	0.000	13.445	115.725	0.000	115.725

Section: LAT_17_Ulupji - Saulkalne
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s17 Road Class: Main (Põhimaantee)
Length: 11.10 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	22.305	2.096	0.000	1.080	25.481	0.000	25.481
2018	0.000	0.000	0.000	0.000	22.981	2.162	0.000	1.112	26.256	0.000	26.256
2019	0.000	0.000	0.000	0.000	23.447	2.208	0.000	1.134	26.789	0.000	26.789
2020	0.000	0.000	0.000	0.000	23.923	2.255	0.000	1.157	27.335	0.000	27.335
2021	0.000	0.000	0.000	0.000	24.408	2.303	0.000	1.180	27.891	0.000	27.891
2022	0.000	0.000	0.000	0.000	24.903	2.351	0.000	1.204	28.458	0.000	28.458
2023	0.000	0.000	0.000	0.000	25.407	2.401	0.000	1.228	29.037	0.000	29.037
2024	0.000	0.000	0.000	0.000	25.922	2.453	0.000	1.253	29.627	0.000	29.627
2025	0.000	0.000	0.000	0.000	26.448	2.505	0.000	1.278	30.230	0.000	30.230
2026	0.000	0.000	0.000	0.000	26.984	2.558	0.000	1.303	30.845	0.000	30.845
Total:	0.000	0.000	0.000	0.000	246.728	23.292	0.000	11.929	281.949	0.000	281.949

Section: LAT_18_Saulkalne - Salaspils
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A6)_2_s18 Road Class: Main (Põhimaantee)
Length: 5.59 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	19.976	2.387	0.000	0.758	23.121	0.000	23.121
2018	0.000	0.000	0.000	0.000	20.588	2.467	0.000	0.781	23.837	0.000	23.837
2019	0.000	0.000	0.000	0.000	21.010	2.523	0.000	0.797	24.330	0.000	24.330
2020	0.000	0.000	0.000	0.000	21.441	2.580	0.000	0.813	24.834	0.000	24.834
2021	0.000	0.000	0.000	0.000	21.881	2.638	0.000	0.829	25.349	0.000	25.349
2022	0.000	0.000	0.000	0.000	22.330	2.698	0.000	0.846	25.874	0.000	25.874
2023	0.000	0.000	0.000	0.000	22.802	2.773	0.000	0.863	26.438	0.000	26.438
2024	0.000	0.000	0.000	0.000	23.365	2.913	0.000	0.880	27.158	0.000	27.158
2025	0.000	0.000	0.000	0.000	24.008	3.082	0.000	0.897	27.987	0.000	27.987
2026	0.000	0.000	0.000	0.000	24.767	3.299	0.000	0.915	28.981	0.000	28.981
Total:	0.000	0.000	0.000	0.000	222.170	27.360	0.000	8.379	257.909	0.000	257.909

Section: LAT_19_Salaspils - Hydropower plant
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A5)_1_s19 Road Class: Main (Põhimaantee)
Length: 2.40 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	5.080	0.561	0.000	1.625	7.265	0.000	7.265
2018	0.000	0.000	0.000	0.000	5.258	0.579	0.000	1.673	7.510	0.000	7.510
2019	0.000	0.000	0.000	0.000	5.390	0.591	0.000	1.707	7.687	0.000	7.687
2020	0.000	0.000	0.000	0.000	5.525	0.603	0.000	1.741	7.869	0.000	7.869
2021	0.000	0.000	0.000	0.000	5.664	0.616	0.000	1.776	8.056	0.000	8.056
2022	0.000	0.000	0.000	0.000	5.805	0.629	0.000	1.811	8.245	0.000	8.245
2023	0.000	0.000	0.000	0.000	5.948	0.642	0.000	1.848	8.438	0.000	8.438
2024	0.000	0.000	0.000	0.000	6.095	0.656	0.000	1.885	8.636	0.000	8.636
2025	0.000	0.000	0.000	0.000	6.246	0.670	0.000	1.922	8.838	0.000	8.838
2026	0.000	0.000	0.000	0.000	6.401	0.684	0.000	1.961	9.046	0.000	9.046
Total:	0.000	0.000	0.000	0.000	57.412	6.230	0.000	17.948	81.590	0.000	81.590

Section: LAT_21_Hydropower plant - Kekava
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A5)_1_s21 Road Class: Main (Põhimaantee)
Length: 5.74 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	12.261	1.207	0.000	0.434	13.902	0.000	13.902
2018	0.000	0.000	0.000	0.000	12.632	1.245	0.000	0.447	14.324	0.000	14.324
2019	0.000	0.000	0.000	0.000	12.888	1.271	0.000	0.456	14.616	0.000	14.616
2020	0.000	0.000	0.000	0.000	13.150	1.298	0.000	0.465	14.913	0.000	14.913
2021	0.000	0.000	0.000	0.000	13.417	1.326	0.000	0.475	15.217	0.000	15.217
2022	0.000	0.000	0.000	0.000	13.688	1.354	0.000	0.484	15.526	0.000	15.526
2023	0.000	0.000	0.000	0.000	13.966	1.383	0.000	0.494	15.842	0.000	15.842
2024	0.000	0.000	0.000	0.000	14.249	1.412	0.000	0.504	16.164	0.000	16.164
2025	0.000	0.000	0.000	0.000	14.537	1.442	0.000	0.514	16.493	0.000	16.493
2026	0.000	0.000	0.000	0.000	14.832	1.473	0.000	0.524	16.829	0.000	16.829
Total:	0.000	0.000	0.000	0.000	135.620	13.410	0.000	4.798	153.828	0.000	153.828

Section: LAT_22_Kekava - Iecava
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s22 Road Class: Main (Põhimaantee)
Length: 25.17 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	67.489	6.094	0.000	5.815	79.399	0.000	79.399
2018	0.000	0.000	0.000	0.000	69.534	6.294	0.000	5.990	81.818	0.000	81.818
2019	0.000	0.000	0.000	0.000	70.943	6.431	0.000	6.110	83.484	0.000	83.484
2020	0.000	0.000	0.000	0.000	72.382	6.572	0.000	6.232	85.185	0.000	85.185
2021	0.000	0.000	0.000	0.000	73.850	6.716	0.000	6.356	86.923	0.000	86.923
2022	0.000	0.000	0.000	0.000	75.347	6.864	0.000	6.484	88.694	0.000	88.694
2023	0.000	0.000	0.000	0.000	76.873	7.015	0.000	6.613	90.501	0.000	90.501
2024	0.000	0.000	0.000	0.000	78.431	7.169	0.000	6.745	92.346	0.000	92.346
2025	0.000	0.000	0.000	0.000	80.021	7.328	0.000	6.880	94.230	0.000	94.230
2026	0.000	0.000	0.000	0.000	81.645	7.490	0.000	7.018	96.153	0.000	96.153
Total:	0.000	0.000	0.000	0.000	746.516	67.972	0.000	64.244	878.732	0.000	878.732

Section: LAT_23_Iecava - Bauska
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s23 Road Class: Main (Põhimaantee)
Length: 20.95 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	45.955	3.785	0.000	4.938	54.679	0.000	54.679
2018	0.000	0.000	0.000	0.000	47.345	3.907	0.000	5.086	56.338	0.000	56.338
2019	0.000	0.000	0.000	0.000	48.303	3.991	0.000	5.188	57.482	0.000	57.482
2020	0.000	0.000	0.000	0.000	49.280	4.077	0.000	5.292	58.649	0.000	58.649
2021	0.000	0.000	0.000	0.000	50.278	4.166	0.000	5.398	59.841	0.000	59.841
2022	0.000	0.000	0.000	0.000	51.294	4.256	0.000	5.505	61.055	0.000	61.055
2023	0.000	0.000	0.000	0.000	52.331	4.348	0.000	5.616	62.294	0.000	62.294
2024	0.000	0.000	0.000	0.000	53.389	4.442	0.000	5.728	63.559	0.000	63.559
2025	0.000	0.000	0.000	0.000	54.468	4.539	0.000	5.842	64.849	0.000	64.849
2026	0.000	0.000	0.000	0.000	55.570	4.638	0.000	5.959	66.167	0.000	66.167
Total:	0.000	0.000	0.000	0.000	508.212	42.150	0.000	54.552	604.914	0.000	604.914

Section: LAT_25_Bauska - LV border area
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s25 Road Class: Main (Põhimaantee)
Length: 16.49 km Width: 9.00 m Rise+Fall: 5.00 m/km Curvature: 10.00 deg/km

Year	Road Agency Costs (RAC)				Road User Costs (RUC)					Net Social / Exogenous Cost	Total Transport Cost
	Capital	Recurrent	Special	Total RAC	MT Vehicle Operation	MT Travel Time	NMT Travel & Operation	Accidents	Total RUC		
2017	0.000	0.000	0.000	0.000	26.424	1.832	0.000	0.956	29.213	0.000	29.213
2018	0.000	0.000	0.000	0.000	27.223	1.889	0.000	0.985	30.096	0.000	30.096
2019	0.000	0.000	0.000	0.000	27.773	1.928	0.000	1.005	30.706	0.000	30.706
2020	0.000	0.000	0.000	0.000	28.335	1.967	0.000	1.025	31.328	0.000	31.328
2021	0.000	0.000	0.000	0.000	28.909	2.008	0.000	1.045	31.962	0.000	31.962
2022	0.000	0.000	0.000	0.000	29.493	2.050	0.000	1.066	32.609	0.000	32.609
2023	0.000	0.000	0.000	0.000	30.089	2.092	0.000	1.087	33.268	0.000	33.268
2024	0.000	0.000	0.000	0.000	30.696	2.135	0.000	1.109	33.941	0.000	33.941
2025	0.000	0.000	0.000	0.000	31.316	2.180	0.000	1.131	34.627	0.000	34.627
2026	0.000	0.000	0.000	0.000	31.949	2.225	0.000	1.154	35.328	0.000	35.328
Total:	0.000	0.000	0.000	0.000	292.209	20.305	0.000	10.563	323.077	0.000	323.077

APPENDIX 6. Emissions summary

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HIGHWAY DEVELOPMENT & MANAGEMENT

Emissions Summary

Study Name: **E67 Smart_project**
Run Date: **05-09-2016**

Section: EST_1_Laagri - Aasmae
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s1 Road Class: Main (Põhimaantee)
Length: 14.13m Width: 12.05m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	66.11	176.02	147.55	4.94	15 209.56	16.82	1.47
2018	69.60	184.71	153.93	5.20	15 869.39	17.70	1.52
2019	73.28	193.87	160.61	5.48	16 560.16	18.64	1.58
2020	77.19	203.54	167.61	5.78	17 283.46	19.62	1.65
2021	81.33	213.76	174.94	6.10	18 040.99	20.67	1.71
2022	83.51	219.22	178.96	6.26	18 456.24	21.22	1.75
2023	85.76	224.82	183.07	6.43	18 881.17	21.79	1.78
2024	88.07	230.57	187.28	6.61	19 316.22	22.38	1.82
2025	90.44	236.48	191.59	6.79	19 761.71	22.98	1.86
2026	92.88	242.55	196.01	6.97	20 218.02	23.60	1.90

Section: EST_2_Aasmae - Marjamaa
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s2 Road Class: Main (Põhimaantee)
Length: 36.99m Width: 9.67m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	395.09	855.48	448.01	31.29	47 187.35	100.25	2.60
2018	419.71	906.82	471.28	33.26	49 658.02	106.48	2.70
2019	445.91	961.38	495.86	35.35	52 267.02	113.12	2.80
2020	473.80	1 019.35	521.80	37.58	55 022.78	120.18	2.90
2021	503.49	1 080.97	549.19	39.95	57 934.36	127.70	3.01
2022	518.67	1 112.59	563.56	41.17	59 462.18	131.54	3.07
2023	534.29	1 145.11	578.31	42.41	61 030.33	135.50	3.13
2024	550.39	1 178.58	593.45	43.70	62 640.77	139.58	3.19
2025	566.97	1 213.06	609.00	45.03	64 295.24	143.79	3.25
2026	584.07	1 248.57	624.98	46.39	65 995.35	148.12	3.32

Section: EST_3_Marjamaa - Halinga
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s3 Road Class: Main (Põhimaantee)
Length: 38.54m Width: 9.55m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	438.18	935.44	453.37	34.72	47 705.56	110.64	2.26
2018	465.66	992.28	477.69	36.91	50 282.13	117.57	2.34
2019	494.91	1 052.70	503.39	39.25	53 006.81	124.95	2.42
2020	526.05	1 116.95	530.56	41.74	55 889.13	132.81	2.51
2021	559.21	1 185.27	559.30	44.39	58 938.62	141.17	2.60
2022	576.12	1 220.20	574.28	45.74	60 527.91	145.44	2.66
2023	593.51	1 256.13	589.64	47.13	62 159.04	149.83	2.71
2024	611.42	1 293.10	605.42	48.56	63 834.64	154.36	2.76
2025	629.89	1 331.19	621.64	50.03	65 556.83	159.02	2.82
2026	648.92	1 370.42	638.31	51.55	67 327.31	163.83	2.87

Section: EST_4_Halinga - Janesselja
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s4 Road Class: Main (Põhimaantee)
Length: 19.95m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	242.77	519.36	261.45	19.29	27 614.38	61.60	1.40
2018	257.76	550.43	275.15	20.49	29 071.21	65.39	1.45
2019	273.72	583.45	289.62	21.76	30 610.08	69.43	1.51
2020	290.69	618.52	304.89	23.12	32 236.12	73.73	1.56
2021	308.75	655.79	321.03	24.56	33 954.48	78.30	1.62
2022	317.97	674.87	329.47	25.30	34 853.13	80.63	1.65
2023	327.45	694.50	338.12	26.06	35 775.20	83.04	1.69
2024	337.22	714.69	347.01	26.84	36 722.10	85.51	1.72
2025	347.28	735.48	356.13	27.65	37 694.88	88.06	1.75
2026	357.65	756.89	365.51	28.48	38 694.48	90.69	1.79

Section: EST_5_Janesselja - Uulu
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s5 Road Class: Main (Põhimaantee)
Length: 18.73m Width: 10.10m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	161.84	347.15	193.08	12.98	20 720.46	41.73	1.23
2018	171.82	367.97	203.04	13.78	21 789.56	44.28	1.28
2019	182.44	390.09	213.55	14.63	22 918.13	46.99	1.33
2020	193.74	413.62	224.65	15.54	24 110.03	49.87	1.38
2021	205.78	438.64	236.38	16.51	25 369.30	52.94	1.43
2022	211.95	451.53	242.58	17.00	26 034.87	54.52	1.46
2023	218.31	464.79	248.94	17.51	26 718.06	56.14	1.49
2024	224.86	478.45	255.47	18.04	27 419.76	57.82	1.52
2025	231.61	492.52	262.18	18.58	28 140.75	59.54	1.56
2026	238.57	507.02	269.07	19.14	28 881.75	61.32	1.59

Section: EST_6_Uulu - Ikla (Border area)
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(4)_1_s6 Road Class: Main (Põhimaantee)
Length: 50.40m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	547.75	1 127.93	459.17	43.66	48 538.72	137.65	1.28
2018	583.45	1 200.46	486.64	46.51	51 450.35	146.61	1.33
2019	621.52	1 277.78	515.84	49.55	54 545.38	156.16	1.38
2020	662.13	1 360.21	546.87	52.80	57 835.95	166.35	1.43
2021	705.45	1 448.10	579.87	56.26	61 334.92	177.22	1.49
2022	727.50	1 492.89	596.86	58.02	63 136.63	182.75	1.52
2023	750.21	1 539.04	614.35	59.84	64 990.33	188.46	1.55
2024	773.63	1 586.59	632.34	61.71	66 898.58	194.33	1.58
2025	797.77	1 635.61	650.87	63.64	68 863.66	200.39	1.61
2026	822.68	1 686.16	669.96	65.63	70 887.64	206.64	1.65

Section: LAT_9_Ainazi - Salacgriva
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s9 Road Class: Main (Põhimaantee)
Length: 11.84m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	161.96	331.17	131.05	12.93	13 890.65	40.71	0.31
2018	166.88	341.23	135.02	13.33	14 311.81	41.95	0.32
2019	170.32	348.24	137.78	13.60	14 604.98	42.82	0.33
2020	173.83	355.40	140.61	13.88	14 904.58	43.70	0.34
2021	177.41	362.73	143.49	14.17	15 210.81	44.60	0.34
2022	181.05	370.15	146.42	14.46	15 521.33	45.52	0.35
2023	184.75	377.71	149.40	14.76	15 837.68	46.45	0.36
2024	188.53	385.43	152.44	15.06	16 160.30	47.40	0.36
2025	192.39	393.30	155.54	15.37	16 489.56	48.37	0.37
2026	196.33	401.34	158.71	15.68	16 825.71	49.36	0.38

Section: LAT_11_Salacgriva - Jelgavkrasti
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s11 Road Class: Main (Põhimaantee)
Length: 30.63m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	360.74	747.01	308.82	28.69	32 562.04	90.55	0.93
2018	371.61	769.45	318.06	29.56	33 538.32	93.29	0.96
2019	379.16	785.03	324.47	30.16	34 215.14	95.18	0.98
2020	386.88	800.94	331.01	30.78	34 906.34	97.12	1.00
2021	394.76	817.20	337.69	31.40	35 612.37	99.10	1.02
2022	402.74	833.67	344.46	32.04	36 327.97	101.11	1.04
2023	410.87	850.43	351.36	32.69	37 056.61	103.15	1.06
2024	419.16	867.52	358.38	33.35	37 799.21	105.24	1.08
2025	427.61	884.94	365.54	34.02	38 556.59	107.36	1.10
2026	436.24	902.72	372.85	34.71	39 329.29	109.53	1.12

Section: LAT_12_Jelgavkrasti - Lilaste
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s12 Road Class: Main (Põhimaantee)
Length: 35.77m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	450.27	956.11	450.19	35.69	47 368.05	113.52	2.09
2018	463.71	984.39	463.42	36.76	48 767.46	116.92	2.15
2019	473.05	1 004.02	472.58	37.51	49 736.61	119.29	2.19
2020	482.57	1 024.05	481.92	38.27	50 725.41	121.70	2.23
2021	492.30	1 044.50	491.46	39.04	51 734.38	124.16	2.28
2022	502.15	1 065.19	501.11	39.83	52 756.90	126.65	2.32
2023	512.18	1 086.26	510.94	40.63	53 798.02	129.19	2.36
2024	522.40	1 107.72	520.96	41.44	54 858.88	131.78	2.41
2025	532.83	1 129.61	531.16	42.27	55 940.34	134.42	2.46
2026	543.46	1 151.93	541.57	43.12	57 043.09	137.12	2.50

Section: LAT_13_Lilaste - Adazi
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s13 Road Class: Main (Põhimaantee)
Length: 14.36m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	202.79	442.06	244.66	16.10	25 866.69	51.77	1.55
2018	208.73	454.80	251.68	16.57	26 616.98	53.30	1.60
2019	212.85	463.62	256.52	16.90	27 135.20	54.36	1.63
2020	217.05	472.61	261.46	17.24	27 663.45	55.44	1.66
2021	221.33	481.79	266.49	17.58	28 202.50	56.55	1.69
2022	225.67	491.07	271.59	17.93	28 748.92	57.66	1.72
2023	230.09	500.52	276.78	18.29	29 305.06	58.80	1.75
2024	234.59	510.13	282.06	18.65	29 871.47	59.96	1.79
2025	239.18	519.93	287.43	19.01	30 448.63	61.14	1.82
2026	243.85	529.91	292.91	19.39	31 036.87	62.35	1.85

Section: LAT_14_Adazi - Riga bypass
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A1)_2_s14 Road Class: Main (Põhimaantee)
Length: 6.94m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	169.80	364.22	204.70	13.64	22 026.03	43.87	1.33
2018	173.18	370.88	208.97	13.93	22 569.91	44.82	1.37
2019	176.35	377.36	213.00	14.20	23 073.00	45.69	1.40
2020	180.57	386.13	218.46	14.55	23 747.22	46.84	1.45
2021	186.52	398.56	226.25	15.05	24 704.92	48.46	1.52
2022	194.10	414.50	236.24	15.68	25 919.87	50.51	1.61
2023	197.65	422.03	240.48	15.96	26 382.31	51.43	1.63
2024	200.70	428.52	244.13	16.21	26 779.51	52.23	1.66
2025	203.82	435.13	247.85	16.46	27 184.61	53.04	1.68
2026	206.99	441.87	251.64	16.72	27 597.89	53.86	1.71

Section: LAT_15_Ryga bypass - Amatnieki
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s15 Road Class: Main (Põhimaantee)
Length: 4.88m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	99.56	207.96	99.23	7.98	10 629.11	25.39	0.47
2018	102.52	214.12	102.17	8.22	10 945.37	26.14	0.49
2019	104.57	218.39	104.21	8.38	11 164.34	26.67	0.49
2020	106.66	222.74	106.28	8.55	11 387.79	27.20	0.50
2021	108.80	227.20	108.41	8.72	11 616.09	27.75	0.51
2022	110.97	231.71	110.56	8.90	11 847.60	28.30	0.52
2023	113.17	236.30	112.75	9.07	12 083.44	28.87	0.54
2024	115.42	240.98	114.98	9.26	12 323.86	29.44	0.55
2025	117.72	245.75	117.25	9.44	12 569.08	30.03	0.56
2026	120.06	250.62	119.57	9.63	12 819.28	30.63	0.57

Section: LAT_16_Amatnieki - Ulupji
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s16 Road Class: Main (Põhimaantee)
Length: 4.48m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	65.84	137.72	64.97	5.27	6 928.70	16.74	0.30
2018	67.80	141.81	66.90	5.42	7 135.00	17.24	0.31
2019	69.16	144.64	68.23	5.53	7 277.74	17.59	0.31
2020	70.55	147.53	69.59	5.64	7 423.36	17.94	0.32
2021	71.96	150.48	70.98	5.76	7 572.01	18.30	0.33
2022	73.39	153.47	72.39	5.87	7 722.72	18.67	0.33
2023	74.85	156.51	73.82	5.99	7 876.20	19.04	0.34
2024	76.34	159.61	75.28	6.11	8 032.63	19.42	0.35
2025	77.85	162.77	76.77	6.23	8 192.13	19.80	0.35
2026	79.40	165.99	78.29	6.35	8 354.83	20.20	0.36

Section: LAT_17_Ulupji - Saulkalne
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A4)_1_s17 Road Class: Main (Põhimaantee)
Length: 11.10m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	180.80	377.51	174.55	14.45	18 580.15	45.89	0.76
2018	186.22	388.78	179.75	14.89	19 135.81	47.26	0.79
2019	189.99	396.63	183.37	15.19	19 521.62	48.22	0.80
2020	193.84	404.64	187.05	15.50	19 915.33	49.20	0.82
2021	197.77	412.82	190.82	15.81	20 317.40	50.20	0.83
2022	201.76	421.10	194.63	16.13	20 725.25	51.21	0.85
2023	205.82	429.54	198.52	16.46	21 140.78	52.24	0.87
2024	209.95	438.15	202.49	16.79	21 564.46	53.30	0.88
2025	214.18	446.93	206.53	17.13	21 996.66	54.37	0.90
2026	218.49	455.88	210.65	17.47	22 437.70	55.47	0.92

Section: LAT_18_Saulkalne - Salaspils
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A6)_2_s18 Road Class: Main (Põhimaantee)
Length: 5.59m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	116.86	251.95	144.38	9.38	15 512.58	30.22	0.96
2018	120.26	259.21	148.55	9.65	15 967.16	31.10	0.99
2019	122.61	264.24	151.45	9.84	16 281.74	31.72	1.01
2020	125.02	269.38	154.40	10.04	16 602.97	32.34	1.03
2021	127.48	274.63	157.41	10.24	16 931.08	32.98	1.05
2022	129.98	279.94	160.47	10.44	17 263.96	33.63	1.07
2023	132.29	284.80	163.32	10.63	17 583.37	34.24	1.09
2024	134.03	288.23	165.57	10.78	17 871.63	34.74	1.11
2025	136.29	292.82	168.52	10.97	18 241.25	35.36	1.14
2026	139.27	298.98	172.45	11.22	18 729.51	36.18	1.17

Section: LAT_19_Salaspils - Hydropower plant
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A5)_1_s19 Road Class: Main (Põhimaantee)
Length: 2.40m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	37.13	76.91	35.83	2.99	3 866.00	9.48	0.16
2018	38.29	79.31	36.94	3.08	3 986.12	9.78	0.17
2019	39.11	81.01	37.72	3.14	4 070.52	9.99	0.17
2020	39.95	82.74	38.52	3.21	4 156.83	10.20	0.17
2021	40.81	84.51	39.34	3.28	4 245.14	10.42	0.18
2022	41.68	86.31	40.17	3.35	4 334.88	10.64	0.18
2023	42.56	88.15	41.02	3.42	4 426.49	10.87	0.18
2024	43.47	90.03	41.88	3.50	4 520.08	11.10	0.19
2025	44.40	91.95	42.77	3.57	4 615.74	11.34	0.19
2026	45.35	93.91	43.67	3.65	4 713.53	11.58	0.20

Section: LAT_21_Hydropower plant - Kekava
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A5)_1_s21 Road Class: Main (Põhimaantee)
Length: 5.74m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	96.67	201.67	94.13	7.74	10 049.06	24.58	0.42
2018	99.56	207.69	96.94	7.97	10 349.47	25.32	0.43
2019	101.57	211.87	98.88	8.13	10 557.86	25.83	0.44
2020	103.62	216.13	100.87	8.30	10 770.50	26.35	0.45
2021	105.71	220.49	102.89	8.46	10 987.66	26.88	0.46
2022	107.84	224.90	104.95	8.63	11 207.93	27.43	0.47
2023	110.00	229.40	107.04	8.81	11 432.34	27.98	0.48
2024	112.20	233.98	109.18	8.98	11 661.14	28.54	0.49
2025	114.45	238.65	111.36	9.16	11 894.54	29.11	0.50
2026	116.74	243.42	113.58	9.35	12 132.68	29.69	0.51

Section: LAT_22_Kekava - Iecava
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s22 Road Class: Main (Põhimaantee)
Length: 25.17m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	560.19	1 169.13	530.76	44.71	56 340.46	141.82	2.21
2018	576.77	1 203.48	546.28	46.04	57 998.46	146.03	2.27
2019	588.27	1 227.31	557.03	46.96	59 146.59	148.95	2.32
2020	600.00	1 251.62	567.98	47.90	60 317.71	151.93	2.36
2021	611.99	1 276.45	579.17	48.86	61 513.68	154.98	2.41
2022	624.13	1 301.58	590.50	49.84	62 725.97	158.06	2.45
2023	636.49	1 327.17	602.04	50.83	63 960.41	161.20	2.50
2024	649.09	1 353.25	613.79	51.84	65 218.38	164.41	2.55
2025	661.94	1 379.83	625.78	52.87	66 500.98	167.67	2.60
2026	675.04	1 406.94	637.99	53.92	67 809.12	171.00	2.65

Section: LAT_23_Iecava - Bauska
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s23 Road Class: Main (Põhimaantee)
Length: 20.95m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	403.76	841.85	371.82	32.17	39 329.15	101.87	1.43
2018	415.80	866.77	382.76	33.13	40 491.95	104.92	1.47
2019	424.16	884.08	390.34	33.80	41 298.24	107.03	1.50
2020	432.69	901.73	398.07	34.48	42 120.68	109.19	1.53
2021	441.40	919.76	405.96	35.18	42 960.28	111.40	1.55
2022	450.23	938.02	413.96	35.88	43 811.39	113.63	1.58
2023	459.22	956.62	422.10	36.60	44 678.11	115.91	1.61
2024	468.38	975.56	430.40	37.33	45 561.44	118.23	1.64
2025	477.73	994.88	438.85	38.08	46 462.13	120.59	1.68
2026	487.27	1 014.59	447.47	38.84	47 380.81	123.01	1.71

Section: LAT_25_Bauska - LV border area
Alternative: Base alternative
Sensitivity: No Sensitivity Analysis Conducted

Sect ID: E67(A7)_1_s25 Road Class: Main (Põhimaantee)
Length: 16.49m Width: 9.00m Rise+Fall: 5.00m/km Curvature: 10.00 deg/km

Year	Annual Emission Quantities in tonnes						
	Hydrocarbon HC	Carbon monoxide CO	Nitrous oxide NOx	Sulphur dioxide SO2	Carbon dioxide CO2	Particulates Par	Lead Pb
2017	280.45	569.59	217.58	22.43	23 110.64	70.47	0.41
2018	288.93	586.79	224.14	23.10	23 808.16	72.60	0.42
2019	294.82	598.74	228.70	23.58	24 292.65	74.08	0.43
2020	300.84	610.96	233.36	24.06	24 787.63	75.59	0.44
2021	306.99	623.44	238.11	24.55	25 293.39	77.14	0.45
2022	313.22	636.09	242.94	25.05	25 805.93	78.71	0.46
2023	319.57	648.97	247.85	25.56	26 327.95	80.30	0.47
2024	326.04	662.10	252.85	26.07	26 860.21	81.93	0.48
2025	332.63	675.49	257.96	26.60	27 402.87	83.59	0.49
2026	339.36	689.13	263.16	27.14	27 956.15	85.28	0.50

APPENDIX 7. Site visit videos

Site visit videos are included on the DVD, enclosed to the report.