Witteveen + Bos

NEA
a member of Panteia

HTM Consultancy

Ministry of Transport
Republic of Latvia

Mobility Plan and Action Program for Riga and Pieriga

SEA Report

Mobility Plan Riga and Pieriga

Tornu iela 4, III C, office no. 203

Riga, LV-1050

Latvia

Phone: +371 7 223 144

Fax: +371 7 223 830

Witteveen + Bos

NEA
a member of Panteia

HTM Consultancy

Ministry of Transport
Republic of Latvia

Mobility Plan and Action Program for Riga and Pieriga

SEA Report

reference	project code	status
LET106-1/hitm/053	LET106-1	final
project manager	**project director**	**date**
D.K. Tensen MSc	C.M. Sluis MSc	December 23, 2010

authorisation	name	initials
approved	A.H.J. van Kuijk MSc	

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

INDEX **P.**

ABBREVIATIONS

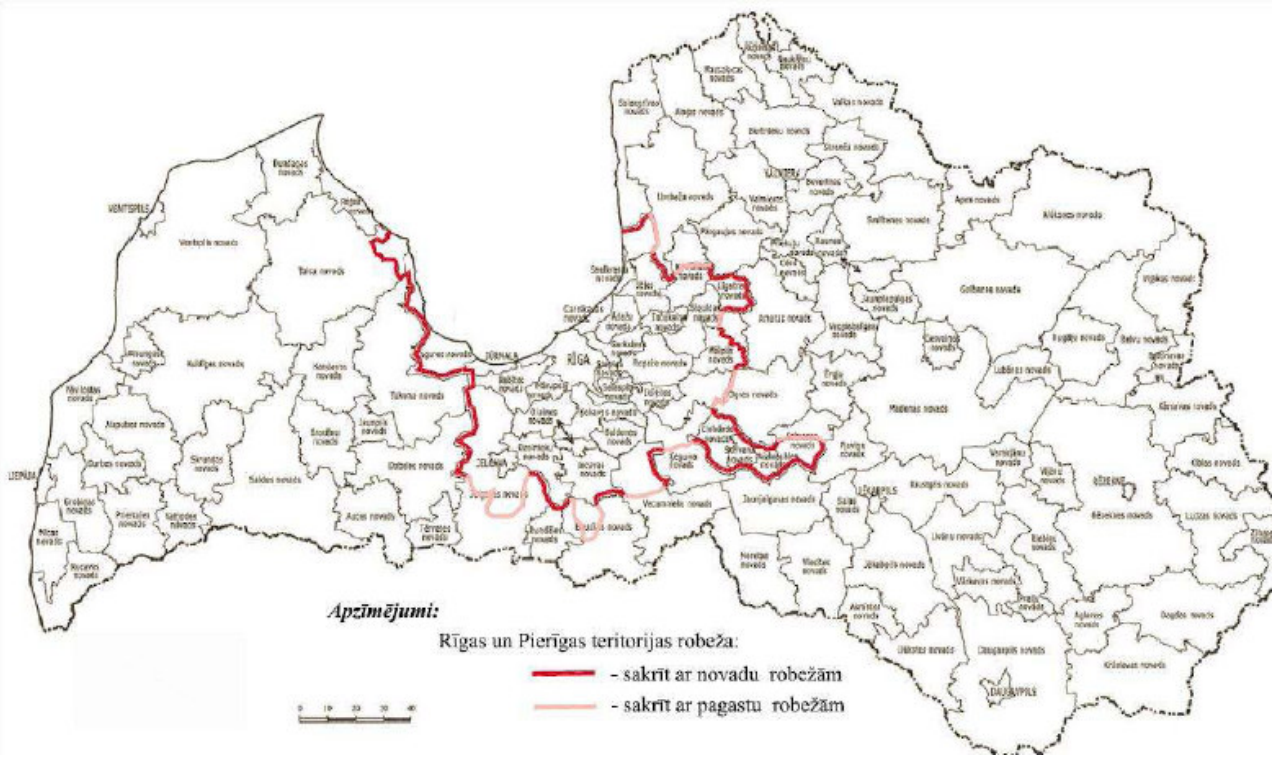
dB(A)	Unit for noise
CO	Carbon monoxide
CO_2	Carbon dioxide
CBA	Cost-Benefit Analysis
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ESB	Environmental State Bureau of the Ministry of Environment
EPER	European Pollutant Emission Register
EIRR	Estimated Internal Rate of Return
EU	European Union
EC	European Commission
GDP	Gross Domestic Product
NO_x	Nitrogen oxide
NMT	Non motorised transport
NTC	Northern Transport Corridor
O_3	Ozone
OECD	Organisation for Economic Co-operation and Development
$PM_{2.5}$	Particulate Matter (diameter < 2.5 µm)
PM_{10}	Particulate Matter (diameter < 10 µm)
Pkm	Passenger kilometres
P+R	Park and Ride
RPMP	Riga and Pieriga Mobility Plan
SAC	Special Area of Conservation
SEIA	Strategic Environmental Impact Assessment
SPA	Special Protection Area
SPNA	Specially Protected Nature Area
WFD	Water Framework Directive
SO_2	Sulphur dioxide
SWOT	Strong points, Weak points, Opportunities and Threats

EXECUTIVE SUMMARY

existing situation in Riga and Pieriga area

The Riga and Pieriga area approximately corresponds to the Riga agglomeration territory with a size of 6,984 km² and a total of 1,069.7 thousand inhabitants. This population is 47 % of the whole population of Latvia and 67 % of this population inhabits the city of Riga. Figure 1 gives an overview of territories in Latvia.

figure 1. Riga and Pieriga



Riga and Pieriga face several main problems related to traffic infrastructure, amongst others:

- lack of unified planning and management of public transport, road and rail networks;
- lack of capacity of the bypasses of the city of Riga, lack of bridges between the two banks of the Daugava river and a fragmented street network resulting in traffic flow congestion;
- one of the highest number of road accidents in Europe;
- inefficient transportation businesses;
- lack of pedestrian, cycle and segregated public transport facilities;
- weaknesses in the organisational and legal framework regarding integrated transport systems and promotion of sustainable mobility;
- high levels of air pollution.

objectives of the RPMP

The RPMP is meant to create an overall framework in which all existing and new plans for construction and improvement of the traffic and transport system in Riga and Pieriga are evaluated and prioritised. Professional expertise and ideas of the consultant team have been combined with existing plans and information in the development. The plan provides solutions for the traffic and transport problems which the Ministry of Transport of Latvia is facing, contributing to spatial, ecological, economical, social and institutional optimization.

The RPMP has the following overall goal: **'To determine a vision and necessary actions in order to promote unified transport system development in Riga and Pieriga, thus improving accessibility of the territory'.**

The RPMP objectives are:

1. to make effective use of the existing transport system of Riga and Pieriga and prefer soft measures (management, organisation, ITS) over hard measures (infrastructure development) where possible;
2. develop an efficient, attractive and competitive public transport system, with priority for electric and railway modes;
3. to create a coherent network with clear road and street classifications and prioritisation of modes, by eliminating bottlenecks in the road and street network;
4. increase the level of road safety, without hampering accessibility;
5. provide multi modal accessibility to different places;
6. ensure good and reliable connections between the Riga Freeport, Riga and other national and international (TEN-T) transport infrastructure networks;
7. ensure good and reliable connections between the Riga international airport, Riga and other main regional centres in a sustainable way.

relation with European objectives on traffic and transport

The main objective of EU and Latvian Transport Policy is to establish a sustainable transport system that meets society's economic, social and environmental needs and is conducive to an inclusive society and a fully integrated and competitive Europe. The RPMP objectives fit very well with the above described as well as with EU and Latvian Sustainable Development Strategies objectives.

The RPMP has been developed in line with National Development Plan 2007-2013, Riga Development plan 2006-2018, Riga Long Term Development Strategy till 2025, as well as with development programmes and plans for Riga, Zemgale, Kurzeme and Vidzeme planning regions.

existing environmental situation

The most significant traffic related environmental aspects that have negative impacts on human health and environment, are air pollution and noise.

<u>air pollution</u>

With increasing number of vehicles and traffic, there is a significant increase in air pollution from transport-related emissions, especially nitrogen oxides emissions. Motor transport is the main polluter in the city of Riga. The total amount of pollution emitted by road transport is remarkably higher than what is emitted by stationary sources. The peculiarity of this type of pollution is that it is emitted near to the ground, and its dispersion is hindered by the construction. For this reason, the same amount of emitted substances of pollution creates much higher concentrations in the immediate vicinity at ground level (with impact on people) than emissions from industries (via chimneys).

The air quality monitoring data, available for Riga sine 2003, shows that due to intensive road transport traffic the limit values of late years have been regularly exceeded in Riga, especially NO_2, PM_{10} and $PM_{2.5}$ (see figure 2 and figure 3).

figure 2. Annual average NO_2 concentrations at Riga monitoring stations

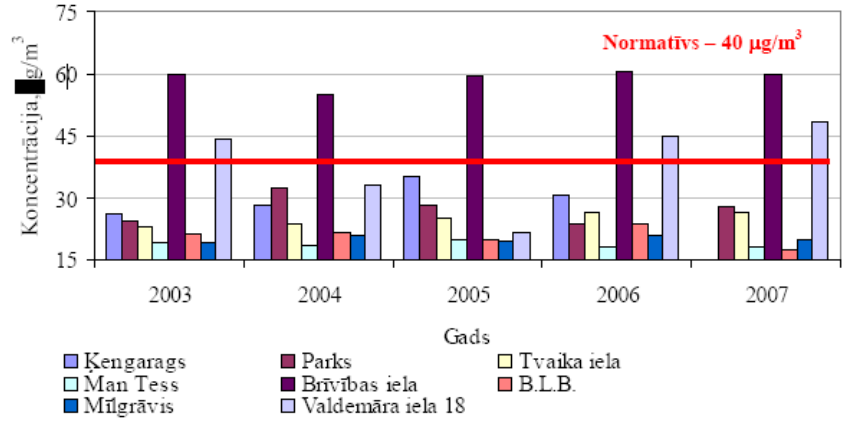
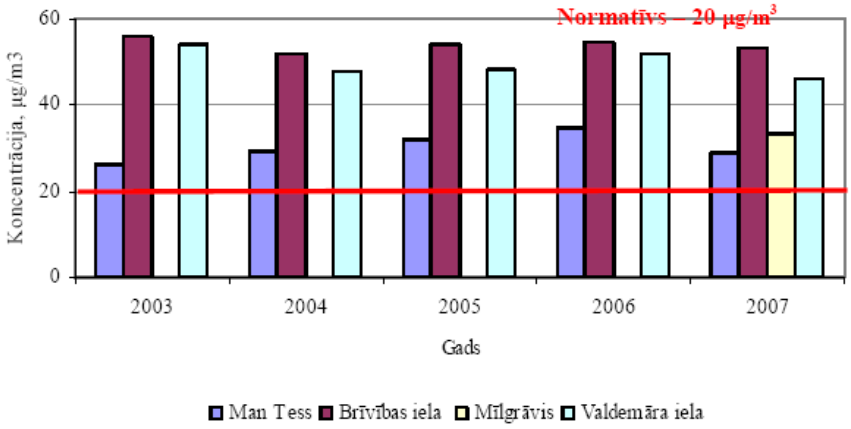


figure 3. Annual average PM_{10} concentrations at Riga monitoring stations[1]



To improve air quality in Riga and in accordance with MC 'Regulations on air quality', the Action Programme for air quality improvement 2004-2009 was developed. Unfortunately the implementation of the Action Program has not been successful. The number of vehicles has not been decreased in the city centre and the air quality limit values are still exceeded.

On January 29, 2010 the Ministry of Environment has received the European Commission's formal notice of infringement procedures Nr. 2008/2195 against the Latvian Republic on the fact that in the Riga agglomeration the threshold levels for particles PM_{10} are exceeded in accordance with prescribed levels in Council Directive 1999/30/EC, as well as the limit values for SO_2, NO_x, PM and lead in the air as stated in Council Directive 2008/50/EC on air quality and cleaner air for Europe.

At present Riga City Council is developing a new action programme, what is planned to be approved before the end of 2010.

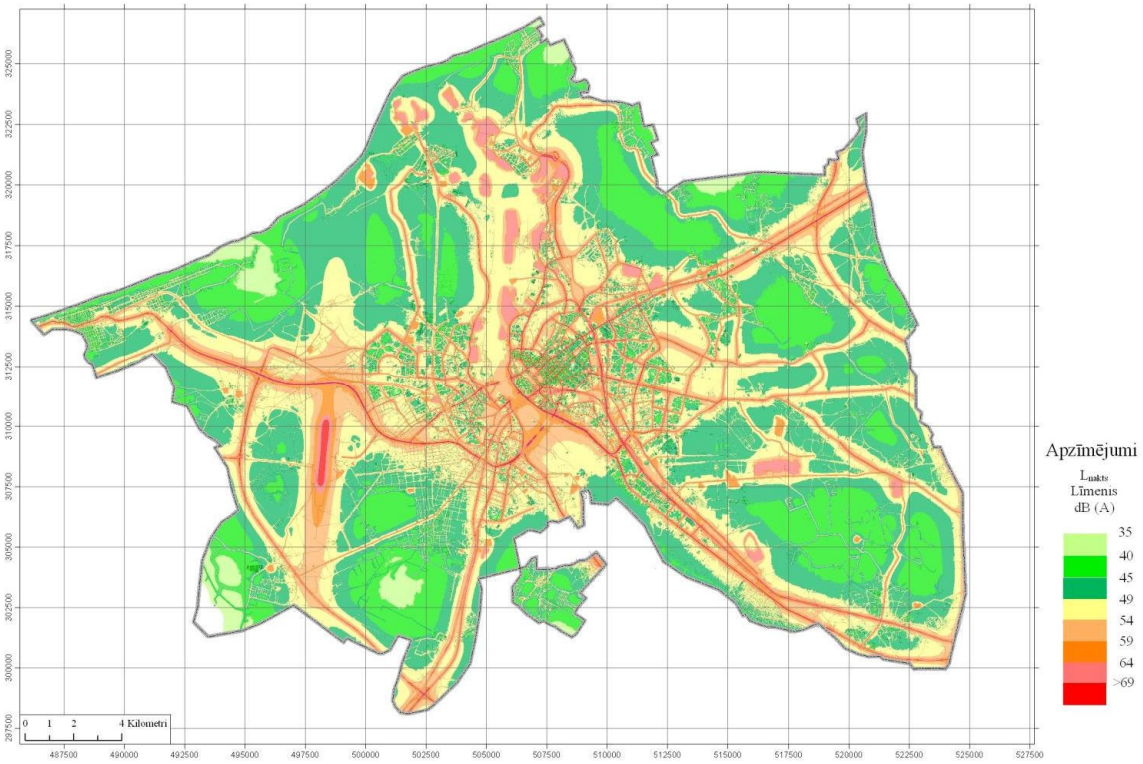
[1] Currently the limit value is 40 µg/m^3 according MC „Regulation on air quality"

noise

Noise is one of the physically disadvantaged factors that cause human discomfort, disorders and diseases. Especially transport noise significantly increases the noise level in cities and motorways of nodes nearby. In Riga region, the noise problem is acute in larger cities, especially in Riga, Riga International Airport area and along major motor ways. Until now, noise identification and mapping of the region has not carried out. It has been done only in Riga agglomeration, where the first strategic noise maps was developed in 2008.

The overall night-time noise levels ratio L_{night} in Riga agglomeration are shown in figure 4.

figure 4. Overall noise ratio per nighttime (L_{night}) in Riga agglomeration



The most affected areas in general are the Riga city centre and areas close to the arterial streets and railway lines. The total number of inhabitants living in the influencing zone, where noise level in the night exceeds 40 dB(A) is 181 458.

To be in accordance with MC regulation 'Procedures for noise assessment and management' the Action Plan for Noise Reduction in Riga Agglomeration 2009-2019 has been developed in 2009. At present Riga City Council is working on development of an action plan for noise reduction in Riga city, what is planned to be approved by the end of 2010.

approach for variant development

In the first step of the variant development three so-called theme variants have been developed, based on themes, with a focus on different aspects of the transport system:

8. focus on accessibility, connectivity and road infrastructure (the 'economy' theme);
9. focus on public transport competitiveness (the 'environment' theme);
10. focus on reducing traffic hindrance and establishing traffic calmed areas (the 'liveability' theme).

With these theme variants diverse (extreme) possibilities for the transport system in Riga and Pieriga have been explored. They have been used as test scenarios for the transport model. The model results provided insight into maximum possibilities and effect of sets of measures. With the theme variants the transport model has been optimally used, through implementation of clearly distinguishable sets of measures.

Simultaneously with the theme variants, the Reference Variant has been developed. This Reference Variant consists of the current situation combined with infrastructure developments which are currently (2010) being built or contracted as well as demographic and economical trends. The Reference Variant is used as a basis for comparison.

main philosophy

The main philosophy for the RPMP is to provide a framework for integrated development of the transport system in Riga and Pieriga. The main philosophy for Riga is to further develop and implement a street hierarchy, along the lines as set out by the Riga City Council. The idea of a hierarchy is that roads and streets are used according to their function. In order to achieve this, the design has to be in accordance with the function, and the network needs to be coherent, to stimulate the right use of the different network links.

To improve safety and liveability a clear distinction between main roads and streets and local streets should be made. Within the grid of main roads and streets, the local streets can be downgraded. However, the wider the grid and the more extensive the traffic calmed areas within the grid, the more problems arise along the major streets and in the grids as well, since traffic is accumulating there. Hence, there is a trade-off between the extensiveness of traffic calmed areas and the traffic related problems on the main grid. Based on the philosophy of road hierarchy, the realistic variants have been distinguished in the density of the main roads and streets grid.

In Pieriga road hierarchy is also an important means for reducing traffic problems, like making a clear distinction between roads with and without direct access of houses, farms and estates. However, the main philosophy for Pieriga is based on spatial planning for the region, as in Pieriga transport and spatial planning are even more interlinked. The Riga Planning Region states that the transport infrastructure of the region should be developed in connection with the planned polycentric development of habitation and distribution of work places. In the context of net outmigration and shrinking population, it is considered essential to the sustainable and balanced development of the region to keep critical mass in towns and villages. With this critical mass the living conditions can be maintained and improved, since the location becomes more attractive for employment, services and dwellers. Accessibility is regarded as the key to maintain critical mass. This is the basis for the RPMP philosophy for Pieriga.

In order to avoid widespread low density housing and industrial estates, the Riga Planning Region recommends concentrating new developments along existing railway lines. This objective is adopted for the RPMP. In the RPMP the railways are chosen as the regional backbone for public transport and spatial development.

basic measures

Transport modelling, interviews and workshops and analyses of model results, existing data and field surveys have been performed. The results have clearly shown important bottlenecks and drawbacks in the transport system, which can be solved with the proposed measures in the RPMP. Several main measures have been identified, which are at least necessary to improve the traffic and transport situation. These measures form the basic set of measures, which is included in all variants.

The main measures included in the basic set are:

- completion of connections to the Southern bridge (stage 3 from Southern bridge till A7), to improve usage of the bridge (traffic analysis has shown that in the RPMP period there is no need for further connection between the A7 and A8, independent of the choice for one of the variants);
- downgrade of Akmens bridge (not in Variant C), traffic calming in the Riga city centre and the introduction of dedicated streets for public and non-motorized transport, to improve accessibility (avoid transit traffic), liveability and traffic safety;
- introduction of a one-way street system to solve bottlenecks on radials crossing the eastern railway loop;
- construction of a bypass for Valmieras iela, to solve local liveability issues;
- improvement of the connection(s) to the port area by rail and road;
- cohesion fund project E22 section Riga (Tinuzi) - Koknese, to enhance Riga accessibility and solve local transport related problems in the corridor;
- reconstruction of E77/A2, section between the Riga bypass and Senite and of E67/A4 Riga bypass, section between the A6 and the A2, mainly to improve the Via Baltica route;
- construction of the E67/A7 Kekava bypass, to solve local transport related problems and to increase Riga accessibility;
- improvement of the public transport network in Riga and Pieriga, with passenger train, tram and trolleybus as backbone, to increase efficiency and competitiveness with the car mode;
- local traffic safety measures in Riga and Pieriga, to eliminate black spots.

The Reference Variant and the RPMP variants have been assessed with a traffic model analysis, a cost-benefit analysis and a multi criteria analysis. The variants give a proposal for the main road, rail and public transport structures in Riga and Pieriga. Based on the results a choice can be made for the future structure of the transport system.

In order to properly and transparently address the environmental aspects that are related with the RPMP, a Strategic Environmental Assessment (SEA) is prepared in line with EU Directive 97/11/EC, as transposed in Latvia into the law 'On Environmental Impact Assessment' and the associated Regulations of the Cabinet of Ministers No. 157 'Procedures for Strategic Environmental Assessment', as well as related international and Latvian regulations.

RPMP variants

The three realistic variants have been distinguished based on the main road and street hierarchy. In Variant A and Variant B the road and street system is complemented with a new river crossing to the north of Vansu Bridge. Analysis has shown that there is a very large demand for such a connection and that such a connection is necessary to be able to reduce the amount of traffic in the Riga city centre. Also, it is regarded as imperative for making a new step in improving the transport system, since possibilities for further optimisation of the existing network are limited without a new crossing.

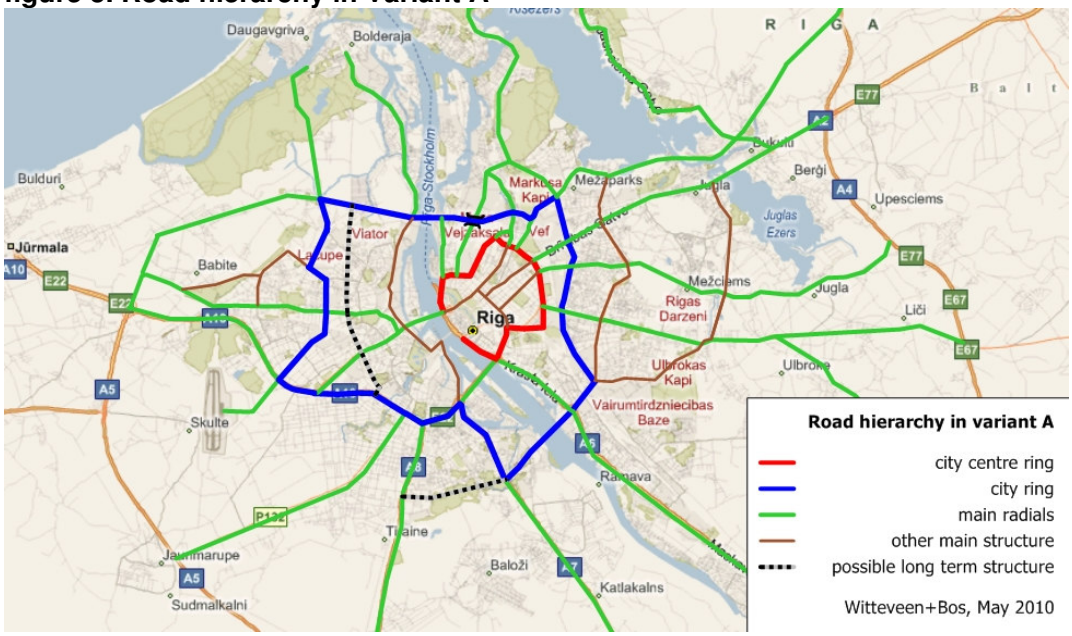
Variant A foresees a sparser main network, with clear hierarchy and high capacities and speeds. Variant B foresees a denser main network, with more possible routes, but less capacity per route. Variant C does not include any new river crossing. This variant focuses on better use of the Southern bridge and improvements with traffic management on the main routes in the road and street hierarchy. Figures 5 to 7 present the future hierarchy for each of the three variants.

Variant A

The main distinguishing measures in Variant A are:

- construction of the complete Northern Transport Corridor (NTC) including a new Daugava crossing, relieving the streets in the historical centre of Riga and accommodating freight traffic to the port and industrial zones in the northern part of city;
- construction of a connection from Jurkalnes iela to Jurmalas gatve as part of the western side of the city ring, also connection both sides of the railway Riga-Jurmala;
- reconstruction of the intersection of Augusta Deglava iela with the Eastern Arterial, providing better connection with the city.

figure 5. Road hierarchy in Variant A

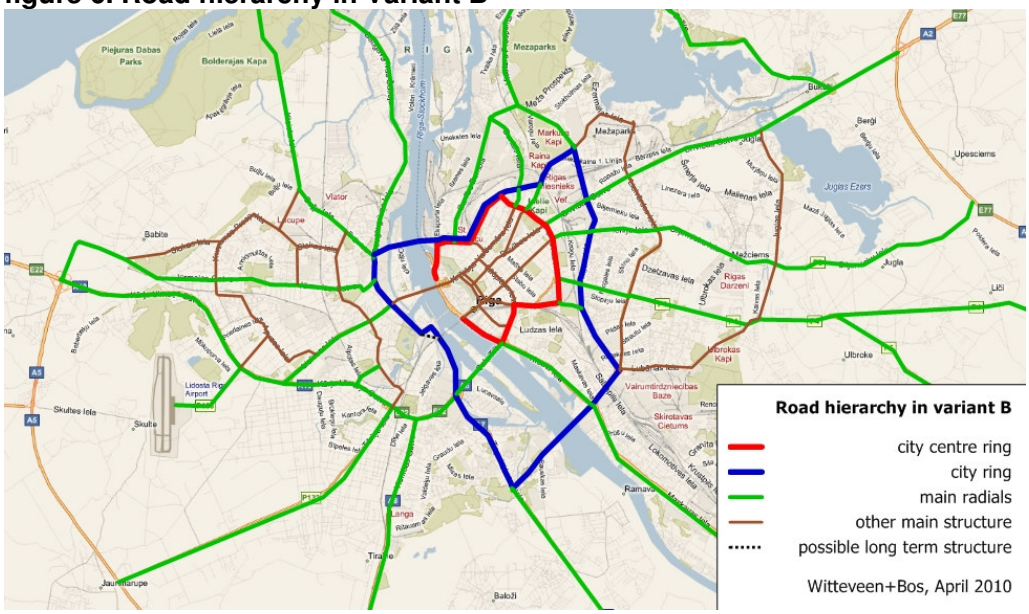


Variant B

The main distinguishing measures in Variant B are:

- construction of the Hanzas bridge including good connections on both banks, accommodating mainly Riga traffic;
- upgrade of the existing route on the west bank of the Daugava close to the river, providing a better, direct (freight) route north-south;
- upgrade of a new connection from Pernavas iela, via Vietalvas iela to the Eastern Magistral, as an alternative for connecting the Eastern Magistral with the city centre.

figure 6. Road hierarchy in Variant B

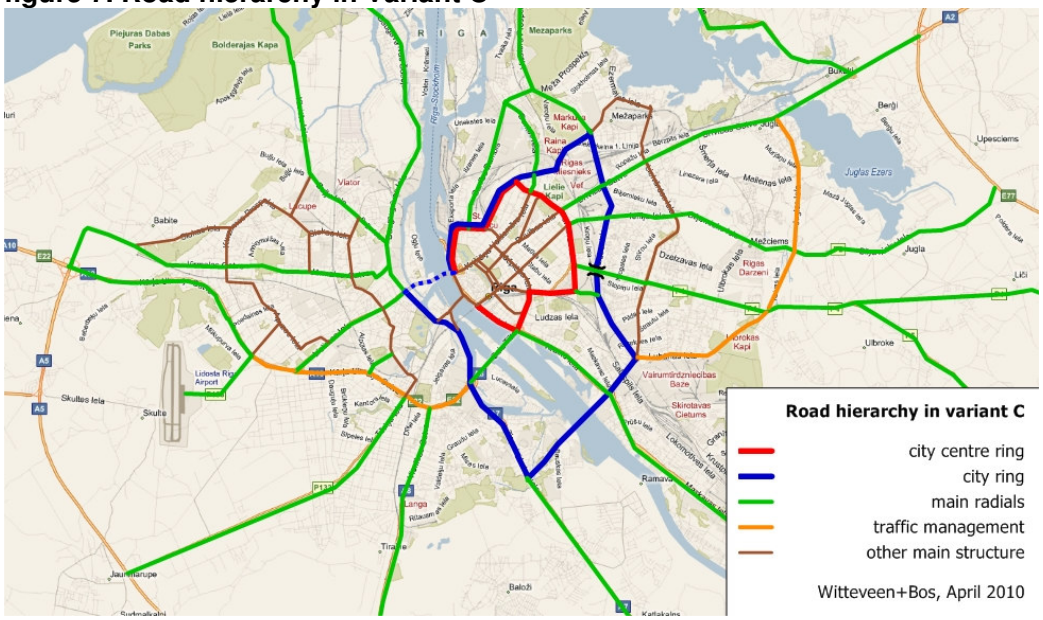


Variant C

The main distinguishing measures in Variant C are:

- upgrade of the existing route on the west bank of the Daugava close to the river, including a new tunnel connecting Ranka dambis directly to Mukusalas iela, with this route being the major north-south route for years to come;
- upgrade of a new connection from Pernavas iela, via Vietalvas iela to the Eastern Magistral, as an alternative for connecting the Eastern Magistral with the city centre;
- implementation of an extensive traffic management system on the main radials with a focus on the routes connecting to the Southern bridge.

figure 7. Road hierarchy in Variant C[2]



[2] Vansu Bridge is part of the city ring in this variant, however this bridge is not accessible for heavy freight traffic

SEA Scoping

The main environmental aspects for the project development are identified and listed in table 1.

table 1. Impacts of infrastructure developments on the environment

aspect	impact	road	PT
air/climate	pollution	√√	√
	noise	√√	√
	temperature changing	√√	0
landscape aesthetic	location of the infrastructure	√√	√
	vegetation changing	√√/+	0
	terrain changing	√√	0
soil	pollution	√√	√
	polluted deposition	√√	√
	compression/sealing	√√	
water	pollution	√	0
	losing water bodies	√	√
	changing the content of atmospheric water	√	0
flora and fauna	loss and damage species	√√/+	0
	pollution pressure	√√	√
	ecological corridor interruption	√√	√
	occupied habitat	√√	√
biotope and biodiversity	vanishing	√√/+	√
	damaging	√√/+	0
agriculture	decreasing potential	√√	√
forestry		√√	√
water management		√√	0
recreation and tourism		√√/+	0
landscape and nature protection		√√	√

√√/√: substantial negative impact; √: negative impact; 0: negligible impact; +: Positive impact

strategy for the SEA

The objective of the SEA is to show the impacts and to present the guidelines for the elaboration of EIA for the projects which are planned in the given area. For the RPMP, the following should be realised:

- project alternatives are developed to a detail that they can be qualitatively compared;
- the alternatives consists of a bundle of individual projects, to be evaluated on their individual merits.

As a consequence of this, the methodology for the SEA needs to be customised for this specific circumstance. The most obvious strategy for this is to include environmental issues into the CBA model. By allocating budget for environmental investments related to the infrastructure development, it can be assured that the environment will be probably addressed. The exact (amount of) measures strongly depend on the (more) detailed design of the individual projects, which will take place in a later stage, when also the EIA procedures are carried out. It should be emphasised that the purpose of the EIA procedures should be to identify full alternatives (including the environmentally friendliest option) per project.

In order to give input to the CBA model, the following activities have been performed:
- the CBA Model takes costs into account for the main environmental impacts related to the project developments;
- for each project development with a significant environmental impact, project fiches are prepared containing relevant environmental information:
  - screening against annex I and annex II of the EIA Directive[3] and the Latvian law 'On Environmental Impact Assessment';
  - overview of qualitative environmental impacts;
  - influences on nearby special locations.

preliminary screening

The preliminary screening expertise was also a part of the SEA, therefore the outcomes are presented.

screening of road projects

Of the 23 road projects that are covered by the RPMP, 6 projects fall under annex I of the EIA Directive:
- Northern Transport Corridor (NTC);
- Hanzas Bridge;
- E22: Section (re)construction Riga by-pass - Koknese;
- E67/A7 Construction of a bypass in the A7 around Kekava;
- E67/A4 Reconstruction of Riga bypass section between A2 and A6;
- reconstruction of E77/A2 section between Riga bypass and Senite.

Full EIAs should be performed for these 6 road projects and the results should be incorporated in the design of the roads. Table 2 presents an overview of their influence areas.

table 2. Influence areas of road development projects

project	urban areas	Ramsar sites	Natura 2000	national parks	nature parks	cultural heritage
Northern Transport Corridor (NTC)	X		X			X
Hanzas Bridge	X					X
E22: Section (re)construction Riga by-pass - Koknese	X					X
E67/A7 Construction of a bypass in the A7 around Kekava	X					
E67/A4 Reconstruction of Riga bypass section between A2 and A6	X					
Reconstruction of E77/A2 section between Riga bypass and Senite	X		X			

The other six new construction projects are listed under annex II of the EIA Directive and law 'On Environmental Impact Assessment'. For these projects the screening procedure should be performed to assess the need for full EIAs.

The impact of the roads in general and with specific attention for these special areas should be/are carefully examined during the EIA and the results should be incorporated in the design of the road. Special attention should be paid in the EIA process for assessing the potential impacts on Natura 2000 sites and the potential harm to them (2 projects according to table 2).

[3] The EC Directive 85/337/EEC as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC

Attention should be paid to highway runoff (rain) water, which can contaminate nearby surface water and/or groundwater with oil products or other chemicals, particularly in case of traffic accidents. During the winter by the road spreading with salt solution (sodium chloride), is likely to worsen the ecological situation in open surface water bodies. Especially in Riga runoff (rain and thaw) water has to be collected in a closed system with adequate treatment before discharge into the environment.

In general, the development of the road projects will reduce traffic flow in the Riga Historical Centre, and the freight traffic flow trough Riga centre will be eliminated, what will improve air quality, reduce noise levels and improve city environment. Vehicle operating costs will be reduced, including fuel consumption, what will give positive impact to climate changes. Traffic safety will be improved.

In Pieriga project developments will significantly improve traffic organization, what will enable more effective fuel use and traffic safety, thereby the accident risk and impact on environment will be reduced.

Screening of Public Transport projects

Within the framework of the RPMP, 9 rail development projects have been discerned, including new station Tornakalns construction, P+R ('Park & Ride') placement in 50 % of all railway stations, railway track improvement, improvements in stations (platforms, information), as well as improvement in safety. None of these falls under annex I or annex II of the EIA Directive and law 'On Environmental Impact Assessment'. Hence, the environmental impacts of these are deemed minor and no EIA is obligatory.

Furthermore, 15 other Public Transport project are covered by the RPMP, of which the following three fall under annex II of the EIA Directive and law 'On Environmental Impact Assessment':

- light rail to the Airport (Tram / Light Rail connection to the airport consisting of shortcut of 0,7 km via Barinu iela, a shortcut of 0,6 km via Maza Nometnu Iela, 5 km of new tracks);
- tram Riga: new track (0,6km) and terminal (4 mln) in Dole at P+R (P+R not included);
- tram Riga, trolleybus: P+R facilities in Riga at 4 locations, new 1,000 spaces in total, improvement of walkway to stops, information.

For these 3 projects, the initial EIA (screening) procedure should be performed. An overview of their influence areas is presented in table 3.

table 3. Influence areas of PT projects

project	urban areas	Ramsar sites	Natura 2000	national parks	nature parks	cultural heritage
tram/Light Rail to the Airport	X					
tram new track and terminal in Dole	X					
P+R facilities in Riga at 4 locations, 1,000 spaces in total	X					

The RPMP plans improvements in the Riga and Pieriga public transport network, what will assure the use of trains, trams and trolleybuses (electric vehicles) as *a* ST *backbone*, will increase the PT efficiency and ability to compete with cars. In general, increase of using rate in mobility of the public and non-motorized transport gives possibility to reduce the intensity of traffic, wherewith avoiding congestion and reducing noise levels as well as the total fuel (fossil fuel) use and related pollution in the air. It can be significant input for sustainable transport development.

environmental situation without RPMP

The changes in mobility between 2007 and the reference situation 2025 have been evaluated in case the RPMP is not implemented. The large increase in car ownership (60 %) has large consequences for the use of the road network and public transport. Compared to the base year 2007 the average car traffic volumes increase by more than 50 %, mainly due to increase of car ownership. Without large infrastructural measures the congestion and delays will increase. Freight transport grows with approximately 10 %. Another result of increasing car ownership is the decrease of public transport use. Without extra public transport measures, the number of trips is expected to decrease by approximately 30 %. In general that will lead to increased air pollution including greenhouse gases. The situation in 2025 without RPMP implementation is the basis for evaluation of the proposed variants for the RPMP, as presented in the next section.

comparison of the variants

Table 4 presents an overview of environmental data per variant, in comparison with the Reference Variant in 2025, based on the reduction of vehicle kilometres.

table 4. Environmental data per variant in 2025 in comparison with the Reference Variant (without RPMP)*

parameter	Variant A	Variant B	Variant C	unit
CO_2	- 4,381	-1,758	-918	ton/year
CO	-136	-74	-57	ton/year
NO_x	-24	-7	0	ton/year
SO_2	-2	-1	0	ton/year
Volatile Organic Hydrocarbons (including benzene)	-28	-15	-11	ton/year
PM	-5	-2	-1	ton/year
costs/benefits for air pollution #	0.3	0.3	0.3	MEuro
costs/benefits for noise pollution #	- 0.4	-0.4	0.0	MEuro
costs/benefits for climate change #	0.1	0.0	-0.2	MEuro

negative figures are costs, positive figures benefits

* Source: calculations by the NEA Transport research and training institute (Netherland), based on the Handbook on Estimation of External Costs in the Transport Sector "ÏMPACT", written by CE Delft, INFRAS, Fraunhofer Geselschaft - ISI, and the University of Gdansk (December 19, 2007), as well as on other various sources.

For the total evaluation of the project, criteria have been defined on which the variants are scored (relative to the Reference Variant). The scores are based on expert judgement, but for air pollution and climate changes based on calculation. The results are shown in table 0.5.

table 5. Multi criteria analysis

criterion	Variant A	Variant B	Variant C
coherent road and street hierarchy	++	+	0
network robustness	++	+	0
connections of Riga Freeport	++	+	0
connection of Riga airport	++	+	+
accessibility Pieriga	++	+	+
multi modal accessibility	++	++	+
public transport development	++	++	+
congestion reduction	++	++	+
mobility	++	+	0
durability for future developments	++	+	0
concurrence with existing plans	++	0	0
traffic safety	++	+	+
liveability in Riga*	++	+	+
use of existing infrastructure in Riga	--	-	0
effect on nature and landscape	--	-	-
air pollution	++	+	0
climate change	++	+	0
investment costs	--	-	0
travel time gains	++	+	0
EIRR	++	+	+

++/+: positive compared with reference scenario; 0: no significant difference from reference scenario; --/-: negative compared with reference scenario

* liveability in Riga includes noise and air pollution

evaluation of the variants

Within the framework of the RPMP, three alternatives are discerned:

- Variant A: sparse, high capacity main road network;
- Variant B: dense main road network;
- Variant C: use of the Southern bridge.

Table 6 ranks the variants for the key environmental parameters.

table 6. Ranking of variants

parameter	Reference Variant	Variant A	Variant B	Variant C
air pollution	4	1	2	3
climate change	4	1	2	3
effect on nature and landscape	1	4	3	2
liveability in Riga	4	1	2	3

1= best; 4 = worst

Variant A is the best variant for air pollution, climate change and liveability. The difference with the other variants is considerable. The difference between Variant C and the Reference Variant is negligible, due to the small investments that will be done.

As to the effect on nature and landscape, variant A scores worst, because includes the construction of large scale infrastructure construction project (NTC).

All of these variants have an overall better score than the Reference Variant. Hence, there is no environmental objection against the development of any one of them. However, Variant A scores much better than B, ranked 2nd and C. Variant A is therefore the preferred variant from environmental point of view.

mitigation measures

The analysis is made under the assumption that the works will be executed in line with local, national and international regulations, focussing on minimising the environmental impact of the activities. If not covered already in the scope of work, it is advised to take as many mitigation measures into account as reasonably feasible, in order to achieve an approach as close as possible to the environmentally friendliest alternative.

A budget reservation should be made for measures that are not deemed necessary beforehand, but might become required during construction or operation to avoid exceeding of threshold values. Conclusions on the latter could be based on the results of environmental monitoring activities.

environmental monitoring

In order to preserve the quality of environment and liveability, in addition to all necessary measurements from the domain of functionality and safety of the projects it is recommended to organise, throughout the operation lifetime, a systematic monitoring of all segments of environment which might become subject to changes possibly beyond reasonable limits, thus deteriorating the quality of environment.

1. INTRODUCTION

1.1. Framework

The Ministry of Transport of the Republic of Latvia awarded the consortium of Witteveen+Bos (leading consultant), NEA and HTM (hereafter called the Consortium) the project 'Mobility Plan and Action Program for Riga and Pieriga' (ref. no SM 2009/07/FM-KF-TP/01/02-01).

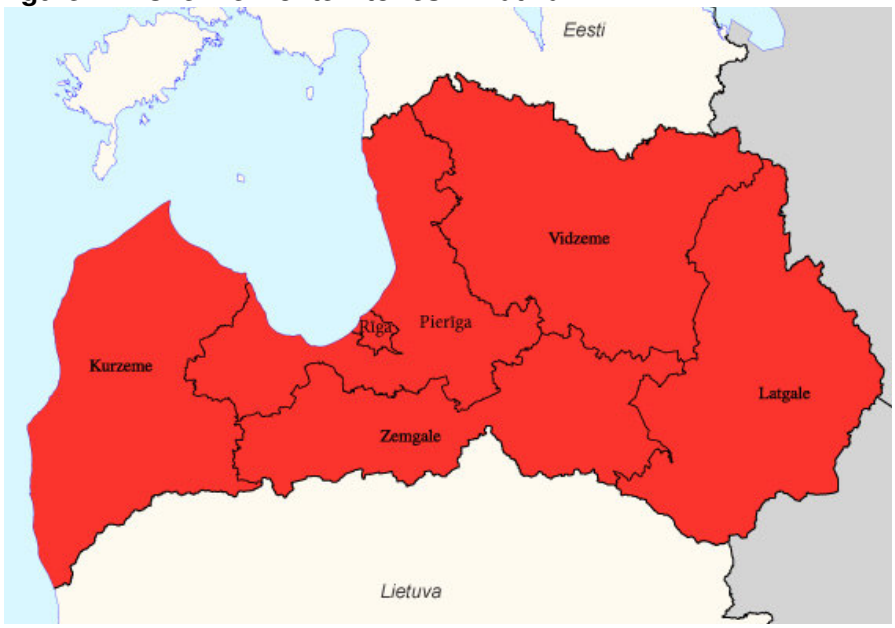
In order to properly and transparently address the environmental aspects within the framework of the project, an environmental study is an integral part of the project. Given the fact that the project focuses on strategic development of mobility, the environmental aspects are analysed in the form of a Strategic Environmental Analysis (SEA). The basic steps for the SEA include:

- environmental screening (What is required from national and international legislation?);
- description of the current environmental situation;
- outline of the development projects;
- environmental scoping (What environmental aspects should be evaluated?);
- environmental analysis of the various alternatives that will are developed;
- needs and possibilities for mitigation;
- evaluation.

1.2. Project background

The Riga and Pieriga area approximately corresponds to the Riga agglomeration territory with a size of 6,984 km² and a total of 1,069.7 thousand inhabitants. This population is 47 % of the whole population of Latvia and 67 % of this population inhabits the city of Riga. Figure 1.1 gives an overview of territories in Latvia.

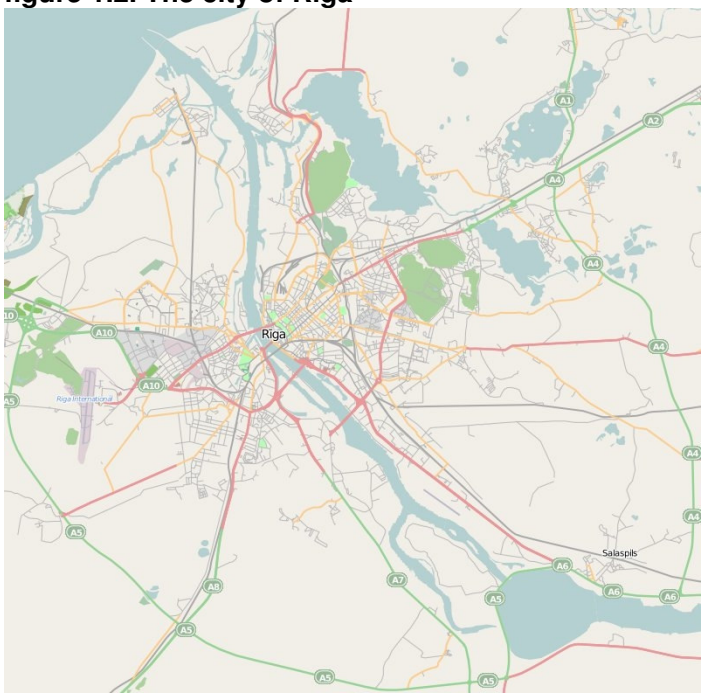
figure 1.1. Overview of territories in Latvia



Riga is the capital city of Latvia and the largest city of the Baltic States. Riga has a major seaport and an international airport and is a junction point of several significant transport arteries (European transport corridor - motorway E77, 'Via Baltica' - motorway E67, motorway E22, and the 'Rail Baltica' railway line (to be constructed)).

The city of Riga is divided by the river Daugava with only few connections between the two banks. In the Pieriga territory a radial road and railway network has historically developed. Riga can be accessed from seven main roads and bypassing is possible through the roads A4 and A5. There are six railway lines connected to Riga. Figure 1.2 gives an overview of the city of Riga and the main road infrastructure.

figure 1.2. The city of Riga



Riga and Pieriga face several main problems related to traffic infrastructure, amongst others:

- lack of unified planning and management of public transport, road and rail networks;
- lack of capacity of the bypasses of the city of Riga, lack of bridges between the two banks of the Daugava river and a fragmented street network resulting in traffic flow congestion;
- one of the highest number of road accidents in Europe;
- inefficient transportation businesses;
- lack of pedestrian, cycle and segregated public transport facilities;
- weaknesses in the organisational and legal framework regarding integrated transport systems and promotion of sustainable mobility;
- high levels of air pollution.

The Riga and Pieriga Mobility Plan (RPMP) should address these problems and has the objective 'to determine necessary actions in order to promote unified transport system development in Riga and Pieriga, thus improving accessibility of the territory'. The RPMP will include three perspectives: long term (20-30 years, strategic level), medium term (15 years, traffic flow survey level) and short term (5 years, action program).

1.3. Objectives of the RPMP

The RPMP is meant to create an overall framework in which all existing and new plans for construction and improvement of the traffic and transport system in Riga and Pieriga are evaluated and prioritised. Professional expertise and ideas of the consultant team have been combined with existing plans and information in the development. The plan provides solutions for the traffic and transport problems which the Ministry of Transport of Latvia is facing, contributing to spatial, ecological, economical, social and institutional optimization.

The RPMP has the following overall goal: **'To determine a vision and necessary actions in order to promote unified transport system development in Riga and Pieriga, thus improving accessibility of the territory**'.

The RPMP objectives are:
- to make effective use of the existing transport system of Riga and Pieriga and prefer soft measures (management, organisation, ITS) over hard measures (infrastructure development) where possible;
- develop an efficient, attractive and competitive public transport system, with priority for electric and railway modes;
- to create a coherent network with clear road and street classifications and prioritisation of modes, by eliminating bottlenecks in the road and street network;
- increase the level of road safety, without hampering accessibility;
- provide multi modal accessibility to different places;
- ensure good and reliable connections between the Riga Freeport, Riga and other national and international (TEN-T) transport infrastructure networks;
- ensure good and reliable connections between the Riga international airport, Riga and other main regional centres in a sustainable way.

relation with European objectives on traffic and transport
There are several documents available in which EU and Latvian objectives concerning traffic and transport are stated (see in chapter 2). The main objective of EU and Latvian Transport Policy is to establish a sustainable transport system that meets society's economic, social and environmental needs and is conducive to an inclusive society and a fully integrated and competitive Europe. The relevant subordinate objectives can be combined in the following categories:
- enhancing mobility of all persons and goods in a sustainable way, strengthening economic and social cohesion;
- improvement of accessibility to centres of economic activity, also improving geographical equality;
- stimulating safe, secure and high quality transport on well maintained and integrated networks;
- stimulating more sustainable and less polluting forms of transport, safeguarding the (living) environment;
- stimulating fair competition between modes, by internalising external costs;
- maximising efficient use of existing infrastructure;
- stimulating intermodality, to increase economic robustness;
- using an integrated approach, stimulating integration and interconnection between transport networks and areas.

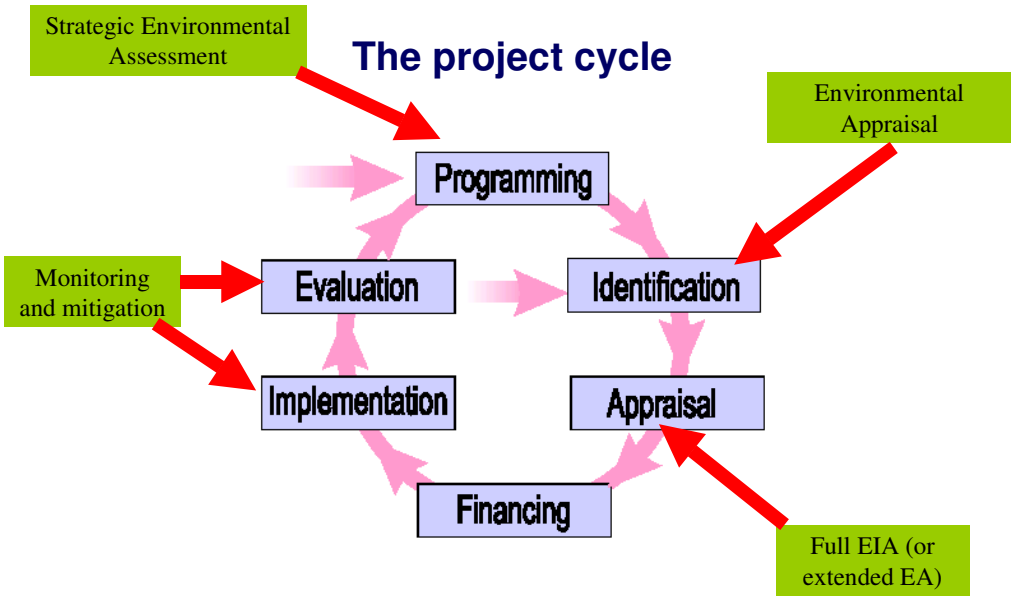
The RPMP objectives fit very well with the EU objectives described above.

During the last five years several policy and development documents have been prepared in Latvia both on the national level and specifically for the Riga and Pieriga area. Together these documents give a framework of basic principles for integrated transport system development in Riga and Pieriga.

1.4. Strategic Environmental Assessment
The development of infrastructure inevitably will have its environmental impacts. Furthermore, different alternatives will have different environmental impacts, both on a local and on a global scale. Including environmental issues in the decision making is an important step towards sustainable development of infrastructure.

Within the framework of environmental assessments, the preparation of a Strategic Environmental Assessment (SEA) is considered to be the most appropriate instrument in the master planning phase. In the SEA not necessarily all aspects have to be reported. Only those aspects that have different effects on the environment regarded to the proposed plan and the alternative plans are useful. The delimitation of the themes for the SEA is also related to the scale of the RPMP. The themes relevant to the choices to be made on the scale of the RPMP have to be dealt with in the SEA. In a later stage, a more detailed assessment of environmental impacts and alternatives for parts of the master plan (e.g. the development of a specific highway) will take place within the framework of the Environmental Impact Assessment (EIA) for that project (see figure 1.3).

figure 1.3. Typical environmental activities in the lifecycle of projects



The SEA for RPMP will provide the competent authority with sufficient information at a strategic level to assess the implications of the final Plan with regard to the environment.

The SEA will deliver the following:

- development of the RPMP while using information about the environmental impacts at a strategic level;
- assessment of the potential significant environmental effects of the proposed plan;
- assessment of the opportunities to promote/enhance environmental conditions;
- recommendations for mitigating or complementary measures and/or alternative plan options to ensure compliance with (European and/or national and/or regional and/or local) environmental policy.

1.5. SEA Scoping

In the first phase of the project, the following was concluded regarding environmental screening and scoping:

- screening: the project is subject to a Strategic Environmental Assessment in accordance with the EIA Directive[4] , as transposed in Latvia into the law 'On Environmental Impact Assessment' and the associated Regulations of the Cabinet of Ministers No. 157 'Procedures for Strategic Environmental Assessment';
- scoping: The main environmental aspects for the project development are identified and listed in table 1.1.

table 1.1. Impacts of infrastructure developments on the environment

aspect	impact	road	PT
air/climate	pollution	√√	√
	noise	√√	√
	temperature changing	√√	0
landscape aesthetic	location of the infrastructure	√√	√
	vegetation changing	√√/+	0
	terrain changing	√√	0
soil	pollution	√√	√
	polluted deposition	√√	√
	compression/sealing	√√	
water	pollution	√	0
	losing water bodies	√	√
	changing the content of atmospheric water	√	0
flora and fauna	loss and damage species	√√/+	0
	pollution pressure	√√	√
	ecological corridor interruption	√√	√
	occupied habitat	√√	√
biotope and biodiversity	vanishing	√√/+	√
	damaging	√√/+	0
agriculture	decreasing potential	√√	√
forestry		√√	√
water management		√√	0
recreation and tourism		√√/+	0
landscape and nature protection		√√	√

√√ substantial negative impact

√ negative impact

0 negiglible impact

\+ positive impact

1.6. Consultation meetings

During the scoping phase the following authorities and institutions/foundations were consulted (Minutes of Meetings are presented in appendix I of this report):

- the Riga City Council Traffic Department;
- the Riga City Council Environmental Department;
- the Environmental State Bureau of the Ministry of Environment (ESB);
- the Ministry of Transport.

[4] Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC).

During the process, consultations were held with representatives from following institutions:
- Ministry of Transport;
- Riga City Council City Development department;
- Riga City Council Traffic Department;
- Latvian State Roads;
- Riga planning region;
- Passenger Train;
- Latvian Railway;
- International airport „Riga";
- Riga Traffic;
- Riga Freeport Authority;
- Ministry of Environment;
- Ministry for Regional Development and Local Government;
- Pieriga local governments.

1.7. Relation SEA and RPMP

The development of the SEA took place parallel to the development of the RPMP. At various stages during the project, interaction between the two took place, in order to exchange information between the team, but also to give input from the SEA towards the development of the RPMP:
- initial stages of the project: development of strategy for SEA;
- mid-term: joint meetings with stakeholders on the SEA Screening and Scoping document that was prepared;
- draft SEA: public hearing obtaining comments from relevant stakeholders and the public.

The most notable impacts the SEA are expected to have on the RPMP, are:
- introduction of strategy to monetarise the environment in the CBA for the projects;
- emphasis on project development as close as possible to the environmentally friendliest alternative;
- recommendation to make budget reservation in the design of the individual projects for unforeseen environmental mitigation measures;
- recommendations for appropriate environmental monitoring during the operation lifetime of the projects.

1.8. Contents of the report

To inform relevant government and non-governmental agencies and the local people of the scope of the project, the report has been structured as follows:
- section 1 provides a general introduction to the project, including information about the purpose of the Project and the process of SEA scoping;
- section 2 outlines the legislative framework in terms of in terms of international and national regulations;
- section 3 describes the current state of the environment in Riga and Pieriga;
- section 4 outlines the potential development projects;
- section: 5 identifies the needs for a SEA (SEA Screening) and identifies the key environmental aspects related to the project development (SEA Scoping);
- section 6 reports the strategic environmental analysis of the RPMP;
- section 7 outlines applicable mitigation measures;
- section 8 covers environmental monitoring;
- section 9 finalises the report with conclusions and recommendations.

2. LEGISLATIVE FRAMEWORK

2.1. SEA Directive

In July 2001, after about 25 years of discussion, the European Commission agreed on the European 'SEA Directive': Directive 2001/42/EC 'on the assessment of the effects of certain plans and programmes'. The Directive was meant to be operational in all 25 European Member States since July 2004. In practice, it was fully operational on time in less than half of the countries, but this is improving over time. The SEA Directive requires SEA for those plans and programmes that meet a complicated set of screening requirements. For those plans that require SEA under the SEA Directive, the text below shows the SEA process required. Note that consultation occurs twice in the process: the first time at the 'scoping' stage with environmental bodies only, and the second time after a final plan has been prepared, with the public and environmental bodies.

Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 states that competent authorities must prepare an environmental report in which the likely significant effects on the environment of implementing the plan, and reasonable alternatives taking into account the objectives and geographical scope of the plan, are identified, described and evaluated. The information to be given is:

- an outline of the contents, main objectives of the plan, and relationship with other relevant plans and programmes;
- the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan;
- the environmental characteristics of areas likely to be significantly affected;
- any existing environmental problems which are relevant to the plan including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;
- the environmental protection objectives, established at international, Community or national level, which are relevant to the plan and the way those objectives and any environmental considerations have been taken into account during its preparation;
- the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors (these effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects);
- the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan;
- an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;
- a description of measures envisaged concerning monitoring in accordance with Article 10;
- a non-technical summary of the information provided under the above headings.

The report must include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process to avoid duplication of the assessment (article 5.2).

The following parties must be consulted within the framework of a SEA:
- authorities with environmental responsibilities, when deciding on the scope and level of detail of the information which must be included in the environmental report;
- authorities with environmental responsibilities and the public, to give them an early and effective opportunity within appropriate time frames to express their opinion on the final plan and the accompanying environmental report before the adoption of the plan;
- other EU Member States, where the implementation of the plan is likely to have significant effects on the environment in these countries.

When the plan is adopted, the public and any countries consulted must be informed and the following made available to those so informed:
- the plan as adopted;
- a statement summarising how environmental considerations have been integrated into the plan and how the environmental report, the opinions expressed and the results of consultations have been taken into account, and the reasons for choosing the plan as adopted, in the light of the other reasonable alternatives dealt with;
- the measures decided concerning monitoring.

2.2. Other EU regulations

EIA Directive

The EU has laid down its procedures regarding Environmental Impact Assessment (EIA) in the Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC. Member States shall adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue inter alia of their nature, size or location are made subject to an assessment with regards to their effects. The EIA Directive defines two classes of projects:
- annex I projects: Projects listed in annex I of the EIA Directive shall be made subject to an EIA;
- annex II projects: Projects of the classes listed in annex II of the EIA Directive shall be made subject to an assessment, where Member States consider that their characteristics so require. To this end Member States may inter alia specify certain types of projects as being subject to an assessment or may establish the criteria and/or thresholds necessary to determine which of the projects of the classes listed in annex II of the EIA Directive are to be subject to an EIA.

The EIA will identify, describe and assess in an appropriate manner, the direct and indirect effects of a project on the following factors:
- human beings, fauna and flora;
- soil, water, air, climate and the landscape;
- material assets and the cultural heritage;
- the interaction between the factors mentioned in the first, second and third indents.

The EIA Directive states that the following information should be supplied in an EIA report:
1. description of the project, including in particular:
   - a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases;
   - a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;
   - an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project;
2. an outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects;

3. a description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors;
4. a description (this description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project) of the likely significant effects of the proposed project on the environment resulting from:
   - the existence of the project;
   - the use of natural resources;
   - the emission of pollutants, the creation of nuisances and the elimination of waste;
   - the description by the developer of the forecasting methods used to assess the effects on the environment;
5. a description of the measures envisaged preventing, reducing and where possible offsetting any significant adverse effects on the environment;
6. a non-technical summary of the information provided under the above headings;
7. an indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

public participation

Following the Århus Convention, the EU has elaborated on public participation in Directive 2003/35/EC. The objective of this Directive is to contribute to the implementation of the obligations arising under the Århus Convention, in particular by:

- providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment;
- improving the public participation and providing for provisions on access to justice within Council Directives 85/337/EEC and 96/61/EC.

Member States shall ensure that the public is given early and effective opportunities to participate in the preparation and modification or review of the plans or programmes required to be drawn up. To that end, Member States shall ensure that:

- the public is informed, whether by public notices or other appropriate means such as electronic media where available, about any proposals for such plans or programmes or for their modification or review and that relevant information about such proposals is made available to the public including inter alia information about the right to participate in decision-making and about the competent authority to which comments or questions may be submitted;
- the public is entitled to express comments and opinions when all options are open before decisions on the plans and programmes are made;
- in making those decisions, due account shall be taken of the results of the public participation;
- having examined the comments and opinions expressed by the public, the competent authority makes reasonable efforts to inform the public about the decisions taken and the reasons and considerations upon which those decisions are based, including information about the public participation process.

Water Framework Directive

The EU Water Framework Directive (WFD) specifies that the aquatic environment should not further deteriorate and that efforts have to be made (programme of measures) to ensure 'good ecological quality' in all natural aquatic ecosystems (surface waters) before the year 2015. Protection and improvement of all surface water bodies is a major aim of the WFD. The WFD states that the best model for a single system of water management is management by river basin - the natural geographical and hydrological unit - instead of according to administrative or political boundaries.

There are a number of objectives in respect of which the quality of water is protected. The key ones are general protection of the aquatic ecology, specific protection of unique and valuable habitats, protection of drinking water resources and protection of bathing water. All these objectives must be integrated for each river basin.

Habitats Directive
A specific additional requirement for environmental assessment arises under Article 6(3) of the Habitats Directive Member States must implement legislation requiring an assessment to be made of any project which is likely to have significant effects on a Natura 2000 site: a Special Protection Area (SPA) designated under Directive 79/409/EEC or a Special Area of Conservation (SAC) designated under Directive 92/43/EEC. In many cases this assessment can be achieved through the EIA procedure, but in some cases, for example where the project does not fall under either annex I or annex II of the EIA Directive, a separate procedure is needed.

Birds Directive
The Birds Directive relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the Member States to which the treaty applies. It covers the protection, management and control of these species and lays down rules for their exploitation. It applies to birds, their eggs, nests and habitats. Member States shall take the requisite measures to maintain the population of the species referred to in article 1 of the Birds Directive at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level. Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in article 1 of the Birds Directive.

The preservation, maintenance and re-establishment of biotopes and habitats shall include primarily the following measures:
- creation of protected areas;
- upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones;
- re-establishment of destroyed biotopes;
- creation of biotopes.

The species mentioned shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. In this connection, account shall be taken of:
- species in danger of extinction;
- species vulnerable to specific changes in their habitat;
- species considered rare because of small populations or restricted local distribution;
- other species requiring particular attention for reasons of the specific nature of their habitat.

Trends and variations in population levels shall be taken into account as a background for evaluations. Member States shall classify in particular the most suitable territories in number and size as special protection areas for the conservation of these species, taking into account their protection requirements in the geographical sea and land area where this directive applies.

Member States shall take similar measures for regularly occurring migratory species not listed in annex I, bearing in mind their need for protection in the geographical sea and land area where this directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes. To this end, member states shall pay particular attention to the protection of wetlands and particularly to wetlands of international importance.

Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats.

Other relevant EU Directives are:
- Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise;
- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2009 on ambient air quality and cleaner air for Europe;
- Directive 2008/96/EC of the European Parliament and of the Council of 19 November 2008 on road infrastructure safety management;
- Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.

2.3. Other international conventions

In addition, the following conventions are to be respected:
- Bern Convention, which amongst others established the Emerald network of protected areas in non-EU countries - in parallel to the Natura 2000 network for the EU countries;
- Bonn Convention, which requires contracting parties to work together to conserve migratory species and their habitat;
- Espoo Convention, which deals with activities causing a significant adverse transboundary impact - particularly related to special environmental sensitive or important sites such as Ramsar sites, national parks, nature reserves, and other protected sites.

The following EU documents are relevant for the development urban transport plan:
- 2001, EC White Paper on Transport;
- 2006, EC Mid-Term Review of the Transport White Paper;
- 2006, EC Thematic Strategy on the Urban Environment;
- 2007, EC Green Paper on Urban Mobility;
- 2009, European Parliament's own initiative report and resolution on Action plan on urban mobility;
- 2009, EC Action Plan on urban mobility.

2.4. Latvian regulations

2.4.1. SEA regulations

The obligations for SEA procedure are set in the law ‘On Environmental Impact Assessment’ (articles 4 and 23^1-23^5). The Regulations of the Cabinet of Ministers No.157 ‘Procedures for Strategic Environmental Impact Assessment (SEA)’ were approved in 23 March 2004. The SEA regulations require SEA procedure for the state and regional level planning documents. Other smaller scale plans and programmes should be assessed only where ESB determines that they are likely to have significant impact on the environment.

The SEA process includes two consultations: the first time at the 'scoping' stage with ESB only, and the second time after a final plan and final environmental report have been prepared, with the public bodies and ESB.

The information to be included in the environmental report is:
- an outline of the contents, main objectives of the plan, and relationship with other relevant plans and programmes;
- the environmental report preparation procedure and involved institutions, public participation and results;
- the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan;
- the environmental characteristics of areas likely to be significantly affected;
- any existing environmental problems which are relevant to the plan including, in particular, those relating to any areas of a particular environmental importance, as well as to specially protected nature territories, wetlands, micro reserves, specially protected species and biotopes, and the Baltic Sea and protective belt of the Gulf of Riga;
- the environmental protection objectives, established at international and national level, which are relevant to the plan and the way those objectives and any environmental considerations have been taken into account during its preparation;
- the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors (these effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects);
- the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan;
- an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;
- possible compensation measures recognized from consultations with Nature Protection Board if such are determinate by the Law on Specially Protected Nature Territories;
- evaluation of the possible significant transboundary impact;
- a description of measures envisaged concerning monitoring of the document implementation;
- a non-technical summary of the information provided under the above headings.

involvement of stakeholders and the public

ESB consults:
- on institutions to whom the finals of the prepared plan or programme and environmental report shall to be send for comments and proposals;
- on possible transboundary impacts;
- on the foreseen compensation measures in case such are set by the Law on Specially Protected Nature Territories;
- on the need of public discussions.

Institutions that received planning document and environmental report finals can send their comments within 20 days from receiving.

The environmental report and planning document finals shall be made available for public on internet by the developer and ESB. The announcement on the availability of the mentioned documents shall be published in the newspaper as well as sent to the municipality and Regional Environmental Board of the territory that could be significantly affected by the plan implementation. The public can submit written comments/remarks within 40 days after the announcement was published.

In case a public hearing is organised, an announcement has to be published in the newspaper as well as sent to the municipality and Regional Environmental Board of the territory that could be significant ly affected by the plan implementation, at least 7 working days before the meeting. The discussions results shall be summarized in the minutes. Additional comments from person participated in the discussion can be submitted within 3 working days after hearing. The discussions minutes as well as additional comments shall be attached to the planning document as annex. Where appropriate, the document will be revised in order to integrate the comments given.

The document will then be sent to ESB that will prepare an opinion regarding the final environmental report within a period of 30 days.

public information on approval of the planning document
Developer before approval of the planning document shall take into account the environmental report, opinions and result of the public discussions. Within 14 days after planning document approval the notification shall be put on developer's home page including the following information:

- how environmental consideration have been integrated into planning document;
- how environmental report, opinions expressed and results from public discussions have been taken into account;
- the reasons for choosing the adopted alternative, in the light of the other reasonable alternatives dealt with;
- the measures decided concerning monitoring of the planning document, deadlines for monitoring report submitting.

Within 5 working days after notification developer shall put on own home page, publish in the newspaper as well as to submit to ESB announcement that the plan is adopted.

environmental screening
The process of deciding whether a plan or programme requires SEA is called screening. The criteria for this decision are defined in the law 'On Environmental Impact Assessment' and Cabinet of Ministers regulations 'Procedures for Strategic Environmental Impact Assessment'. The SEA Directive applies to both plans and programmes. In Latvia the term 'planning document' is used instead, which covers not only plans and programmes but also other strategic documents. According to the EIA Law it has been decided that SEA will apply to the following types of planning documents: plans, programmes, conceptions and strategies.

Article 4 of the EIA Law describes the scope of the SEA Directive. In this context, a mandatory (paragraph 3) and a non-mandatory scope (paragraphs 4 and 5) are to be differentiated: SEA shall, in accordance with regulatory enactments or other provisions, be performed for planning documents, as well as for such documents related to the utilisation of European Union co-financing and the amendments thereof if the relevant planning documents are formulated or adopted by the Saeima, the Cabinet of Ministers', a local government, a State or local government authority:

- in the areas of agriculture, forestry, fisheries, energy, industry, transport, waste management, management of water resources, telecommunications, tourism, extraction of mineral resources and for the planning documents which are related to regional development, land use, territorial planning and include the basic requirements for implementation of the intended activities provided for in annex 1 or 2 of the EIA Act;
- which may have a significant impact on areas of European significance (NATURA 2000), except for planning documents which determine the requirements for nature protection and management and the measures in relation to such territories.

The Cabinet of Ministers Regulations on procedure for conducting SEA provides a list of planning documents for which the SEA is always obligatory:

- national level planning documents (hereinafter - national planning document):
  - strategies, plans and programmes of sectoral policy;
  - conceptions that refer to the fields referred to in Section 4, Paragraph 3 of the EIA Act;
  - the national plan (spatial development perspective of Latvia);
- regional or local level planning documents:
  - regional or local level development strategies, plans or programmes;
  - regional or local level sectoral policy planning documents that refers to the planning of the entire sector;
  - spatial plans of cities of Latvia and districts.

However, also other planning documents may be subject for SEA. With these the decision is made case-by-case, based on the screening criteria.

According to the EIA Law Article 4 paragraph 4 and 5, SEA shall be performed for planning documents in areas which are not referred to in the EIA Law Article 4 paragraph 3 if they include the basic requirements for the implementation of intended activities and the implementation of planning documents may have a significant impact on the environment.

SEA of the planning documents referred to in Paragraph 3 of the EIA Act of article 4 which are related to the use of small territories on the local government level, as well as for small technical amendments of the planning documents referred to in Paragraph 3 of this Article shall not be performed, except for cases where the implementation of such documents may have a significant impact on the environment.

The Cabinet of Ministers' Regulations on procedure for conducting SEA describe how the significance of effects resulting from planning documents mentioned above may be assessed. This is done through case-by-case examination approach. The general decision as to whether certain types of plans and programmes are likely to have significant environmental effects is taken by ESB. The significance criteria identified in the Article 23.2 of the EIA Act have to be taken into account in all cases.

Prior to submitting the application form to ESB, the developer shall consult (taking into account the type of the planning document, the field of its implementation and the territory that might be significantly affected by the implementation of the planning document) with environmental and public health institutions and the appropriate regional environmental board, as well as the Nature Protection Council or the administration of a specially protected nature territory and the relevant branch of the Public Health Agency regarding the possible impact of the planning document on the environment, human health, as well as the necessity for the SEA.

2.4.2. Other relevant Latvian regulations

EIA regulations

The EIA process in Latvia is regulated by the following legal acts:

- Law 'On Environmental Impact Assessment';
- Regulations of Cabinet of Ministers No 87 'Procedures for assessing the impact of intended activities on the environment' (prescribe in precise and detailed fashion the implementation procedures of the requirements stipulated in the law 'On Environmental Impact Assessment');
- Regulations of Cabinet of Ministers No 355 'Procedures for planned action accept';
- Regulation of Cabinet of Ministers No 455 'On Environmental Impact Assessment for NATURA 2000 territories';
- Regulations of Cabinet of Ministers No 91 'Procedures for technical conditions issued by regional board for the Proposed Development, when the environmental impact assessment is not needed'.

In general the Council Directives 85/337/EEC, 97/11/EC, 96/61/EC, 79/409/EEC, 92/43/EEC, 2001/42/EC and Directive 2003/35/EC on public participation are transposed in Latvian EIA regulations. All annex I projects of the EIA Directive are covered by the Latvian Law 'On Environmental Impact Assessment', annex 1. All annex II projects of the Directive are covered by the Law 'On Environmental Impact Assessment', annex 2.

The 'Procedures for technical conditions issued by regional board for the Proposed Development, when the environmental impact assessment is not needed' defines those proposed developments in eleven branches for which technical conditions are needed and they are mentioned in the annex to the Procedures. These proposed developments are similar to those developments for which the initial EIA (screening) is needed, except there are no set threshold values.

The overall procedure for EIA in Latvia can be summarised as follows:
- for annex I projects, the developer makes an initial application to ESB;
- for annex II projects, the developer makes the initial application to the Regional Environmental Board (REB). The REB carries out an Initial Assessment (based on annex III criteria) which is sent to ESB who makes the final determination whether an EIA is required (screening). An initial public hearing may also be held at this stage;
- ESB prepares an EIA programme (scoping);
- the developer prepares the final Environmental Impact Statement (EIS) which is sent to ESB. The developer may request information from relevant authorities in preparing the final EIS;
- there is a public hearing on the final EIS;
- the Developer must also send the final EIS to statutory consultation authorities as relevant (not specified in the legislation, but includes the SB and local municipalities and nature authorities);
- ESB collects comments from the public and authorities on the final EIS and evaluates the final EIS. The comments and evaluation are sent to the developer;
- the developer prepares a final EIS which is evaluated by ESB in an Evaluation Report;
- the developer must then apply for a permit to commence the development from the relevant state body or the local municipality. This body/municipality, when making its decision whether to grant development consent, must take into account the final EIS, the evaluation report from ESB and the comments from other relevant authorities and the public;
- the public are informed about the decision whether or not to grant development consent, with reasons for the decision and measures that must be taken to prevent or reduce any negative environmental impacts.

The EIA procedure is also integrated with Integrated Pollution Prevention and Control requirements (IPPC): Where a proposed new activity or a substantial change to an existing installation also requires an EIA, the operator must attach the final EIS and the opinion of ESB to the IPPC permit application. It should be noted that as from January 1, 2011 the changes to the law 'On Environmental Impact Assessment ' will be in force, which specifies the EIA procedure.

water protection legislation

The EU Water Framework Directive (WFD) is transposed into the law 'On Water Management' and binding regulations such as:
- regulations on river basins management plans and action programmes;
- regulations regarding the Quality of Surface Waters and Ground waters;
- regulations regarding Discharge of Polluting Substances into Water;
- regulation on Bathing Sites Establishment and Hygienic Requirements.

Protection and improvement of all surface water bodies is a major aim. There are a number of objectives in respect of which the quality of water is protected. The key ones are general protection of the aquatic ecology, specific protection of unique and valuable habitats, protection of drinking water resources and protection of bathing water. All these objectives must be integrated for each river basin.

habitats and birds protection
The Habitat and Birds Directives 92/43/EEC and 79/409/EEC are transposed into the laws 'On Specially Protected Nature Territories' and 'On the Conservation of Species and Biotopes'.

noise protection
Directive 2002/49/EC relating to the assessment and management of environmental noise is transposed to the Regulations of Cabinet of Ministers 'Procedure on noise assessment and management'.

air protection
Directive 2008/50/EC on ambient air quality and cleaner air for Europe is transposed to the Regulations of Cabinet of Ministers 'Regulation on air quality'.

2.4.3. Latvian transport development policy documents

- Guidelines of transport development , 2007-2013;
- Road traffic safety program, 2007-2013;
- Public transport development concept, 2005-2014;
- The state procurement concept on passenger carriage, 2007-2016.

3. THE CURRENT STATE OF THE ENVIRONMENT IN RIGA AND PIERIGA

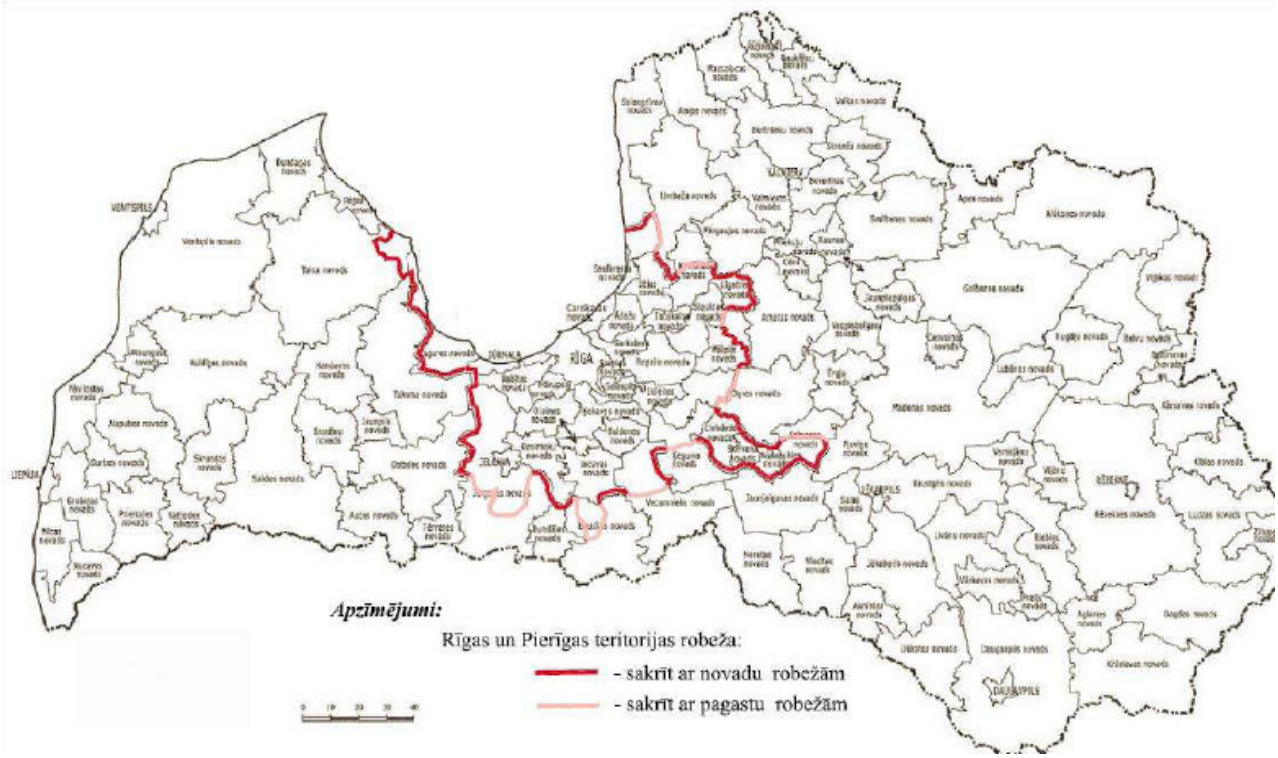
3.1. Introduction

The elaboration of the SEA should incorporate the survey of the present state and quality of the environment in the reported area, because the characteristics of the present state are the basis for any research of environmental issues in the area. The main characteristics of the present state required for this research should be defined based on: the results of measurements of environmental elements performed by the authorised organisations, the existing plan documents, reports on the performed researches, available professional and scientific literature.

3.2. About Riga and Pieriga

The project territory is shown in figure 3.1.

figure 3.1. Riga and Pieriga



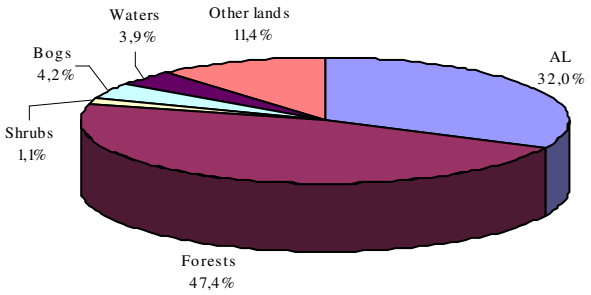
Administratively there is not such a legal entity as Pieriga (or Riga agglomeration) but instead there is a formal administrative territorial unit: the Riga planning region. It consists of Riga City, Riga County, Ogre County, Limbazi County and Tukums County, each of these Counties containing a set of local municipalities.

The Riga planning region is located in the central part of Latvia in the plains of Piejura (seaside) and Viduslatvija (Middle-Latvia) lowlands at the Gulf of Riga. Region's central-strategically very advantageous location and natural conditions are advantages for varied development compared to neighbouring regions, Latvian and Baltic.

Land use in Riga planning region is as follows (see also figure 3.2):

- almost half (47.4 %) of Riga region territory is covered by forests, with a total forest area of 494,755 ha (see appendix III, map 1);
- almost one third (32 %) from Riga region territory is occupied by agricultural land (AL). Taking into account the relatively urban nature the agricultural land proportion in region is lower than in the country as a whole (38.3 %), see appendix 3 map 2;
- 4.2 % of the region territory is occupied by bogs, the largest of them being Cenu and Kemeru heats;
- Riga region's territory is rich in rivers, canals, lakes and ponds; waters cover 3.9 % of the region's territory.

figure 3.2. Land use in Riga planning region

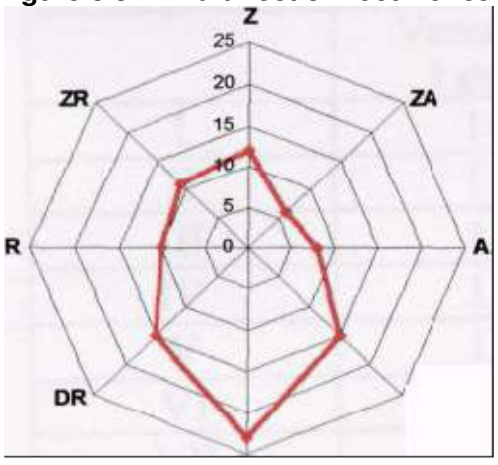


3.3. Climate, air, water, soil and the landscape

3.3.1. Climate

Climatic conditions are affected by the proximity of the Gulf of Riga. Therefore there is typical maritime climate with relatively cool summers and mild winters, strong winds in spring and autumn in the region. The Baltic Sea and the Atlantic Ocean air mass influx, especially in summer and winter, are affecting air temperature, precipitation and other meteorological elements nature. Overall, the prevailing are southerly quadrant winds (see figure 3.3), but in spring and summer N and NW winds share is increasing.

figure 3.3. Wind direction recurrence (%)



The most frequently repeated are the winds at a speed of 4-5 m/s, while the maximum wind gusts could reach up to 26 m/s.

During the year the coldest month is January with an average temperature of - 4.7 ℃. The warmest month is July with an average air temperature + 16.9 ℃. The annual amount of precipitation is about 630 mm. Most rainfall is in July - August, less in February.

3.3.2. Air

air quality in Latvia

Air quality monitoring in Latvia has been carried out by the Latvian Environment, Geology and Meteorology Centre (LEGMC) and Riga Municipality (in Riga). The Air Quality Monitoring network for Latvia (excluding Riga) is shown in figure 3.4 and table 3.1.

figure 3.4. Location of the air monitoring stations in Latvia, 2008/2009

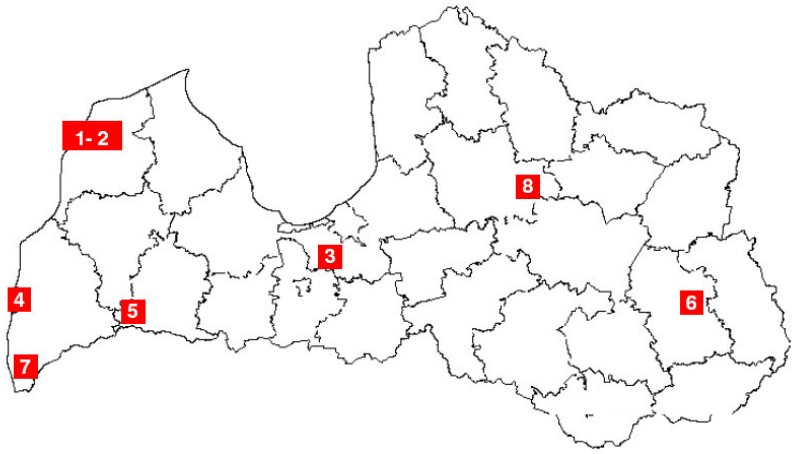


table 3.1. Air quality monitoring stations in Latvia, 2008/2009

number	name and address of station	owner of station
1	Ventspils	LEGMC
2	Ventspils	Ventspils City council
3	Olaine 10 Jelgavas Str., Olaine	LEGMC
4	Liepaja	LEGMC
5	Nigrande.	LEGMC
6	Rezekne	LEGMC
7	Rucava	LEGMC
8	Zoseni	LEGMC

Only monitoring station 3 in Olaine is situated within boundaries of Pieriga. This is an urban background station at which SO_2, NO_2, O_3, PM_{10}, Pb, Cd, Ni, As, $PM_{2.5}$ and benzene are monitored. The following exceedances occurred in 2008/2009:

- Particulate Matter PM_{10}:
  - exceedance of the annual mean concentration lower assessment threshold for the protection of human health (10 µg/m^3): 20.9/ - µg/m^3;
  - times that the lower assessment threshold for the protection of human health was exceeded (limit value 35 times per year): 133/- times;

air quality in Riga

The air quality monitoring network[5] for Riga is shown in figure 3.5 and table 3.2.

[5] Source: Air Quality Annual Report 2008/2009, Latvian Environment, Geology and Meteorology Centre (LEGMC).

figure 3.5. Location of the air monitoring stations in Riga

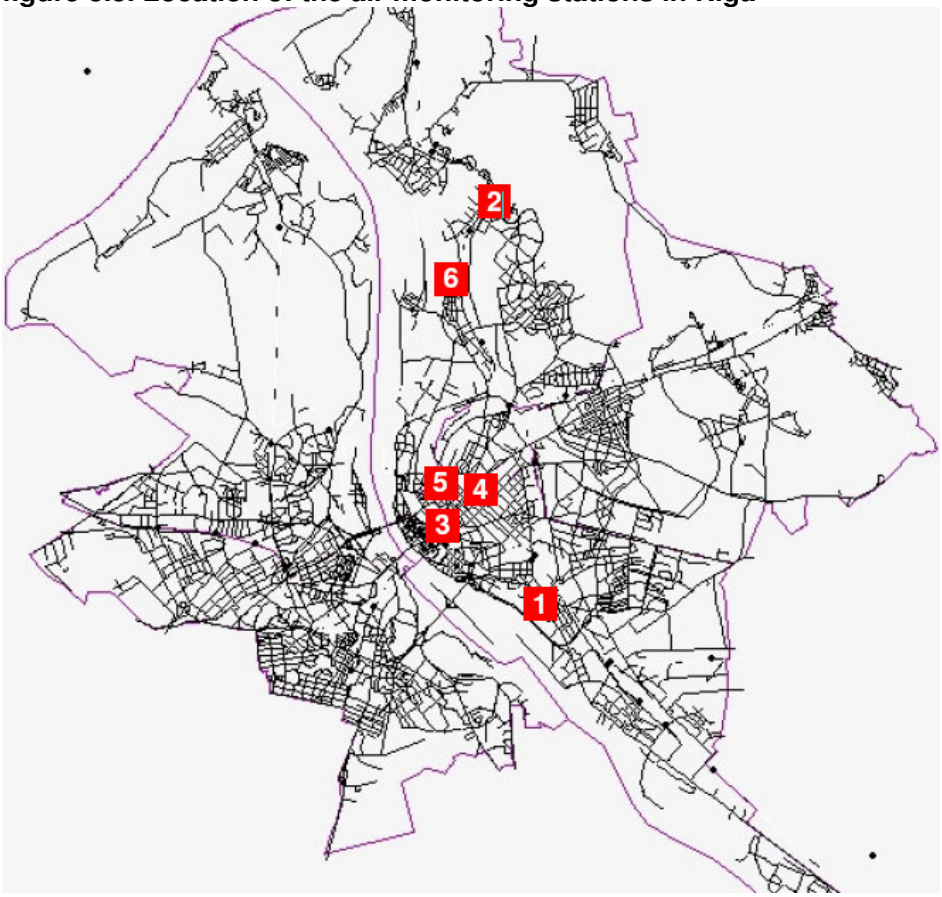


table 3.2. Air quality monitoring stations in Riga, 2008/2009

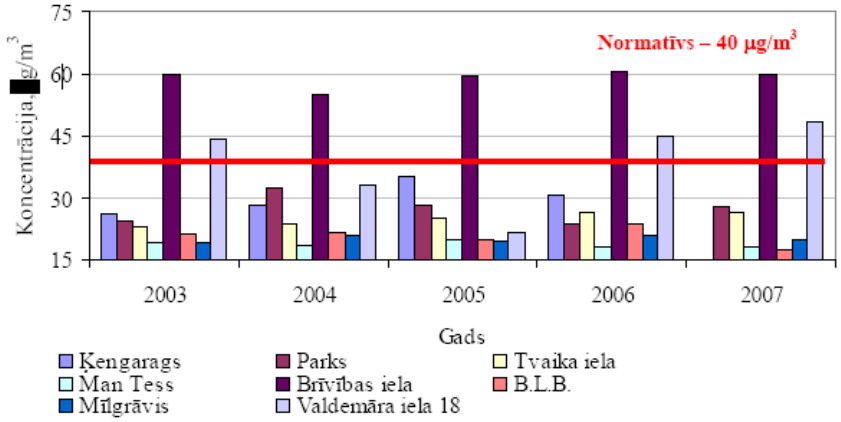
number	name and address of station	owner of station	type of station/method of measurement	measured substances
1	Kengarags 165 Maskavas Str	LEMGC	urban background station	SO_2, NO_2, O_3
2	Milgravis 24 Viestura avenue	LEGMC	urban background station	SO_2, NO_2, O_3, PM_{10}, Pb, Cd, Ni, As, $PM_{2.5}$, benzene
3	Parks 19 Raina boulevard	LEGMC	urban background station	SO_2, NO_2, O_3
4	Brivibas Str. 73 Brivibas Str.	Riga City Council LEGMC	traffic station	SO_2, NO_2, O_3, PM_{10}, Pb, Cd, Ni, As, $PM_{2.5}$, benzene benzo(a)pyrene
5	Valdemara Str. 18 Valdemara Str.	Riga City Council	traffic station	NO_2, CO, O_3, PM_{10}, benzene
6	Tvaika Str. 44 Tvaika Str	Riga City Council	traffic/industrial station	SO_2, NO_2, O_3, benzene

The results of air quality monitoring in Riga in 2008/2009, were as follows:

- Sulphur dioxide (SO_2): no exceedances;
- Nitrogen dioxide (NO_2): the following exceedances occurred:
  - exceedance of limit value for the protection of human health (40 µg/m^3):
    - Brivibas Street: 60.6/50.8 µg/m^3;
    - Valdemara Street: 44.0/ - µg/m^3;
  - times that the 1-hour lower assessment threshold value was exceeded (limit value 18 times per year):
    - Brivibas Street: 730/519 times;
    - Valdemara Street: 117/519 times;
    - Parks: 51/53 times;
    - exceedance of lower threshold value for the protection of human health (26.0 µg/m^3):
    - Brivibas Street, Valdemara Street and Parks: 26.6/34.8 µg/m$^{3;}$;
- Particulate Matter PM_{10}:
  - exceedance of limit values for the protection of human health and the population information value (40 µg/m^3):
    - Brivibas Street: 48.5/ -µg/m^3;
    - Valdemara Street: 43.9/ - µg/m^3;
  - exceedance of the annual mean concentration lower assessment threshold for the protection of human health (20 µg/m^3):
    - Brivibas Street, Valdemara Street and Milgravis: 23.8/ 39.1 µg/m^3;
  - times that daily limit values for the protection of human health was exceeded (limit value 35 times per year):
    - Brivibas Street: 126/68 times;
    - Valdemara Street: 104/81 times;
  - times that the lower assessment threshold for the protection of human health (25 µg/m^3) was exceeded (limit value 35 times per year):
    - Valdemara Street: 343/306 times;
    - Brivibas Street: 331/251 times;
    - Milgravis: 198/81 times;
- Particulate Matter $PM_{2.5}$:
  - exceedance of the annual mean concentration target value for the protection of human health (25 µg/m^3):
    - Brivibas Street: 30.0/28.0 µg/m^3;
  - exceedance of the annual mean concentration lower assessment threshold for the protection of human health (12 µg/m^3):
    - Brivibas Street: 30.0/15.8 µg/m^3;
    - Milgravis: 19.4/15.8 µg/m^3;
- Benzene (C_6H_6):
  - exceedance of the limit value for the protection of human health (5.0 µg/m^3):
    - Tvaika Street: 6.6/ - µg/m3;
    - Brivibas Street: 5.6/ - µg/m^3;
  - exceedance of the limit value for of the lower assessment threshold for the protection of human health (2.0 µg/m3):
    - Tvaika Street: 6.6/ 4.6 µg/m3;
    - Brivibas Street: 5.6/ 5.0 µg/m3.

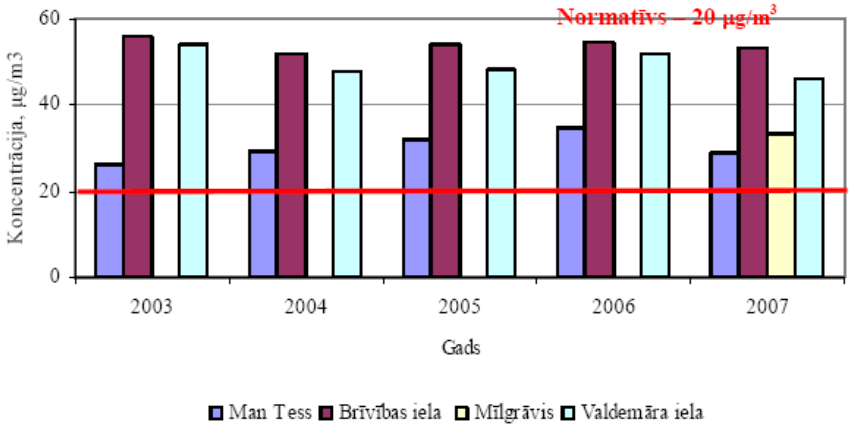
The annual average NO_2 concentrations in the monitoring stations of Riga are shown in figure 3.6 (LEGMC data).

figure 3.6. Annual average NO_2 concentrations at Riga monitoring stations



The annual average PM_{10} concentrations in the monitoring stations of Riga are presented in figure 3.7 (LEGMC data).

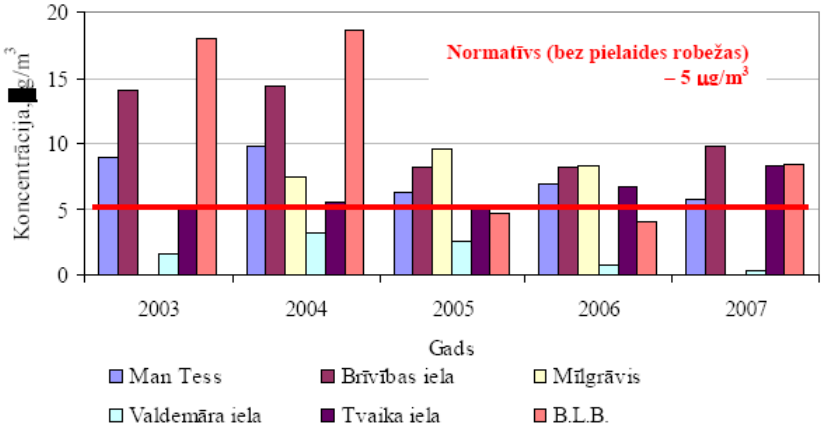
figure 3.7. Annual average PM_{10} concentrations at Riga monitoring stations[6]



The annual average benzene concentrations at the monitoring stations of Riga are given in figure 3.8 (LEGMA data).

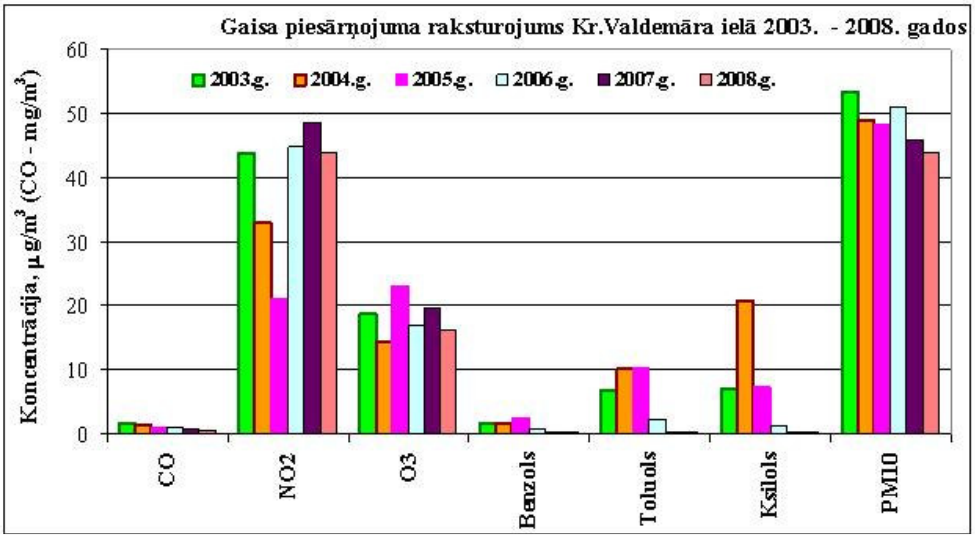
[6] Currently limit value is 40 µg/m^3 according MC 'Regulation on air quality'

figure 3.8. Annual average benzene concentrations at Riga monitoring stations



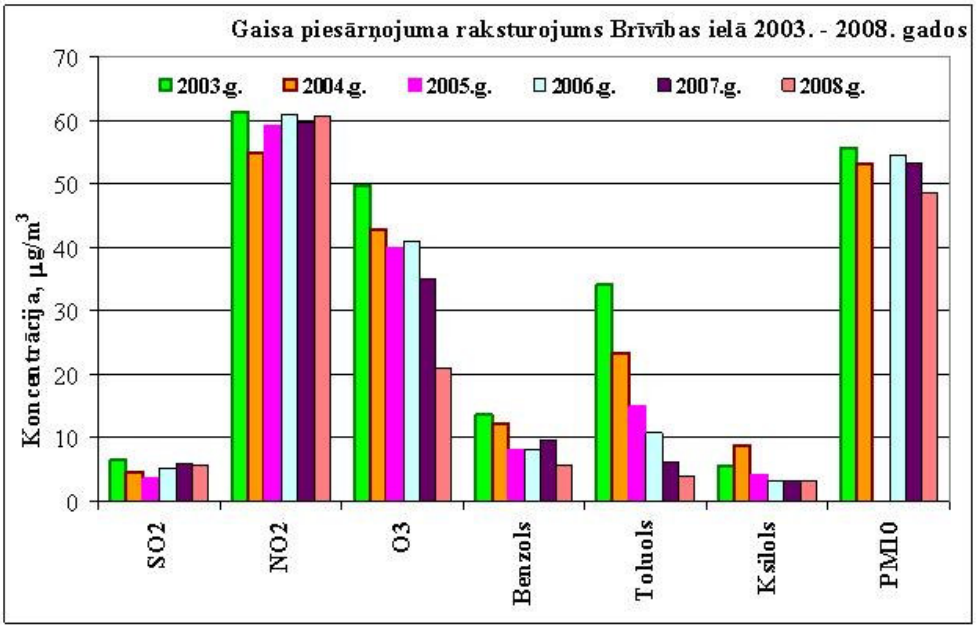
Air quality monitoring results in Riga (2003-2008) are showed on Kr. Valdemara Street in figure 3.9 and on Brivibas street in figure 3.10[7].

figure 3.9. Air pollution in Kr. Valdemara Street, Riga 2003-2008



7 Source: Riga City Council Department of Housing and Environment.

figure 3.10. Air pollution in Brivibas Street, Riga 2003-2008



The results of pollutant dispersion modelling results for NO_2, PM_{10} and benzene in Riga (2007) are presented in appendix 3, maps 3-5.

The air quality monitoring data shows that due to intensive road transport traffic the limit values of late years have been regularly exceeded in Riga, especially NO_2, PM_{10} and $PM_{2.5}$.

To improve air quality in Riga and in accordance with MC 'Regulations on air quality', the Action Programme for air quality improvement 2004-2009 was developed. At present a new action programme is under development, what is planned to approve before the end of 2010.

emissions

Air quality in Riga region is affected by the pollutants emissions from stationary and mobile sources. Due to the decline in industrial production in recent years, as well as energy efficiency measures as a whole significantly are reduced air pollution emissions from stationary sources.

The main contribution to emissions from stationary sources comes from manufacturers of heat power (including boiling houses of factories and units of production). Next, factories and units of production contribute significantly to the national emissions. The proportion of other groups of polluters is significantly lower.

There is a tendency of increase in numbers of polluters in the centre of Riga as well as in the suburbs, as the land and building owners prefer building a local boiling house in their own property rather than central heat supply.

Lately the consumption of sulphur fuel in Riga for the purpose of producing heat power is significantly decreased, and a process of transferral to consumption of environment - friendly fuel, which is gas in this case, is being carried out.

With increasing number of vehicles and traffic, there is a significant increase in air pollution from transport-rising emissions, especially nitrogen oxides emissions. Motor transport is the main polluter in the city of Riga. The total amount of pollution emitted by road transport is remarkably higher than the one created by the stationary sources. The peculiarity of this type of pollution is that it is emitted near to the ground, and its dissipation is hindered by the construction. For this reason, the same amount of emitted substances of pollution creates much higher concentration on the air - ground interface resided by the inhabitants than the way it would have been if the same amount would be created by a boiling house for instance.

3.3.3. Noise

Noise is one of the physically disadvantaged factors that cause human discomfort, disorders and diseases. Especially transport noise significantly increases the noise level in cities and motorways of nodes nearby. In Riga region, the noise problem is acute in larger cities, especially in Riga, Riga International Airport area and along major motor ways. Until now, noise identification and mapping of the region has not carried out. It has been done only in certain places-for example, Riga city and Riga airport impact zone.

The main noise sources in Riga are:
- road transport;
- railway transport;
- the airport;
- the public entertainment venues;
- the trans-shipment activities in the port.

The limit values for noise according Cabinet of Ministers Regulation No. 597 'Procedures for noise assessment and Management' are shown in table 3.3.

table 3.3. Limit values for noise

no	function of the territory	limit values for noise		
		L_{day} (dB(A))	$L_{evening}$ (dB(A))	L_{night} (dB(A))
1	territory of low-storey dwelling houses, health resorts, hospitals, children's institutions and social care institutions	50	45	40
2	territories of multi-storey apartment dwelling houses, territory of cultural, educational, administrative and scientific institutions	55	50	45
3	territories of buildings (with apartments) of various functions	60	55	45
4	territory of hotels, business, trade and service, sports and public institutions	60	55	50

- For those parts of the territory that are located closer than 30 m from stationary noise sources the referred to limit values for noise shall be considered to be target values.
- In order to assess the acoustic situation and to implement measures against noise, the limit values for the noise indicator L_{hour} shall be the limit values for the noise indicator L_{day}, L_{night} or $L_{evening}$ during the appropriate part of the day and night period.
- The referred to limit values for noise shall not apply to those parts of the territory which are located in the railway right-of-way or protective zone of the railway.

The first strategic noise map for Riga agglomeration was developed in 2008[8]. The Riga agglomeration strategic noise map characterises the situation in 2006 from the following sources including in Riga territory:
- railway track traffic (including trains and trams);
- motorway traffic (including motorcars, lorries, city traffic buses and trolleybuses);
- air traffic (including air liner and transport planes);
- industrial sources.

[8] http://mvd.riga.lv/lv/vide/troksnu_kartes/.

The noise impact areas from railway traffic (noise ratio per day or L_{day}) are shown in figure 3.11. Table 3.4 presents the number of inhabitants and houses in various categories of noise levels.

figure 3.11. Noise ratio per day (L_{dav}) from railway traffic

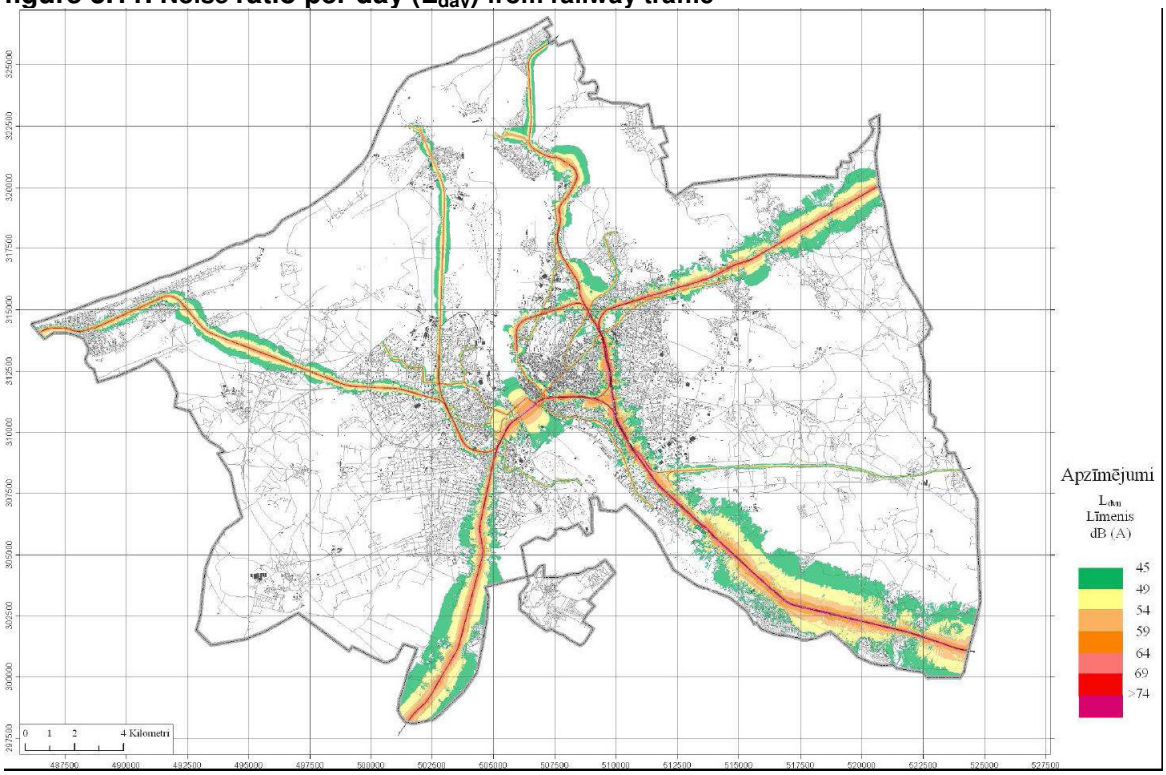


table 3.4. Number of inhabitants living in area, influenced by noise from railway traffic

parameter	number of inhabitants	number of housing
45-49 dB(A)	59,194	28,187
50-54 dB(A)	41,098	19,570
55-59 dB(A)	28,387	13,518
60-64 dB(A)	20,112	9,577
65-69 dB(A)	6,316	3,008
70-74 dB(A)	806	384
>75 dB(A)	70	33
total number of inhabitants in the agglomeration*	807,470	384,408

* Number of inhabitants is showed in the whole agglomeration.

The Riga agglomeration strategic noise map shows that road transport is a significant noise source, influencing practically all of Riga agglomeration (see figure 3.12). The number of inhabitants and houses in various categories of noise levels are summarised in table 3.5.

figure 3.12. Noise ratio per day (L_{day}) from road transport

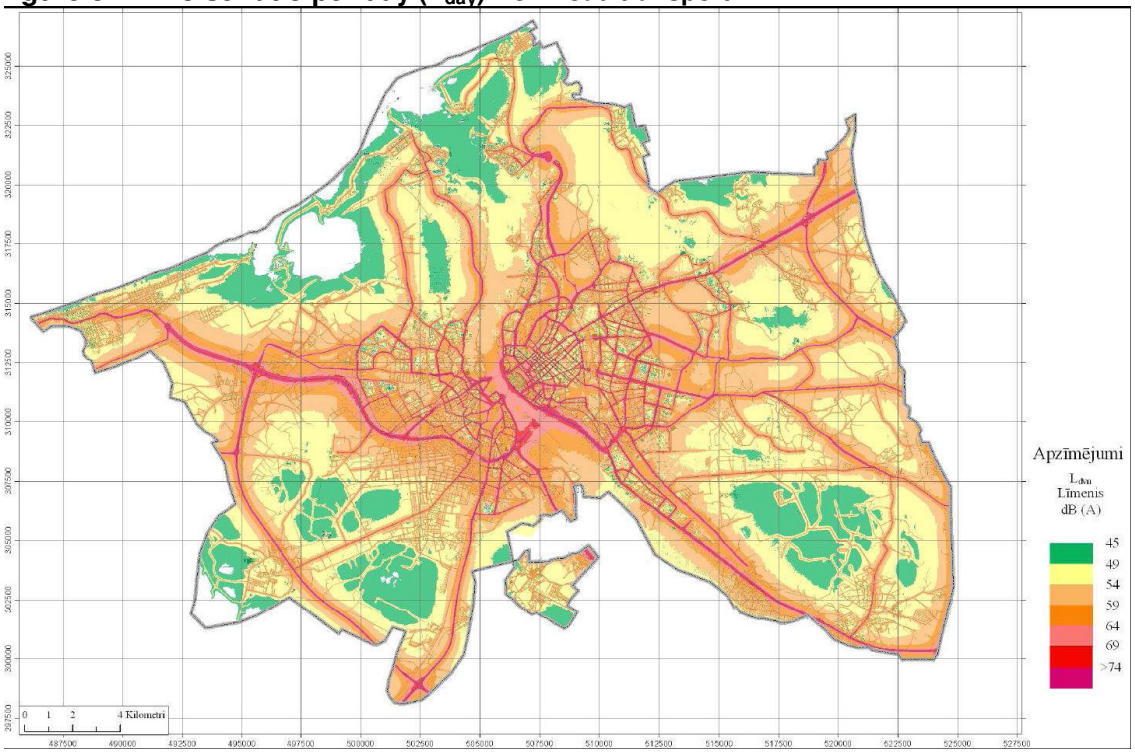


table 3.5. Number of inhabitants living in the noise from road transport influencing zone

parameter	number of inhabitants	number of housing
45-49 dB(A)	19,325	9,202
50-54 dB(A)	98,074	46,705
55-59 dB(A)	233,693	111,291
60-64 dB(A)	218,723	104,159
65-69 dB(A)	129,280	61,563
70-74 dB(A)	81,061	38,601
>75 dB(A)	25,093	11,949
total number of inhabitants in the agglomeration*	807,470	384,408

* number of inhabitants showed in the whole agglomeration

Noise from air traffic is assessed taking into account airport 'Riga' activities (see figure 3.13). The Number of inhabitants and houses in the various noise levels are summarised in table 3.6.

figure 3.13. Noise ratio per day (L_{day}) from Riga airport

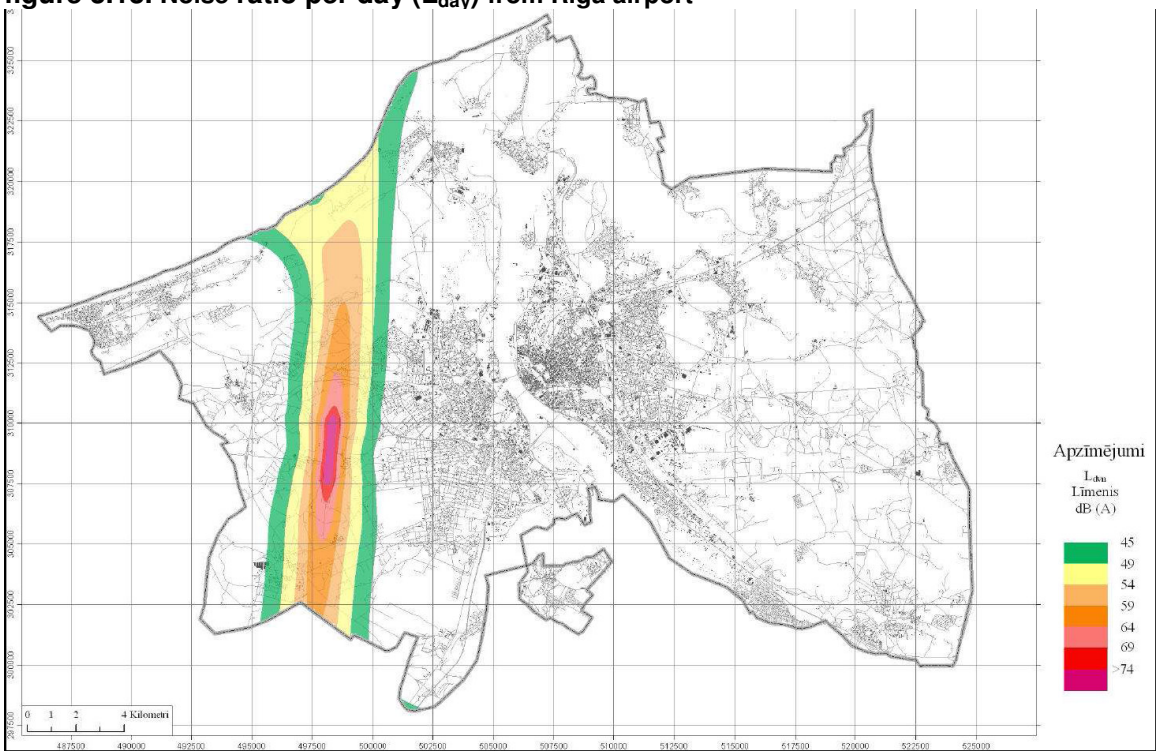


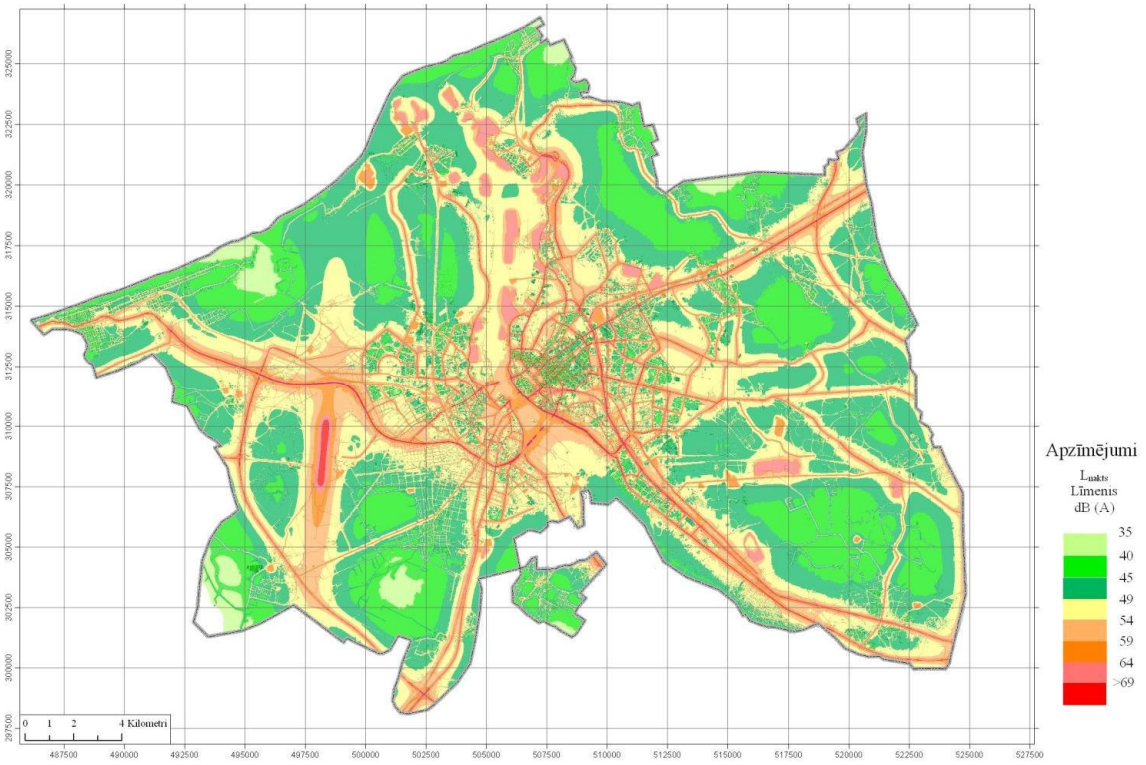
table 3.6. Number of inhabitants living in the noise from Riga airport influencing zone

parameter	number of inhabitants	number of housing
45-49 dB(A)	15,572	7,415
50-54 dB(A)	2,935	1,398
55-59 dB(A)	1,506	717
60-64 dB(A)	1,506	497
65-69 dB(A)	2	1
70-74 dB(A)	0	0
>75 dB(A)	0	0
total number of inhabitants in the agglomeration*	807,470	384,408

* Number of inhabitants showed in the whole agglomeration.

The overall night-time noise levels ratio L_{night} in Riga agglomeration are shown in figure 3.14.

figure 3.14. Overall noise ratio per nighttime (L_{night}) in Riga agglomeration



The most affected areas in general are the Riga city centre and areas close to the arterial streets and railway lines.

table 3.7. Number of inhabitants living in the overall night noise influencing zone (L_{night}) [9]

Noise level dB(A)	number of inhabitants
40-45	6 585
45-50	22 609
50-55	33 949
55-60	28 956
60-65	64 956
65-70	24 228
70-75	175
75 - 80	0
total number of inhabitants in the agglomeration*	807,470

* Number of inhabitants showed in the whole agglomeration.

The total number of inhabitants living in the influencing zone, where noise level in the night exceeds 40 dB(A) is 181 458.

To be in accordance with MC regulation 'Procedures for noise assessment and management' the Action Plan for Noise Reduction in Riga Agglomeration 2009-2019 has been developed in 2009. At present Riga City Council is working on development of a action plan for noise reduction in Riga city, what is planned to be approved by the end of 2010.

[9] http://mvd.riga.lv/lv/vide/Rigas_aglomeracijas_troksna%20_plans/.

3.3.4. Water

Riga planning region's territory is rich in rivers, canals, lakes and ponds. Waters cover 3.9 % of the region's territory. Generally the region's rivers are of low contaminated till contaminated (see appendix III, map 6). The Lielupe River is the most polluted river with organic substances. Also, the Daugava River basin has high proportion of contaminated rivers. Almost all of the lakes in the region are subject to eutrophication.

Riga territory includes more than 30 different water bodies (rivers, branches, canals, drainage ditches, lakes and ponds). They account for ~ 17.6 % of all urban areas. In fact, the entire city falls within the Daugava River basin.

Road surface run off water may cause pollution of the immediate water bodies and/or underground waters.

Since January 1, 2006 under operation is the Latvian State Environmental Monitoring Program, under which the surface water monitoring is performed by the Latvian Environment, Geology and Meteorology Centre. In Riga city there are two water quality monitoring stations on River Daugava - Andrejsala and Daugavgriva. For example, in Andrejsala station water quality in 2006 was evaluated as average, but in 2007, 2008 and 2009 - as good. In Daugavgriva monitoring station water quality for all mentioned years was evaluated - as good.

3.3.5. Landscape and soil

According the European Landscape Convention, landscape means ‘an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’. Landscape is an important part of local culture formation. It is the basic element of natural and cultural heritage, what constitutes human well-being and contribute to strengthening the identity of the place. The landscape is a whole, what at the specific place is formed by the interaction of nature and human kind. For research and planning purposes it is necessary to differentiate the view on the landscape. This is related with the nature of human perception, as well as with various objectives which are raised in the planning process, and in one way or another in the future could affect the future shape of the landscape.

Changes in transport and infrastructure will accelerate the transformation of landscapes. Internal landscape spatial structure and nature vary for the planned activities territory. This includes forest areas, river areas, rural areas with the urbanization trend of agricultural land, horticultural land, urban rural, urban blocks, the urban industrial area, degraded urban landscapes.

The Soviet Military Network in Riga planning region had a wide range. Therefore the region territory has been polluted by large quantities of hazardous substances, unexploded and damaged munitions and mines, as well as various polluting substances polluting the soil. Soil pollution from Russian military sites has been accumulated for years and its treatment requires substantial resources. A likewise situation exists for old factories, mechanical workshops, service stations, oil terminals and chemical storages.

In general, the soil is clean of such pollutants as heavy metals, pesticide residues, and radioactive substances. Map 7 in appendix III shows all kind pollution in Riga region (air, noise, soil, water, groundwater and landscape degradation).

3.4. Flora and fauna

3.4.1. Biological diversity

Riga and Riga planning region's biological diversity is determined by the geographic location and inhabitant economic activity, different terrain and hydrological conditions as well as the closeness of Riga Gulf. Sandy beaches and dunes of the Riga Gulf, coastal wetlands, wet forests, virgin bogs, natural and semi-natural meadows are all natural resources of national and international importance.

A considerable wealth of the region is the catchment area of three major Latvian rivers (Daugava, Gauja and Lielupe) as other rivers and lakes which form the structure of the 'blue' Pieriga. Particularly important for the preservation of biological diversity are shallow coastal lagoon lakes.

Forests are among the most important ecosystems in the Riga region. Ongoing intensive use of forests, especially in private forests, creates a negative impact on forest biodiversity.

A special value of the region with their specific flora and fauna are bog ecosystems. They are important both or climate and water system maintenance. Their value is the closeness to the Riga.

Only in Riga city territory are found 14 in Latvia specially protected habitat types. There are identified 36 specially protected flowering plant species, 10 specially protected mushroom species, 8 specially protected mammals, 4 specially protected amphibian species, 20 specially protected invertebrate species. Riga nests over 150 bird species or 60 % of the total Latvian bird species count (53 of them are specially protected bird species).

3.4.2. Special protected areas

The following Specially Protected Nature Areas (SPNA) are present in Latvia: strict nature reserves, national parks, biosphere reserves, nature reserves, nature parks Nature monuments (protected trees, geological and geo-morphological nature monuments) and protected landscape areas.

SPNA covers more then 10 % of the Riga region's total area. There are two national parks (Gauja National Park and Kemeru National Park), many nature reserves, nature parks and protected landscape areas as well as nature monuments (see appendix III, map 8).

Riga is unique in that in its territory are located five nature reserves of national significance: Daugavgriva, Vecdaugava, Jaunciems, Kremeri, Vakarbulli, as well as Piejura Nature Park (see appendix III, map 9). There have been find more 25 protected herbs species. Piejura Nature Park including nature reserves Daugavgriva and Vakarbulli, as well as nature reserve Jaunciems are included in the list of Natura 2000.

RPMP planned projects have link with two NATURA 200 areas. The place foreseen for construction of the first stage of Nordic Transport Corridor ((NTC) motorway is situated nearby Nature Reserve „Jaunciems", that is included in Latvian NATURA 2000 list with code LV0524600. The nature reserve area is established for protection of specially protected species, excluding birds, and habitats.

RPMP include's Project for reconstruction of E67/A7 road section between Riga bypass and Senite, what go's trough Nature Reserve „Garkalne forest", what is included in Latvian NATURA 2000 list with code LV0527400. The nature reserve area is established for protection of specially protected species (including birds) and habitats.

3.5. Cultural heritage

Riga region is multi-cultural interaction space with a rich culture and landscape. In that the different cultures (Balts, Livs, Vikings, Germans, Russians, Polish and Swedish) heritage deposits exist. The region boasts a wide variety of architectural, artistic, archaeological, industrial and underwater heritage sites, attractions and cultural and historical monuments and landscapes. Riga region's rural cultural uniqueness is formed by the rural building up the principle of farmsteads, manor network (and its associated church) in rural cultural landscapes and archaeological heritage.

Prevalence of the natural and cultural monuments there are concentrated along the Daugava and Gauja River and the sea coast, creating an aesthetically appealing landscapes. The region's cultural monuments mostly are located in the populated areas There are testimony of the ancient Balts settlements, the medieval fortified castles, churches, town centres, manors and other building objects created in different periods, as well as places associated with eminent people or special events. Peculiar sort of heritage buildings are fisherman villages and wooden summerhouses districts on the Sea coast.

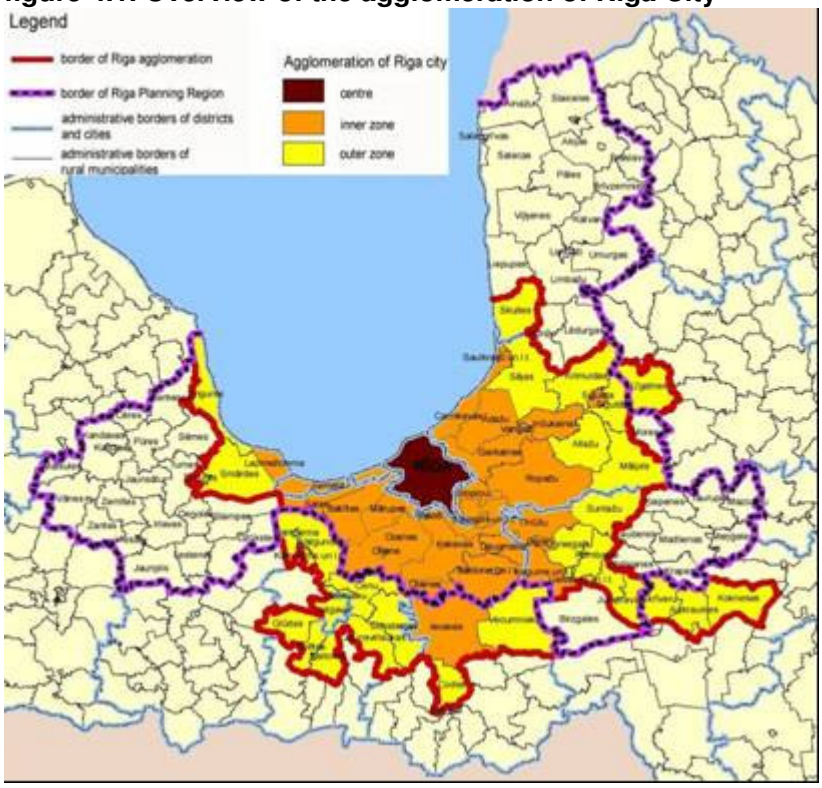
Cultural heritage of Riga city has been developed more than eight centuries. Nowadays saved Riga heritage is unique not only in Latvian or Baltic Sea region, but is significant on a global scale. Latvian State protected cultural monuments list the total number included over 8,600 monuments, which are classified according to their specificities in the following categories: urban, archaeological, architectural, artistic and historical monuments. There are about 1670 cultural monuments within Riga administrative boundaries, of which 743 are of national importance - 4 urban, 2 archaeological, 244 architecture, 452 art and 41 historical monuments.

4. ANALYSIS OF CURRENT MOBILITY IN RIGA AND PIERIGA

4.1. The study area

The study area for the RPMP and action program consists of the Riga and Pieriga area. They form the Riga agglomeration territory as shown in figure 4.1 with a size of 6,984 km². The text box at the end of this section lists the municipalities and cities which are part of the Riga agglomeration. It should be noted that the area of Riga agglomeration is somewhat arbitrary. It is based on the interrelationship between Riga and the outer territories. Latvia is divided into five planning regions (Riga, Kurzeme, Zemgale, Vidzeme and Latgale regions). Of these five regions, Kurzeme, Zemgale and Vidzeme border on the Riga Planning Region and have a direct relation to the RPMP. These three regions are also partly overlapping the Riga agglomeration.

figure 4.1. Overview of the agglomeration of Riga City



source: Spatial Plan of Riga City 2006-2008

Municipalities within the Riga agglomeration

Local municipalities

Engure district
Tukums district
Jelgava district
Ozolnieki district
Bauska district
Vecumnieki district
Koknese district
Aizkraukle district
Skriveri district
Lielvarde district
Kegums district
Ogre district
Malpils district
Sigulda district
Krimulda district
Seja district
Limbazi district
Incukalns district
Ropazi district
Kekava district
Baldone district
Iecava district
Babote district
Marupe district
Olaine district
Salaspils district
Stopini district
Ikskile district
Garkalne district
Adazi district
Carnikava district
Saulkrasti district

Cities*

Jelgava
Jurmala
Riga

Source: Ministry of Transport of Latvia (in: The Baltic Palette II, 2004)

the network structure

The structure of the road and street network in the Riga agglomeration is radial with the Riga old town being in the centre of the structure. The road and street network is roughly classified into:

- highways and main regional roads;
- city main streets (streets with arterial traffic);
- streets (without arterial traffic);
- sidewalks.

There is also a limited number of dedicated bicycle paths. In Riga tram infrastructure is integrated in the streets. The majority of tram infrastructure is also used as a lane for motorised traffic. In the Spatial plan of Riga (2006 - 2018) the characteristics for the different road and street classes are described. At present the majority of Highways and City main streets do not meet the proposed characteristics. This is (among others) caused by a lack of space, demand for parking places on main streets in the centre or insufficient financial sources to upgrade existing roads and streets. Figure 4.2 gives an overview of the Riga road and street network.

figure 4.2. Riga road and street network

Source: Description of existing transport situation for the Spatial plan of Riga, 'Imink', Ltd.

The following main State level motor roads intersect the Riga Planning Region: A1 Riga (Baltezers) - Estonian border (Ainazi), A2 Riga - Sigulda - Estonian border (Veclaicene), A3 Inchukalns - Valmiera - Estonian border (Valka), A4 Riga bypass (Baltezers - Saulkalne), A5 Riga bypass (Salaspils - Babite), A6 Riga - Daugavpils - Kraslava - Belarus border (Paternieki), A7 Riga - Bauska - Lithuania border (Grenctale), A8 Riga - Jelgava - Lithuania border (Meitene), A9 Riga (Skulte) - Liepaja and A10 Riga-Ventspils.

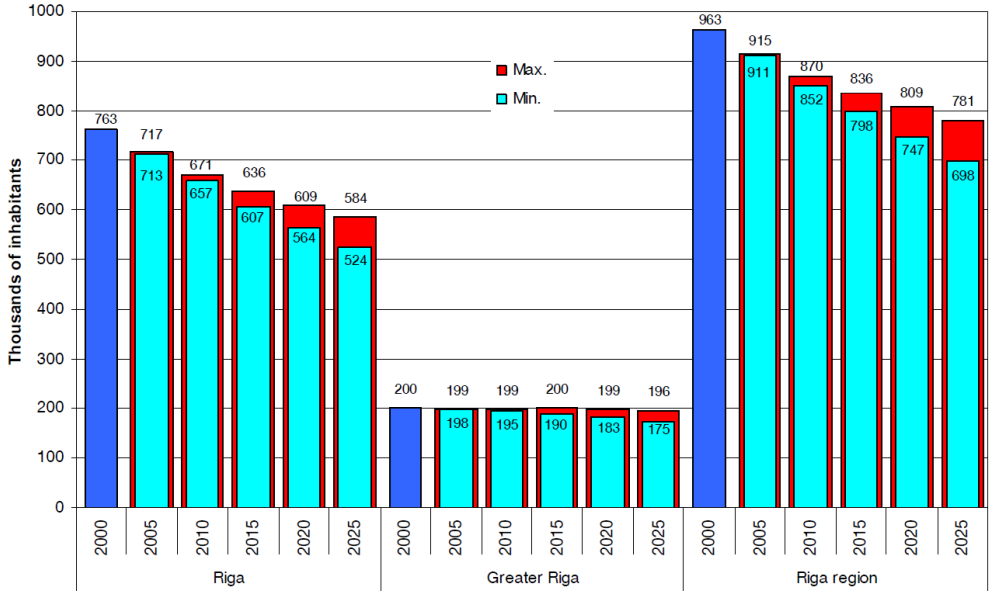
4.2. Socio-economic characteristics

population

The Riga agglomeration currently has a total of approximately one million inhabitants (almost 50 % of the total population of Latvia). Of this population around two third inhabits the city of Riga. In the last 20 years the population of Riga decreased by more than 20 %. The total Latvian population gradually decreased by 15 %. In Pieriga (excluding Riga) the population decreased until 1999 and has been increasing since 2000. This is mainly due to inhabitants of Riga city moving to Pieriga, inhabitants of other regions moving to Riga Planning Region and development of new residential areas outside Riga city. The population increase in Pieriga is located in the municipalities near Riga. In the periphery of Pieriga the population is stable or decreasing.

Figure 4.3 presents the expected changes in population until 2025. For both Riga and the Riga Planning Region the decrease in population is expected to continue. For Pieriga (noted as Greater Riga) a consolidation or small decrease is foreseen. However, one may notice that the actual situation in regard to the population number in Riga (713,000 in 2009) shows less decrease than forecasted in this figure.

figure 4.3. Expected changes in population numbers until 2025

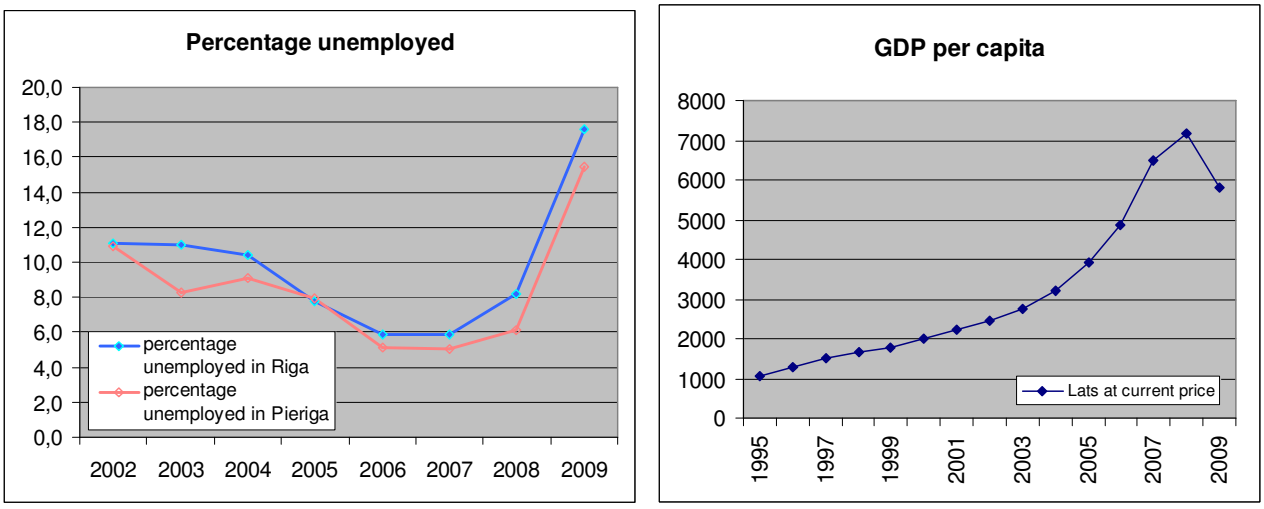


Source: Analysis of Spatial Planning Documents of Riga City and Riga Planning Region within the Context of Traffic Development and the Northern Corridor, Metrum Ltd., 2006

employment

Since 2002 there was a heavy decline in the percentage of unemployed (of the active population) in Riga and Pieriga. However, due to the economic crisis in 2008 there was again a large increase in the percentage of unemployed workers (figure 4.4). The increase in unemployed workers resulted in a clear decrease of traffic flows in the city and region. The figure also shows development of gross domestic product (GDP) per capita in Latvia. The GDP shows a sharp increase till 2007. The increase in GDP is clearly tempered in 2008. However, despite the recent downfall, employment is expected to increase within the city limits.

figure 4.4. Development of unemployment in Riga and Pieriga and GDP per capita in Latvia



Source: CSB, http://data.csb.gov.lv.

car fleet

In the past decade car ownership in Latvia (in cars/1000 inhabitants) has grown by 200 % between 1998 and 2008 and has reached 360 privately owned cars/1,000 inhabitants in 2008. With an average of 2.49 persons per household, this comes down to around 0.9 cars per household. The growth of Latvian's car ownership follows the same growth path as Latvian's GDP per inhabitant in the same period. In 2008 the growth seems to slow down, due to the current economic crisis. However, this does not imply that the growth has come to an end.

It is expected that the saturation level for Latvia lies somewhere between 600-700 (registered) cars per 1000 inhabitants. Compared to other European countries the saturation level is in line with Belgium or the Netherlands, but lower than for example Germany or France. This is due to the fact that Latvia's population is strongly urbanised, half of the Latvian population lives in the Riga agglomeration. The saturation level in a highly urbanised area is usually lower than in less urbanised areas.

Currently, the increase of the unemployed population and the tempering of the GDP and car ownership contribute to a decrease in the traffic flows in Riga and Pieriga. However, with rising car ownership traffic flows are expected to increase in the near future.

4.3. The policy framework

The authorities of Riga and Pieriga have developed many policy documents and initiated many studies on improvement of the situation of traffic and transport. For Riga City three main policy and planning documents have been made: the long-term vision document 'Riga Long-term Development Strategy till the year 2025', the 'Riga Development Program 2006-2012', and the longer term zoning plan 'Spatial Plan of Riga 2006-2018'. The Riga Development Program 2006-2012 contains a detailed description of the current situation in Riga from sector angle and specification of the objectives to be undertaken pursuant to the long-term development strategy of the city, as well as the programmes and projects designed to further develop the social and economical development of Riga.'Spatial Plan of Riga 2006-2018' determines the land use policy on the entire city scale. The Riga Long-term Development Strategy till the year 2025 is an all embracing document setting the development visions of the city, defining the interests of the city and its development priorities and goals, the basic concepts of spatial planning as well as the strategy implementation supervision model.

On regional level the 'Development Programme of Riga Region 2005-2011', the 'Spatial Development Plan of Riga Region' and the 'Riga County Territorial Plan 2007-2019' have been developed. The Development Programme of Riga Region 2005-2011 sets convenient international and local accessibility as the most direct goal. The Spatial Development Plan of Riga Region (approved in 2007) has a scope of 20 years and determines the spatial planning development directions and methods for Riga planning region. The Riga County Territorial Plan 2007-2019 is a wider scale regional plan. The hierarchy of the planning documents is indicated in the laws on territorial planning and on regional development.

4.4. Analysis of the supply side of the transport system

A thorough analysis has been made of the infrastructure supply, plans and developments in the first phase of the development of the RPMP. This section presents conclusions on the main bottlenecks on the supply side of the transport system.

lack of hierarchy and missing links

The road and street structure in the Riga agglomeration has historically been developed and formed around the three major crossings of the Daugava River (Vansu, Akmens and Salu bridges). With the improvement of the economical situation over the years the car ownership and freight transport increased. As a result of this development parts of the road and street network in the Riga agglomeration became heavily used by local traffic as well as transit traffic. A hierarchical road and street network for separating local from transit traffic, and passenger from freight traffic has not been created. Consequently, transit (freight) traffic is passing the Riga historical centre, since there is no adequate alternative available.

Another issue of lack of road hierarchy is related to traffic safety. In Riga no clear distinction is made between streets for (through) traffic and streets for accessing properties and activities. As a result, function, design and usage of streets do often not match. In the grid system of the city centre a form of hierarchy is established by means of a one way system. Although this system helps to improve traffic circulation, it also leads to extra vehicle kilometres. It should be noted though that possibilities to change the transport system in the city centre are limited, since the area is on the UNESCO World Heritage list.

The major road and street network in Riga is suffering from fragmentation and some supply side bottlenecks:

- highways are not directly connected to each other and to the main city arterials;
- not all city main streets are adequately equipped;
- the number of crossings of the railway circle around the centre and river crossings is limited, leading to confinement of network parts and bottlenecks at the available crossings;
- there is no complete ring structure within Riga to divert transit traffic from the Riga historical centre.

Network development is hindered by physical constraints, like the UNESCO listed city centre, the railway circle around the centre, the limited number of river crossings that lie in each others vicinity, and the lack of publicly owned space to make a direct highway connection between the west- and the East bank.

The A4-A5 connection can be seen as a ring structure in Pieriga. A bottleneck in this connection is the dam at the Riga Hydropower station which has a very limited traffic flow capacity and does not provide a logical, direct connection. Furthermore, this highway ring is not connected on the northern side. This problem is part of one of the main problems in Pieriga and Riga: the limited number of crossings of the River Daugava.

In Pieriga the main roads do not provide fast connections and their design invokes all kind of traffic safety problems. Most safety problems are related to substantial differences in travel speed. They lack measures like slip roads and parallel roads for local access, protected junctions for motorised traffic and crossings for non-motorised transport, grade-separated railway crossings, and grade-separated interchanges. Also, they often lack lanes for overtaking, reducing their capacity (like the A4 and the A5). Furthermore, despite all efforts the maintenance backlog is increasing.

Daugava crossings
Both Riga and Pieriga are divided by the Daugava River with only few connections between the two banks. Until the end of 2008 within the city of Riga there were only four connections over the Daugava River, among which one railway connection. Recently the Dienvidu (Southern) bridge was realized as the fifth connection. This bridge is already in use, but a large part of the access streets is still under construction. In Pieriga (outside Riga) cross river connections are made by the dam in the Riga bypass A5, the dam at Kegums and the dam at Aizkraukle.

The capacity of the bridges is currently not a real bottleneck. However, the location of the bridges within the traffic structure and more specifically the intersections at both sides of the bridges are serious bottlenecks for the traffic flow. On the eastern bank the Vansu, Akmens and Salu bridges have their end in or at the borders of the historical centre. Due to the lack of bridges in a larger ring around the city centre and in Pieriga all traffic is routed through the centre to and from the bridges. Around the old town there is no space to make direct connections for all traffic directions and the distance between junctions is limited. This results in large traffic flows around the old town and the development of congestion and blocking back effects around the intersections.

This might well be one explanation for the fragmented network existing at present. However, with a proper road and street hierarchy, reinforced by traffic lights, turn prohibitions and eventually reconstruction activities, it should be possible to get road usage more in line with the functions desired, and to establish basic routes between major origins and destinations. This might lead to a lesser impact of the supply bottlenecks existing.

airport and port connections
The port and airport of Riga have grown substantially in recent years and further growth is expected. This leads to an increase in passenger (airport) and freight traffic (sea port) flows. The connections between the port and airport on one side and the Riga city centre and the hinterland on the other are insufficient. Especially, the connections to the public transport network are missing. Furthermore, most freight routes for transport to destinations outside Riga lead through the city centre of Riga. Solutions lie in the provision of adequate infrastructure.

network overlap and competition
In several parts of Riga and Pieriga there is overlap between the network for bus, trolleybus, tram and minibus. These networks are developed and operated separately from each other. The result is a very dense network within the city centre, which actually provides more PT lines than necessary. On the other hand, outside the city centre the networks spread out, containing missing links as well as parallelism.

The train network facilitates (mainly) inter-city traffic in the Riga agglomeration. However the competition with other public transport modes (like regional buses) and the private car is increasing significantly. The bus services are more flexible than the passenger rail. The train is losing its passenger share due to a lack of demand-oriented services (like frequency, speed and passenger information), bad accessibility of the stations and the lack of a feeder role by other public transport modes.

4.5. Analysis demand side of the transport system

The transport issues Riga and Pieriga are facing, are very challenging. From a supply side point of view, the wishes are to extend the road and street network around Riga. At the same time extension of the road and street network will lead to new activities in the vicinity of the new infrastructure. These new sites will become car dependent if the PT network is lacking behind.

The demand for infrastructure will remain high as trip making will not decrease. The challenge is to shift part of this mobility to more sustainable modes. By far the most sustainable modes are NMT. Although weather conditions during half of the year are not very favourable, cycling could become a substantial mode for mandatory trip making.

As not all residents of Riga and Pieriga can benefit from new infrastructure, equity and social justice might become important issues to address. Studies can be conducted on how to take care of specific demand for mobility not facilitated by major infrastructure investments.

4.6. SWOT analyses

Based on analysis of the supply and the demand side of the current transport system in Riga and Pieriga SWOT analyses have been conducted for road, street and rail infrastructure and for public transport. Tables 4.1 and 4.2 summarize the results.

table 4.1. SWOT analysis of road, street and rail infrastructure

Strengths	1. The old city still has a street pattern and dimensions that reinforce the historic and cultural qualities (this has by some sources been described as a weakness in the past); 2. The Southern (Dienvidu) bridge will lead to extra capacity for through and long distance traffic that does not longer strongly interfere with local traffic; 3. The marine passenger terminal and the railway station/bus station are close to the old town and the CBD, and these sites are in principle capable of transferring a lot of passengers without giving too much traffic impact problems in the area; 4. Most arterials at the entrances of Riga have reserve capacity and, albeit physical barriers, do not have a strong impact on liveability in the residential areas; 5. Riga has a well developed PT network with high frequencies, with almost all inhabitants and employees in 5 minutes vicinity of a PT stop. This system has been highly beneficiary for the levels of service on roads and streets; 6. Latvia has a Public Transport tradition which goes back into the Soviet time. As a result the Pieriga region has train infrastructure with train stations and is served by transit busses which stop in several villages or small towns.
Weaknesses	1. The bridges Vansu and Akmens concentrate (through) traffic in and around the centre and the East bank, which leads to congestion, traffic unsafe, extra vehicle kilometres, barriers and substantial environmental impact; 2. Transit traffic is using the streets in and around the Historical Centre of Riga since there is no by-pass like the planned Northern Transport Corridor available in the Riga territory at present time. Transit traffic prefers routes through Riga city centre over the available A4 bypass; 3. Due to the economic situation the budget for public transport outside Riga has decreased. As a result many PT-lines in rural areas have been cancelled or frequencies were lowered dramatically; 4. The railway loop has lead to a limited number of street crossings that appear as bottlenecks in peak periods. Reducing these bottlenecks will require considerable capital investments; 5. The dense grid system in the CBD has an adverse impact on liveability, by allowing motorized traffic to drive everywhere. The one-way system has limited reach to control this. The UNESCO World Heritage listing limits possibilities for redesigning the traffic space; 6. There is no strict road and street hierarchy reinforced by different designs, resulting in adverse effects on liveability and traffic safety. Also the absence of lighting on several strategic locations is reducing traffic safety; 7. The network of arterial streets is still incomplete and under development, and therefore failing to distract through traffic from the centre and residential areas; 8. Most state road stretches in the Riga and Pieriga region have some weak points regarding traffic safety, like access of properties via the highway, locations for U-turns and left-turns, zebra crossings, no median barrier, lack of lane marking etcetera. The same refers also to municipal streets; 9. Apart from the central station area there are no big transport hubs in the city and the outskirts. Also, rail and tram/bus/trolleybus are not interconnected, giving more pressure on the street system; 10. Up till now PT has no or hardly any priority at traffic lights. Only some tramlines have some priority measures at traffic lights. Also, since many routes are not diametrical, through passengers are forced to transfer, which worsens PT travel times and competitiveness; 11. There are 18 dedicated PT-lanes on street sections, but none of the PT-lines has a complete dedicated lane in the entire City Centre; 12. Infrastructure for pedestrian movements like street and road passing is limited and often lacking facilities for the disabled; 13. Insufficient knowledge of EU-financing regulations together with insufficient municipal planning documents has lead to missing EU-subsides for the construction of cycle roads in Pieriga; 14. The maintenance level of up to 40 % of the road and street infrastructure is classified as (very) poor. Due to specific investments in periodical maintenance and reconstruction of roads and streets in the past and next years this percentage is decreasing; 15. The accessibility of the north western port region (West bank Daugava) is limited; the access streets do not have a suitable design for the new envisaged

	developments; 16. Not all new development areas in the north western port region are connected to the rail network; 17. The only route for rail cargo from the port region to the East bank goes via the city centre of Riga, resulting in hindrance and external safety issues.
Opportunities	1. The railway circle gives possibilities to make multimodal interchanges and together with real estate developments the PT network can be strengthened and the traffic can be better spread and disentangled; 2. The marine passenger terminal and the railway station/bus station are close to the old town and the CBD and are capable of transferring a lot of passengers without giving too much traffic impact problems in the area;. The accessibility for pedestrians of both terminal and station however could be improved. Furthermore the Central Bus Station is located in a narrow place and walking distance towards the train station is to far for quick interchange. Improvement of these connections is possible and will provide a better use of PT; 3. New bridges can be combined with moving car traffic away from the existing bridges (Akmens in particular) and provide opportunities to reclaim the East bank as a valuable city promenade, and even to close the railway circle for interconnecting city sections, secondary centres next to arterial crossings and the marine passenger terminal; 4. The grid system in the CBD can provide parallel safe and attractive cycle routes; 5. The Daugava river is very suitable for water recreation as well as passenger and freight transport north-south and east-west; 6. The further decentralisation of jobs and dwellers might reduce the strong orientation on the city centre, leading to more balanced traffic flow patterns; 7. New infrastructure can be linked to new spatial developments in order to safeguard efficient use of the extra capacity; 8. A more stringent car parking policy can lead to better traffic conditions throughout the city centre; 9. The PT network can be enhanced, e.g. by better serving important O-D patterns accompanied with promotion, leading to a modal shift away from the car; 10. With a new railway bridge, together with the street infrastructure linking with the port, freight traffic can be diverted from the city centre; 11. New infra around Riga might strengthen the strategic position of Riga as a main transport hub/gateway city in the European region, leading to a greater budget for the road and street network; 12. investments in railways and surroundings can boost rail as a mode for internal trip making, also reducing car trips; 13. With the right investments in engineering, education and enforcement traffic safety figures can further improve, as evidence from other European countries suggests; 14. With resources derived from economic prosperity measures can be taken to improve the emissions of the vehicle stock; 15. The adverse impact of location of companies and services on the network and the surroundings can be reduced with the help of zoning policy, mobility management, and tax differentiation and alike; 16. To combine road cross river connections of the Northern Transport Corridor with a new rail connection in the Northern part of Riga.
Threats	1. The continuing rise in car ownership and car use might lead to highly oversaturated junctions, gridlocks (in the grid system of the CBD) and illegal parking, causing extensive delay, accessibility problems and inefficient capacity usage (e.g. the bridges); 2. A lack of funds for public transport which already has lead to a decrease in public transport services in the Pieriga region will lead to extra car usage from commuters who live in small towns, villages or rural areas; 3. A location of a possible new river crossing must be chosen carefully to be attractive to drivers in order to achieve the proposed/wanted change in traffic routes. If not chosen carefully there is a chance the existing traffic jams in the City Centre will remain; 4. The connection of the new river crossing to existing infrastructure might lead to new traffic jams at other locations; 5. Too many (new) river crossings might excavate PT when the car mode becomes even more competitive and PTs reaction to reduced demand is reducing frequencies;

	6. The promotion of bicycle use might lead to traffic unsafety if drivers are not yet used to bicycles and the infrastructure does not protect the cyclist enough; 7. The further decentralisation of jobs and dwellers will lead to more traffic flow in the outskirts, on relations not serviced by PT, leading to congestion and traffic unsafety. Also, commuting into the centre might rise and the unbalance in PT volumes by direction might grow which could reduce competitiveness; 8. The development of new infrastructure will lead to a bigger maintenance program that will be challenged in situations of shortage of resource; 9. Completion of the outer ring might lead to new settlements far away from the city, causing more commuter traffic and vehicle kilometres; 10. Lack of alternatives might lead too more dangerous cargo being transported via the city centre; 11. Transit freight traffic will increase if the economy of Riga and Latvia is further developing; 12. The transport of cargo by rail is losing competitiveness in comparison to transport by road, leading to an increase of road transport and decrease of accessibility.

table 4.2. SWOT analysis of public transport and rail

Strengths	1. Riga and Pieriga still have a well developed PT network with high frequencies. In Riga almost all inhabitants and employees live or work in 5 minutes walking vicinity of a PT stop; 2. Inhabitants are used to travel with PT and are well informed about the possibilities of PT; 3. PT has a good punctuality and an acceptable level of comfort. In recent years many investments in (new) rolling stock have been made; 4. Just recently an integrated ticketing system has been deployed, leading to more PT integration;
Weaknesses	1. The old town has a street pattern and street dimensions that make it impossible for regular PT to operate services; 2. The bridges over the Daugava river form a barrier for PT, due to traffic congestion, network restrictions and extra vehicle kilometres. Only one bridge can be used by trams and one by train; 3. Apart from the central station area there are no big transport hubs in the city and the outskirts; 4. There is no hierarchical line structure, consisting of fast lines serving main traffic flows and slower lines with more stops on minor traffic flows, feeding fast lines; 5. Rail and tram/ bus/ trolleybus lines are not interconnected; 6. Up to now PT has no or limited priority at traffic lights, and the number of dedicated lanes is limited; 7. Most routes are not diametrical, which forces passengers to transfer, and which worsens PT travel times and competitiveness; 8. The road and street infrastructure is suffering from a maintenance backlog which has a negative influence on comfort, travel speed and costs of repairs; 9. The number of lines is high, with much parallelism, resulting in less efficient operations; 10. The electric modes have not been developed with the growth of the city in the last decades; 11. As a result from the ticketing system the user is confronted with a less transparent network: especially transfer and choice opportunities are not yet encouraged by the fare system; 12. The railway stations are badly accessible and not integrated in the public transport system; 13. The railway rolling stock is outdated and unattractive.
Opportunities	1. New infrastructure can be linked to new spatial developments in order to safeguard efficient use of the extra capacity; 2. New road and street infrastructure can provide opportunities for more dedicated PT lanes, e.g. for restricting a bridge to PT modes only; 3. The PT line network can be improved by introducing a hierarchical structure, more diametrical lines and interconnection with railways and between PT modes; 4. With relative small investments the electric network can be extended to improve air quality and possibly travel speeds; 5. A more stringent car parking policy can lead to better traffic conditions throughout the city centre. PT can be linked to the parking system;

	6. The PT network can be enhanced, e.g. by better serving important O-D patterns, accompanied with promotion, leading to a modal shift away from the car; 7. The adverse impact of location of companies and services on the road and street network and the surroundings can be reduced with the help of zoning policy, mobility management, tax differentiation and alike. PT can play an import role in developing those policies, e.g. by providing a good alternative to the car; 8. Connection of new spatial developments to train stations, improving accessibility of the developments and the use of the passenger rail; 9. Improvement of accessibility and use of the passenger rail through introduction of intercity trains.
Threats	1. The continuing rise in car ownership and car use might lead to decrease of modal share and volume of PT, which decreases the possibilities for an efficient and high quality routes and lines structure; 2. New bridges might excavate PT when the car mode becomes even more competitive and PTs reaction to reduced demand is reducing frequencies; 3. The further decentralisation of jobs and dwellers will lead to more traffic flows in the outskirts, on relations that cannot easily be serviced by PT. Also, commuting into the centre might increase the unbalance in PT volumes by direction; 4. Completion of the outer ring might lead to new settlements far away from the city, causing more commuter traffic and vehicle kilometres and less opportunities for competitive PT; 5. Urban sprawl around Riga along other corridors then the railway corridors, reducing the competitiveness of the rail in relation to car traffic.

4.7. Non Motorised Transport

The infrastructure for Non Motorised Transport (NMT) in Riga is insufficient. Especially a cycle network is lacking. The infrastructure for pedestrians is quite good in Riga, but the combined use of sidewalks by pedestrians and cyclists is undesirable. There are no data on the amount of walking in Riga, but it is known that a lot of trips are made by foot, either the whole trip or the part from and to the public transport stops. Furthermore, the amount of cycling in Riga is currently small, but respondents in surveys indicate that they are willing to cycle if better facilities are available.

Confronting the supply and the demand leads to the following conclusions:

- the current bicycle network does not meet the demand for cycle routes on most relations;
- the planned bicycle network facilitates most demand relations;
- it the planned bicycle network a tangential route between Mezaparks on one hand and Mezciems and Purvciems on the other hand is missing;
- in the planned bicycle a connection from Plavnieki to the network is missing.

4.8. Traffic safety

In comparison with other European countries Latvia is one of the countries with the worst traffic safety figures. On the other hand Latvia also shows one of the best improvements in traffic safety in recent years, in spite of the large growth of the car fleet. The number of traffic deaths decreased by 25 % from 2007 to 2008.

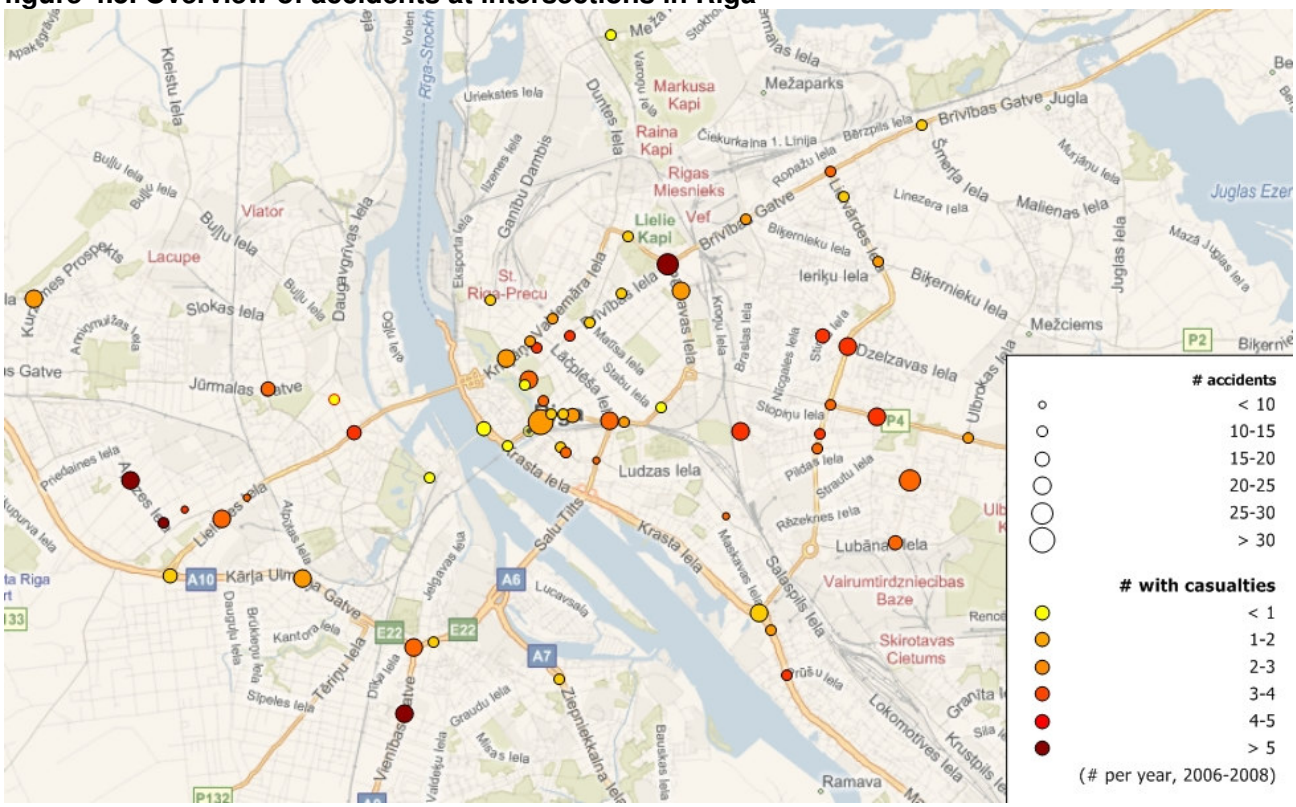
On average in the last decade in 50 % of the accidents vulnerable road users (NMT users) were the victim. This figure relates to the lack of good infrastructure for these road users. The main causes of fatal accidents are speeding (23 %), driving under the influence of alcohol (21 %) and manoeuvring and aggressive driving (8 %).

For the state roads in Riga and Pieriga the following main observations can be made in relation to traffic safety:

- small roads or even driveways are directly connected to main roads. This negatively affects traffic safety because of conflicting left and U-turns and large speed differences (especially at U-turns);
- there is a lack of hierarchy. The state roads are used by passenger cars, but also by slow agricultural vehicles. Furthermore, people walk and cycle along the road due to the lack of dedicated infrastructure;
- there are dangerous NMT crossings; most crossings are not provided with safety facilities.
- there is insufficient lighting at night.

Figure 4.5 gives an overview of accidents and accidents with casualties on Riga's intersections. The intersections with more than 10 accidents per year and/or more than 2 accidents with casualties are shown (average per year for 2006 - 2008).

figure 4.5. Overview of accidents at intersections in Riga



The three intersections with the largest number of traffic accidents (more than 25 per year) are:
- Brivibas iela - Pernavas iela;
- 13 Janvara iela - Gogola iela;
- Akademika Mstislava Keldisa iela - Andreja Saharova iela.

The four intersections with the largest number of traffic accidents with casualties (5 or more per year) are:
- Brivibas iela - Pernavas iela;
- Apuzes iela - Jurkalnes iela;
- Graudu iela - Vienibas Gatve;
- Apuzes iela - Volguntes iela.

Latvian State Roads has made an overview of the main accident locations along state roads. The locations with most traffic accidents are the following:
- A7 section with the connections to Balozi and Valdlauci;
- A5-A6 connection near Salaspils;
- A6-A4 connection near Salaspils;
- A4-A2-A1 connection near Baltezers;
- Section A7 kilometre 10;
- A10 connection to Jurmala.

4.9. Liveability

The lack of road hierarchy is already indicated several times in this analysis. A side effect of the lack of hierarchy is the negative influence on liveability in the city centre and in residential areas. Main traffic routes cross through Riga city centre and local centres, leading to traffic unsafety, social disintegration and health impacts in these areas. Especially the freight traffic causes noise and emission hinder. The lack of guidance of through-going traffic leads to a decrease of the liveability in Riga.

Part of liveability is the ease of (multimodal) access to activity centres, like the port, shopping malls, hospitals, schools and alike. The fragmented network has led to much inequity in this respect. This issue will be addressed in the process of developing variants, on the basis of functional relations between areas.

Public transport remains a relatively clean mode, especially in case of a high seat utilisation degree. Several studies show that if calculated per passenger kilometre, public transport makes about 30 to 50 % less use of energy than private cars. Electric transport has an extra advantage, since air pollution is concentrated at the energy production plant and not in the urban area. Besides this, 'green' electricity can be produced by alternative means like windmills, hydroplants and solar panels.

5. VARIANTS FOR RPMP

5.1. Approach for variant development

Figure 5.1 presents an overview of the variant development process. In the previous tasks the objectives for the RPMP have been established and possible measures and projects for the Riga and Pieriga transport system have been identified.

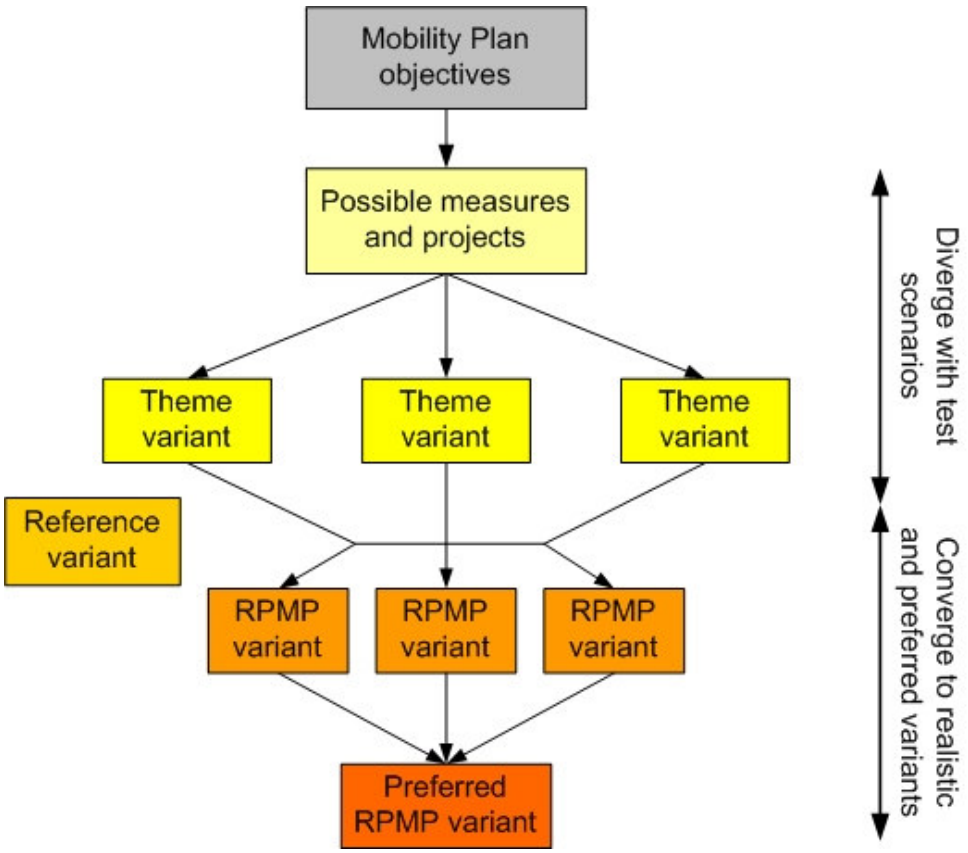
In the first step of the variant development three so-called theme variants have been developed, based on themes, with a focus on different aspects of the transport system:

1. focus on accessibility, connectivity and road infrastructure (the 'economy' theme);
2. focus on public transport competitiveness (the 'environment' theme);
3. focus on reducing traffic hindrance and establishing traffic calmed areas (the 'liveability' theme).

With these theme variants diverse (extreme) possibilities for the transport system in Riga and Pieriga have been explored. They have been used as test scenarios for the transport model that was developed in the previous task. The model results provided insight into maximum possibilities and effect of sets of measures. With the theme variants the transport model has been optimally used, through implementation of clearly distinguishable sets of measures.

Simultaneously with the theme variants, the Reference Variant has been developed. This Reference Variant consists of the current situation combined with infrastructure developments which are currently (2010) being built or contracted as well as demographic and economical trends. The Reference Variant is used as a basis for comparison.

figure 5.1. Variant development process



In the second step three realistic RPMP variants have been developed, based on the results of the previous step. The RPMP variants consist of a combination of components of the theme variants, added with more detailed measures. The Reference Variant and the RPMP variants have been modelled and assessed with a cost-benefit analysis. On the basis of this assessment a choice for the preferred variant has been made.

main philosophy

The main philosophy for the RPMP is to provide a framework for integrated development of the transport system in Riga and Pieriga. The main philosophy for Riga is to further develop and implement a street hierarchy, along the lines as set out by the Riga City Council. The idea of a hierarchy is that roads and streets are used according to their function. In order to achieve this, the design has to be in accordance with the function, and the network needs to be coherent, to stimulate the right use of the different network links.

To improve safety and liveability a clear distinction between main roads and streets and local streets should be made. Within the grid of main roads and streets, the local streets can be downgraded. However, the wider the grid and the more extensive the traffic calmed areas within the grid, the more problems arise along the major streets and in the grids as well, since traffic is accumulating there. Hence, there is a trade-off between the extensiveness of traffic calmed areas and the traffic related problems on the main grid. Based on the philosophy of road hierarchy, the realistic variants have been distinguished in the density of the main roads and streets grid.

In Pieriga road hierarchy is also an important means for reducing traffic problems, like making a clear distinction between roads with and without direct access of houses, farms and estates. However, the main philosophy for Pieriga is based on spatial planning for the region, as in Pieriga transport and spatial planning are even more interlinked. The Riga Planning Region states that the transport infrastructure of the region should be developed in connection with the planned polycentric development of habitation and distribution of work places. In the context of net outmigration and shrinking population, it is considered essential to the sustainable and balanced development of the region to keep critical mass in towns and villages. With this critical mass the living conditions can be maintained and improved, since the location becomes more attractive for employment, services and dwellers. Accessibility is regarded as the key to maintain critical mass. This is the basis for the RPMP philosophy for Pieriga.

In order to avoid widespread low density housing and industrial estates, the Riga Planning Region recommends concentrating new developments along existing railway lines. This objective is adopted for the RPMP. In the RPMP the railways are chosen as the regional backbone for public transport and spatial development.

basic measures

Transport modelling, interviews and workshops and analyses of model results, existing data and field surveys have been performed. The results have clearly shown important bottlenecks and drawbacks in the transport system, which can be solved with the proposed measures in the RPMP. Several main measures have been identified, which are at least necessary to improve the traffic and transport situation. These measures form the basic set of measures, which is included in all variants.

The main measures included in the basic set are:

- completion of connections to the Southern bridge (stage 3 from Southern bridge till A7), to improve usage of the bridge (traffic analysis has shown that in the RPMP period there is no need for further connection between the A7 and A8, independent of the choice for one of the variants);
- downgrade of Akmens bridge (not in Variant C), traffic calming in the Riga city centre and the introduction of dedicated streets for public and non-motorized transport, to improve accessibility (avoid transit traffic), liveability and traffic safety;
- introduction of a one-way street system to solve bottlenecks on radials crossing the eastern railway loop;
- construction of a bypass for Valmieras iela, to solve local liveability issues;
- improvement of the connection(s) to the port area by rail and road;
- cohesion fund project E22 section Riga (Tinuzi) - Koknese, to enhance Riga accessibility and solve local transport related problems in the corridor;
- reconstruction of E77/A2, section between the Riga bypass and Senite and of E67/A4 Riga bypass, section between the A6 and the A2, mainly to improve the Via Baltica route;
- construction of the E67/A7 Kekava bypass, to solve local transport related problems and to increase Riga accessibility;
- improvement of the public transport network in Riga and Pieriga, with passenger train, tram and trolleybus as backbone, to increase efficiency and competitiveness with the car mode;
- local traffic safety measures in Riga and Pieriga, to eliminate black spots.

The road measures in Pieriga are based on the already started projects and priorities of Latvian State Roads for Pieriga. This program fits very well with the philosophy of the RPMP for Pieriga. The listed projects are supposed to have the largest contribution to improvement of the regional accessibility. The public transport measures are based on different analyses to increase efficiency as well as competitiveness. Parts of those analyses were made with the help of the RPMP transport model.

5.2. Description reference scenario

The RPMP describes the measures and projects to be realized to arrive to an improved future transport system in Riga and Pieriga. However, this is also influenced by several autonomous developments. Therefore, the RPMP variants are compared to the Reference Variant which consists of the basic situation in the year 2007 and the autonomous developments between 2007 and 2025.

These autonomous developments consist of socio-economic and demographic developments such as developments in population, employment, car ownership and GDP. A summary of these aspects is given in table 3.1. Furthermore, also the projects and developments which are already contracted or being constructed are seen as autonomous developments. These projects are listed in table 5.1 and shown in figure 5.2. The autonomous developments give the basic situation for the RPMP.

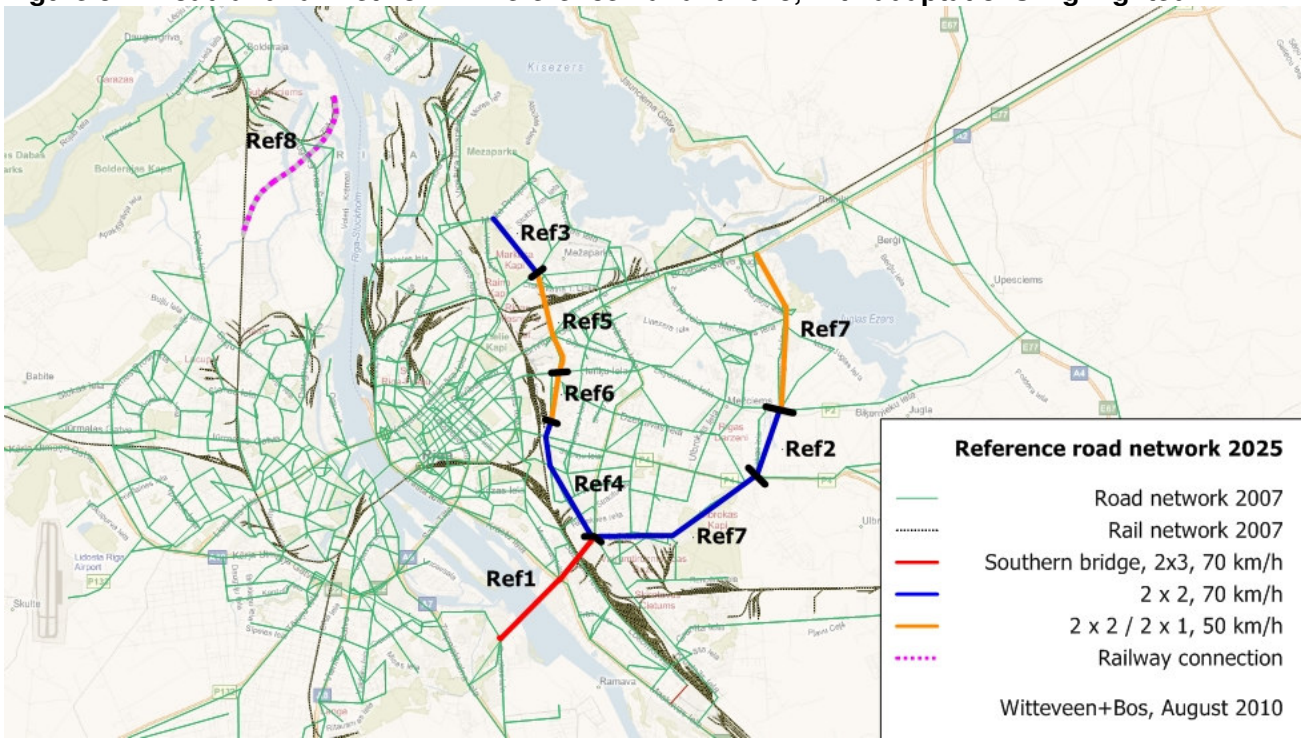
table 5.1. Road and rail projects for reference 2025

ID	project	from	to	capacity	speed	remarks[10]
ref. 1	Southern bridge stage 1 and 2	Slavu iela roundabout	Daugava West bank	2 x 3 lanes	70 km/h	1st stage completed in 2008, 2nd stage to be completed in 2011
ref. 2	Reconstruction of Juglas iela	Bikernieku iela	Lubanas iela	2 x 2 lanes	70 km/h	to be completed in 2010
ref. 3	Extension Gustava Zemgala gatve (part of eastern arterial)	Gustava Zemgala gatve	Viestura Prospekts	2 x 2 lanes	70 km/h	road section completed in 2008; construction of flyover near Gaujas iela in RPMP period; section between Meza prospekts and Viestura to be finished in 2011
ref. 4	Eastern arterial (upgrade)	Slavu iela	Ieriku iela	2 x 2 lanes	50 km/h	section Slavu apils – Vietalvas iela is completed; design is ready for the section till Ieriku iela; construction in RPMP period
ref. 5	Eastern arterial (upgrade)	Ieriku iela	Gaujas iela	2 x 2 lanes	70 km/h	completed before 2010
ref. 6	Eastern arterial (new connection)	Braslas iela	Gustava Zemgala gatve	2 x 2 lanes	50 km/h	completed before 2010
ref. 7	Slavu/Jugla ring road (upgrade)	Southern bridge	A2	2 x 2/ 2 x 1 lanes	50/70 km/h	reconstruction completed in 2008
ref. 8	Rail connection	current network	Krievu sala			LDZ project
ref. 9	E22 Riga (Tinuzi)-Koknese	bypass A4	Tinuzi	2 x 1 lanes	90 km/h	LSR project (not in figure); first part between Riga bypass A4 and Tinuzi has been finished and is therefore a reference project. The part from Tinuzi till Koknese is included in the action program

When confronting the reference measures with the main network structure for the RPMP this shows that the measures are important links within the RPMP philosophy. Reference projects 3 to 6 are parts of the Eastern arterial, which is part of the Riga city ring in the RPMP structure. Also reference project 1 is part of this city ring. Reference projects 2 and 7 are part of one of the main roads connection to the Riga city ring. Reference project 8 provides a better connection to the port area, which is one of the objectives for the RPMP. The main structure defined for the RPMP builds further on the projects which already are planned or have been started in Riga and Pieriga.

[10] During development of the RPMP it became clear that not all reference projects will be finished before 2011 and not for all project finance has been arranged. Therefore, several reference projects (related to the eastern arterial and Southern bridge) have been fncluded in the action program, to be finished during the first implementation period of the RPMP.

Figure 5.1. Road and rail network in Reference Variant 2025, with adaptations highlighted



For public transport in Riga the services for tram and trolleybus are included in the Reference Variant as they are existing in 2010 (see table 5.2). These lines form the backbone of the public transport system in Riga. All other changes in public transport will be taken into account in the variants.

table 5.2. Tram lines in Reference Variant 2025

line	from	to	average frequency	runtime (min)
2	Central Tirgus	Tapesu iela	4/hr	27
3	Jugla	Dole	1/hr	58
4	Central Tirgus	Imanta	12/hr	28
5	Ilguciems	Milgravis	5/hr	56
6	Stacijas Laukums	Jugla	10/hr	36
7	Ausekla iela	Dole	9/hr	33
9	Aldaris	Dole	1/hr	52
10	Central Tirgus	Bisumuiza	6/hr	32
11	Stacijas Laukums	Mezaparks	8/hr	30

Tram line 8 is out of service in 2010 (and thus in 2025).

figure 5.2. Tram lines in Reference Variant 2025

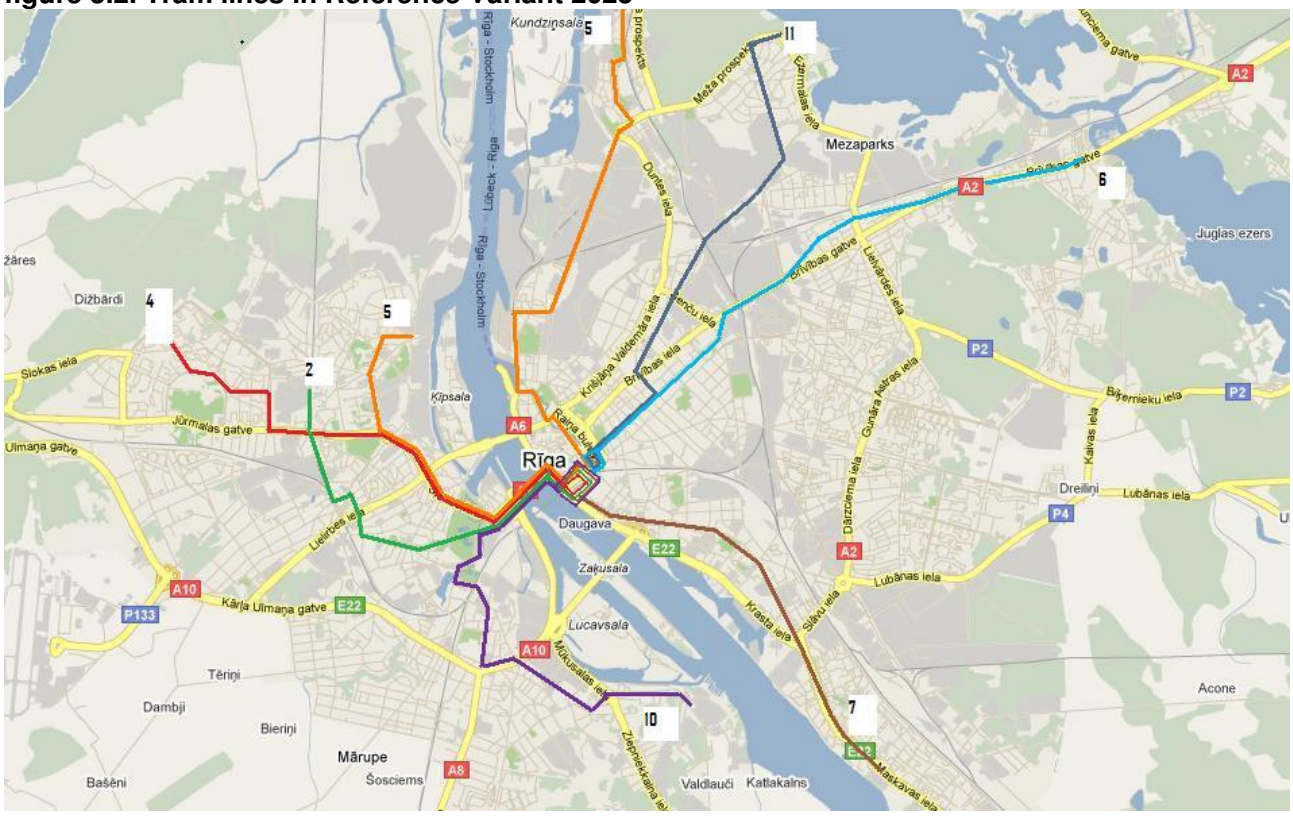


table 5.3. Trolleybuses in Reference Variant 2025

line	from	to	average frequency	runtime (min)
1	Valmieras iela	Petersalas iela	5/hr	15
3	Central Tirgus	Sarkandaugava	12/hr	23
4	Central Tirgus	Smerlis	5/hr	30
5	Daugavas stadions	Kliniska Slimnica	4/hr	33
7	Agenskalna priedes	Keguma iela	3/hr	38
9	Stacijas Laukums	Ilguciems	3/hr	31
11	Centrala stacija	Ieriku iela	5/hr	23
13	Central Tirgus	Ieriku iela	5/hr	28
14	Esplanade	Mezciems	8/hr	35
15	Latvijas Universitate	Viskus iela	24/hr	29
16	Pjavnieki	Smerlis	5/hr	35
17	Centrala stacija	Purvciems	13/hr	35
18	Centrala stacija	Mezciems	6/hr	32
19	Petersalas iela	Ziepniekkalns	10/hr	37
20	Latvijas Universitate	Televizijas centrs	1/hr	12
22	E.Birznieka-Upisa iela	Pjavnieki	17/hr	31
23	Centrala stacija	Purvciems	14/hr	25
24	A/s Dzintars	Petersalas iela	5/hr	37
25	Brivibas iela	Ilguciems	11/hr	32
27	Stacijas Laukums	Abolu iela	4/hr	26

Compared to 2007 the following trolleybus lines have changed:
- line 5: extended route;
- line 6: out of service;
- line 8: out of service;
- line 9: extended route;
- line 13: extended route;
- line 20: extended route;
- line 21: out of service;
- line 24: extended route;
- line 25: added (old line 21);
- line 27: added (old line 8 extended to east bank Daugava).

figure 5.3. Trolleybus lines in Reference Variant 2025

The bus and minibus networks have not been adapted in the Reference Variant to the situation 2010. The network in the current situation (2007) was implemented for 2025 without adaptations. For the rail network in Riga and Pieriga also the situation of 2007 has been applied. The reason for this is that there were no significant changes between 2007 and 2010 and there are no significant adaptations foreseen till 2025. Also, for regional and intercity buses in Pieriga the situation 2007 is used.

5.3. RPMP variants

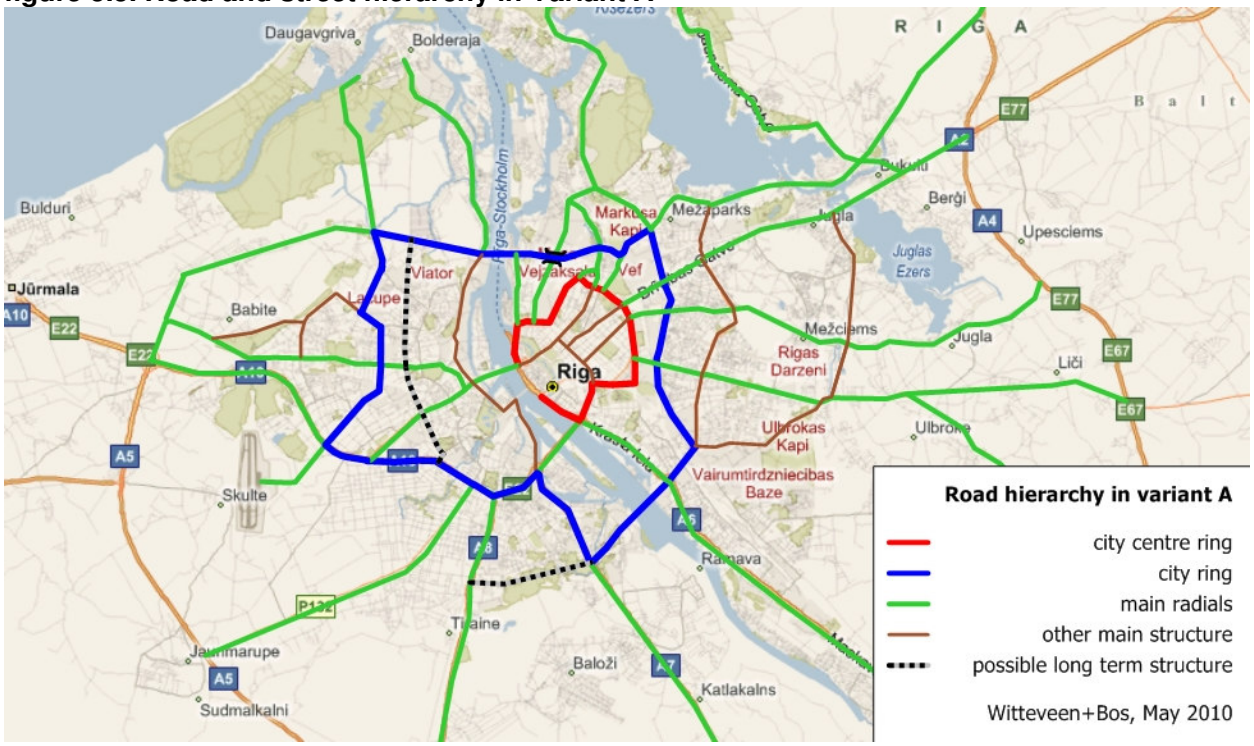
The three realistic variants have been distinguished based on the main road and street hierarchy. In Variant A and Variant B the road and street system is complemented with a new river crossing to the north of Vansu Bridge. Analysis has shown that there is a very large demand for such a connection and that such a connection is necessary to be able to reduce the amount of traffic in the Riga city centre. Also, it is regarded as imperative for making a new step in improving the transport system, since possibilities for further optimisation of the existing network are limited without a new crossing.

Variant A foresees a sparser main network, with clear hierarchy and high capacities and speeds. Variant B foresees a denser main network, with more possible routes, but less capacity per route. Variant C does not include any new river crossing. This variant focuses on better use of the Southern bridge and improvements with traffic management on the main routes in the road and street hierarchy. Figures 5.5 to 5.7 present the future hierarchy for each of the three variants.

The main distinguishing measures in Variant A are:

- construction of the complete Northern Transport Corridor (NTC) including a new Daugava crossing, relieving the streets in the historical centre of Riga and accommodating freight traffic to the port and industrial zones in the northern part of city;
- construction of a connection from Jurkalnes iela to Jurmalas gatve as part of the western side of the city ring, also connection both sides of the railway Riga-Jurmala;
- reconstruction of the intersection of Augusta Deglava iela with the Eastern Arterial, providing better connection with the city.

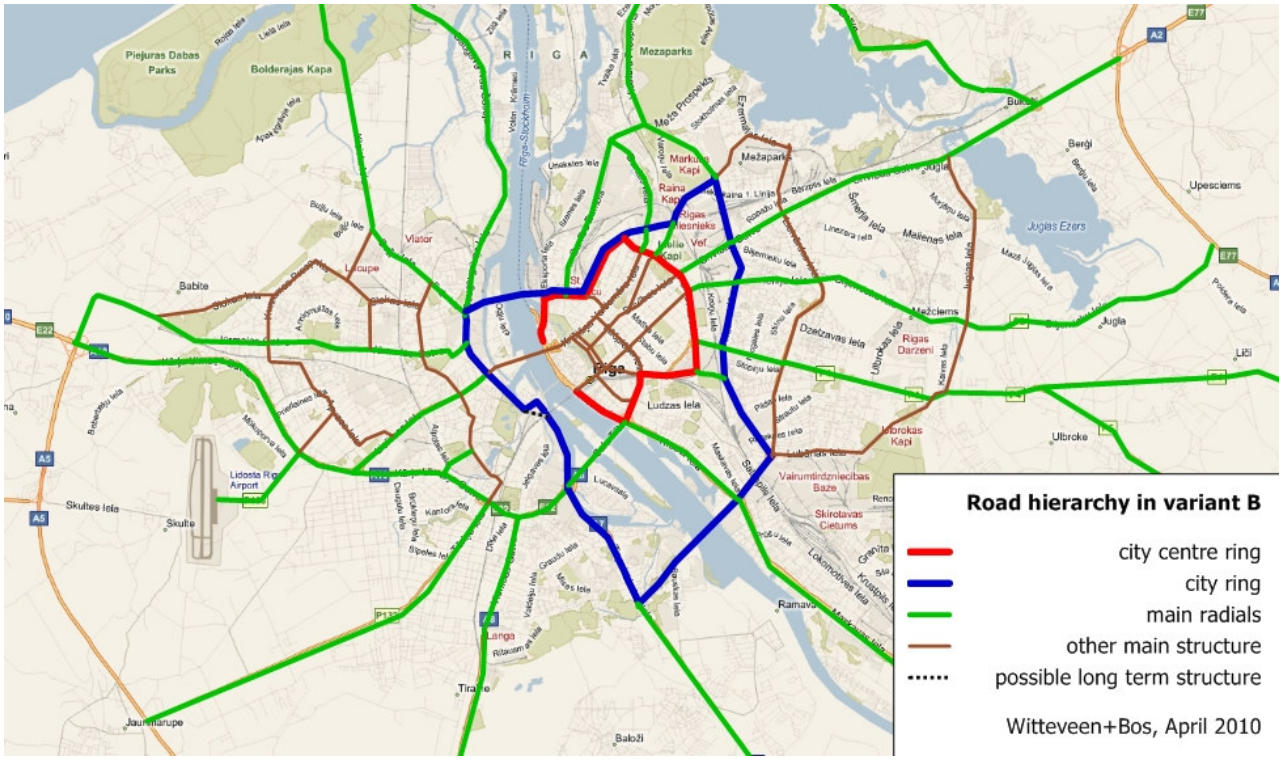
figure 5.5. Road and street hierarchy in Variant A



The main distinguishing measures in Variant B are:

- construction of the Hanzas bridge including good connections on both banks, accommodating mainly Riga traffic;
- upgrade of the existing route on the West bank of the Daugava close to the river, providing a better, direct (freight) route north-south;
- upgrade of a new connection from Pernavas iela, via Vietalvas iela to the Eastern arterial, as an alternative for connecting the Eastern arterial with the city centre.

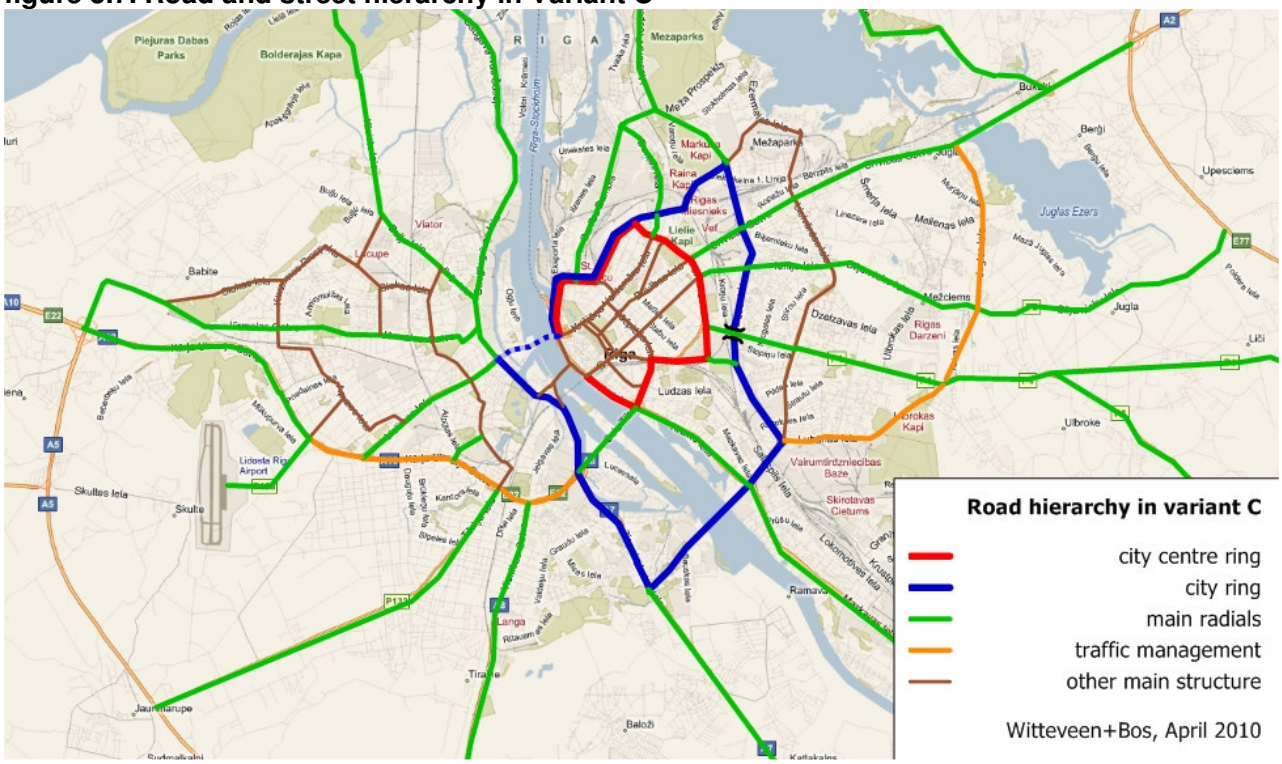
figure 5.6. Road and street hierarchy in Variant B



The main distinguishing measures in Variant C are:

- upgrade of the existing route on the West bank of the Daugava close to the river, including a new tunnel connecting Ranka dambis directly to Mukusalas iela, with this route being the major north-south route for years to come;
- upgrade of a new connection from Pernavas iela, via Vietalvas iela to the Eastern arterial, as an alternative for connecting the Eastern arterial with the city centre;
- implementation of an extensive traffic management system on the main radials with a focus on the routes connecting to the Southern bridge.

figure 5.7. Road and street hierarchy in Variant C[11]



5.4. Freight truck routing

Improvements of the connections between the Riga Freeport, Riga and other national and international (TEN-T) transport infrastructure networks are of great importance for economical development of Latvia. More specific for Riga one of the main issues with road freight traffic is the hindrance caused by trucks in populated areas.

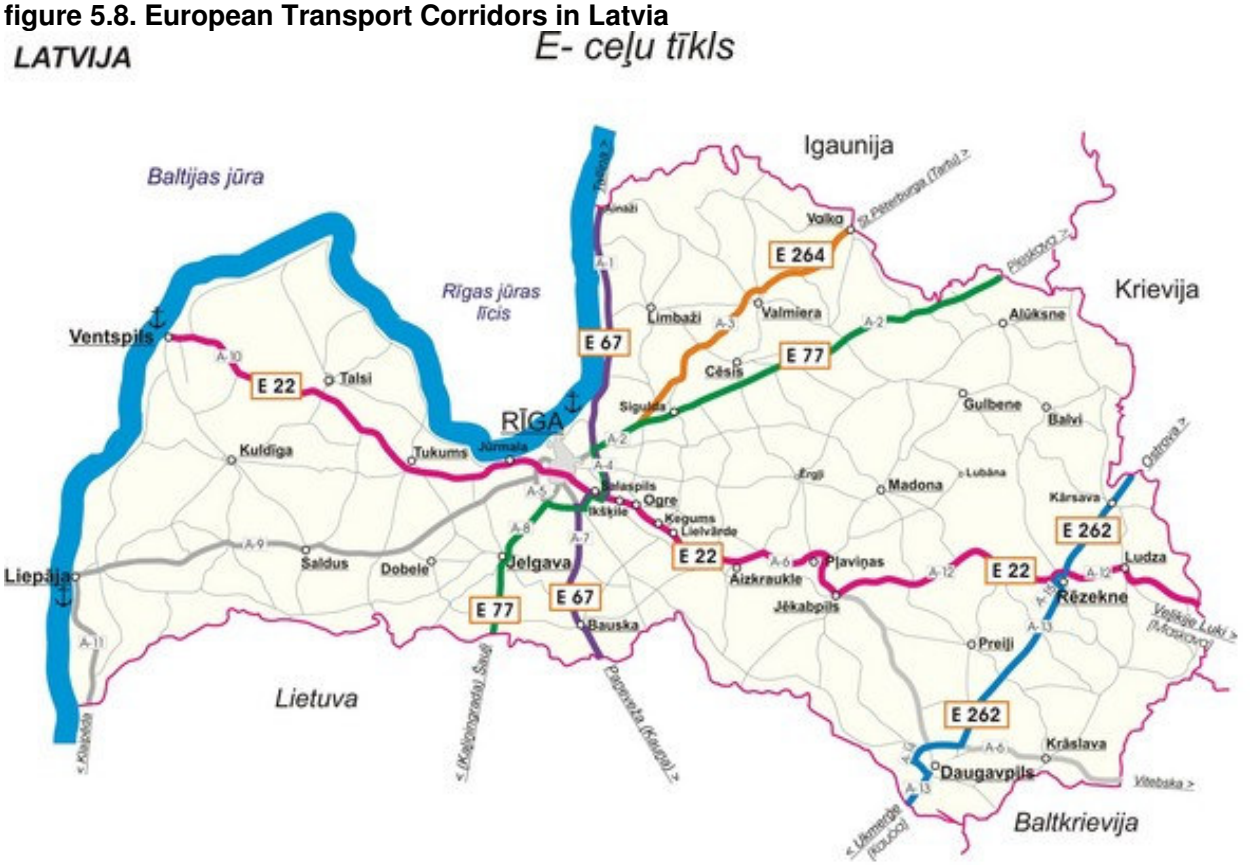
freight traffic at a regional and national level

Three main road transport corridors cross Riga and Pieriga (as shown in figure 4.7). The E67 or 'Via Baltica' connects the Baltic states with Southern and Western Europe. The E77 is a north-south connection as well and provides a connection to St. Petersburg. Both the E22 and the E77 are access roads to the TEN-T network. The E22 is a west-east connection and provides a road connection from Ventspils to Russia and further on to the European-Asian transport corridors.

Freight traffic on the E67 and E77 currently crosses the Daugava river at the HES-dam or travels via the city of Riga. There is no direct connection from the A4 to the A5. This is considered as an important missing link in the north-south related European transport corridors. For international (transit) transport and for improving the connection of Latvia to the TEN-T network, this route is of value for the longer term when the number of freight trucks increases. For traffic with an origin or destination in Riga, especially after connecting the Southern bridge to the A7 and the A8, the route via the Southern bridge will be of more importance. Also Pieriga traffic can use this route on the short term. Therefore, the project is considered as a long term project for the period after 2025. If monitoring of the HES-dam leads to the conclusion that the dam should be downgraded for traffic, the new connection should get higher priority.

[11] Vansu bridge is part of the city ring in this variant, however this bridge is not accessible for heavy freight traffic.

figure 5.8. European Transport Corridors in Latvia



Source: www.lvceli.lv

rerouting of transit freight traffic in the RPMP period

The HES dam and the future NTC are strategic connections in the freight route network. However, the NTC will not be operational before 2025. Furthermore, the HES dam will be replaced by a new A4-A5 connection in the period after 2025 and will not be able to facilitate all freight traffic till replacement. Therefore, in the period till 2025 the freight traffic will use routes via existing river crossings in Riga and Pieriga. Transit freight routes for the first implementation period of the RPMP will use the HES-dam and the Southern bridge to cross the Daugava river. Especially for the E67 (Via Baltica) and E77 (A8-A1) this seems logical, for the E22 route the Salu bridge is an alternative.

There is a possibility that within the RPMP period the HES-dam might no longer be available as river crossing for freight traffic, due to the vulnerable construction. If so, the E67 and E77 routes will be diverted to the Southern Bridge. This can lead to an increase of freight traffic in some populated areas as can be seen in figure 5.9. However, construction of a connection between the A7 and A8 is planned for the second implementation period. This connection provides a direct route from the A8 to the Southern bridge, preventing traffic crossing through the residential areas.

freight traffic within the Riga boundaries

Approximately 40 %[12] of freight truck movements within the boundaries of Riga is crossing the Daugava at the Akmens, Salu or Southern bridge[13]. Another 40 % of freight truck movements stays within the boundaries of Riga but is not crossing the Daugava. Only 13 % of freight truck movements has an origin or destination outside Riga and 7 % is transit freight traffic. Freight traffic is strongly related to the port area although there are also substantial industrial zones located close to the railway circle at the right bank and between Dreilini and Mezciems.

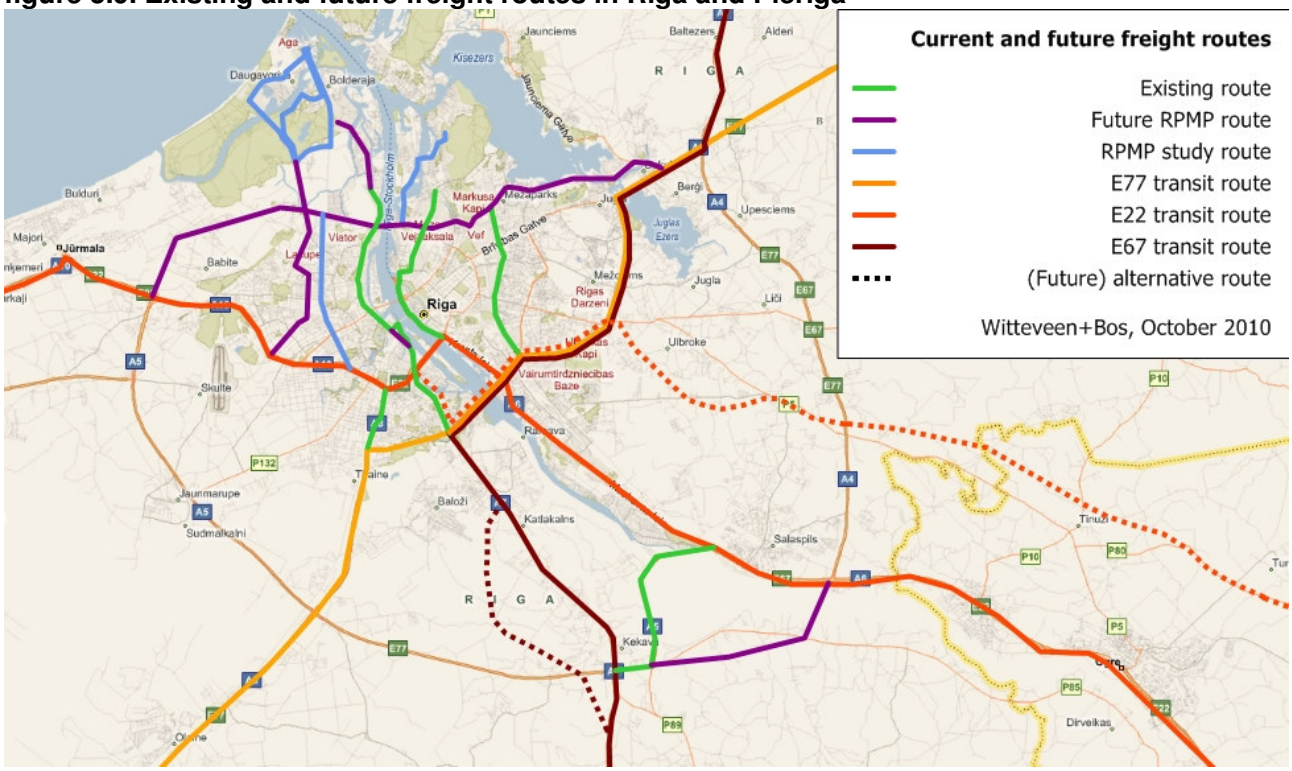
With the ongoing development of the port areas and the relocation of Andrejsala and Eksportosta activities to Krievu Sala and Kundzinsala, part of the freight traffic will shift to other locations. For Krievu Sala (left bank) till 2020 the majority of transhipped goods will be coal which is mainly transported by rail. After 2020 an increase of general cargo which is transported by truck is expected at Krievu Sala. At Kundzinsala (right bank) an increase of container transport up to 15 million tons per year is foreseen, which will lead to an increase of truck freight traffic in the coming period.

Currently, there are two main north-south transport axis used by the trucks situated closely to the river Daugava:

- at the right bank: Ganibu dambis - Eksportosta iela - 11. novembra krastmala - Krasta iela;
- at the left bank: Daugavgrivas iela - Ranka dambis - Mukusalas iela.

At the right bank the Eastern Arterial serves as an alternative route and at the left bank the Kleistu iela is an alternative for the Daugavgrivas iela.

figure 5.9. Existing and future freight routes in Riga and Pieriga



12 Source Description of existing transport situation or the Spatial plan of Riga for 2006-2018, Imink/RCC, 2005

13 Depending on the traffic situation, RCC prohibits freight traffic to use the Akmens bridge.

5.5. Traffic safety

Improving traffic safety is one of the main objectives for the RPMP. In the last decade Latvia has made a substantial progress in improving traffic safety at main roads and the local or municipal street network. The Road Traffic Safety Directorate (CSDD) of the Ministry of transport has a leading role in Black Spot Analyses and traffic safety audits of e.g. design, construction or existing situations. The weakest points in Pieriga are intersections of local streets with main roads and pedestrian crossings at main roads[14].

The target of the Road Traffic Safety Program (2007 - 2013) is to halve the number of accident victims (till 280 in 2010) in comparison with year 2001 and to decrease the number of victims by 70 % (till 160) in 2013. The target for 2010 was already reached in 2009 when there were 254 fatal injuries. Compared to 2008 in 2009 the number of accidents decreased rapidly, probably also due to less traffic caused by the economic situation.

Given the current economical situation in Latvia, the budget for improving traffic safety has been reduced. However, there is still a lot of improvement necessary in the coming period. In order to do so, there is an additional budget for traffic safety of EUR 5.000.000,-- included in the RPMP action program for the first seven years. The main allocation of this budget is to improve traffic safety in Riga (RD19a) and Pieriga (RD29a) and should be administrated and prioritised by the MoT (and CSDD), based on the annual black spot list and traffic safety audit advices. The annual budget is EUR 715.000,-- This budget is meant to subsidise quick win measures and not for large reconstruction projects.

5.6. Outline of other measures

This section gives an outline of several general aspects which are also part of the RPMP. These aspects are not differentiated in the variants, since these do not entail major decisions for the future traffic and transport system.

5.6.1. PT network

PT network Riga

A set of measures has been developed to create an attractive and more efficient public transport system. The measures are estimated to lead to a growth of approximately 18 % in use of public transport compared to the reference situation. The focus lies on creating corridors, served by high frequent connections that have a travel time which is competitive with travel times by car. Another goal is to decrease the parallelism between bus lines, trolley bus lines and tramlines. To achieve the objectives important conditions are:

- a complete and coherent network of dedicated PT infrastructure in congested areas to increase the travel speed of PT;
- financing of costs for both infrastructure and operations;
- marketing of the entire public transport network;
- changing the tariff system to an integrated system for all PT modes without a penalty for transfers.

[14] Based on results of questionnaire among Pieriga municipalities.

tram network

Passengers prefer the tram to travel with, above the other modes. Also the tram can be regarded as an environmentally friendly system, especially when using green energy. Therefore, the tram network is considered to be the backbone of PT in Riga, although closure of some parts of the network is necessary to realize a more cost-effective solution and to reduce the need for large investments. The tram network will be redesigned to further increase the attractiveness and efficiency of this system. The tram related measures are estimated to result in a 20 % increase of average travel speed. The current radial network will be (partly) transformed into a transversal network[15] to create more direct routes and to reduce the need to transfer for passengers. Figure 5.10 give an overview of the future tram network.

The new tramline to the Airport (RPMP line 1, replacing current line 2) enables a good connection from the Airport to the central station and the city centre. This line will also attract passengers in the areas served between the airport and the Riga city centre. The redirecting of tramline 2 from Tapesu iela towards the Airport reduces operation costs. This enables the operation of an attractive tramline to the Airport. Passenger volumes from the airport alone are not enough for operating a frequent railway line with trains. Also travel times by rail will not be shorter than by tram and a railway offers less direct connections to the city centre. A tramway is therefore the best alternative for the existing bus line 22. Examples of successful tramlines to the airport can be found in several cities, as in Bremen, Germany and Lyon (France). The tramline from the airport will be connected to the existing tramline to Jugla, which is the first line to be operated with the new low floor trams. In the RPMP this line has the highest priority to be improved.

trolleybus network

The existing trolleybus network is mostly modern and dense. Trolleybuses have large benefits for the environmental impact in the city and comfort for the passengers, although the current speed is too low (approximately 16 km/h). In the RPMP the focus lies on using the existing trolleybus facilities and rolling stock and on redesigning the network to increase attractiveness and efficiency where possible. This can be achieved with more transversal lines (direct connections), extensions of the trolleybus network, reduction of parallelism with the tram, dedicated infrastructure and priority at intersections. The redesign of the network will lead to a reduction in the number of trolleybus lines and an easier understandable network. The lines will be renumbered to realize distinctive numbering for tram, trolleybus and bus lines.

bus network

The changes in the bus network are limited in comparison to the other PT modes. The most important measure is the elimination of several bus lines which are parallel to the tram or trolleybus lines over longer distances and the provision of clear, fixed timetables. These changes must be worked out together with the proposed changes in the tram and trolleybus lines.

Furthermore, several bus lines with low frequencies will be replaced by non direct connections with tram and trolleybus lines and shortened to new transfer points where passengers can easily transfer from bus to train, tram and/or trolleybus as indicated in the preceding sections.

[15] In a transversal network tram lines do not terminate at the central station in the city centre, but pass this station and continue to another end station. With a transversal, compared to a radial network, more direct routes can be created. Furthermore, a benefit is that no turning points are necessary at the main tram stop in the city centre, reducing the need for space.

multi modal transfer points

Transfer points where passengers can easily change from one line to another are an essential part of a more hierarchic PT network. On these transfer points it should be easy for people to change modes and lines. This means that a transfer point must meet the following requirements:

- recognizable as transfer point;
- passenger information about connecting lines;
- short and safe walking distances between connecting lines;
- waiting comfort (shelter, seating, lighting, social security);
- when lower frequency than every 10 minutes: secured connection between lines (vehicles waiting for each other when delayed).

Transfer points between bus and tram or train can also help to reduce the number of buses driving to Riga central station, thus helping to reduce negative impacts of these buses and reducing the space needed for a bus terminal near Riga station. Transferring people from bus to train or tram is only acceptable when people have no significant longer travel time despite the need to change and do not have to buy an extra ticket for the last part of the trip. Transfer points can be combined with P&R facilities. In Riga transfer points can best be realized in combination with an upgrade of the tramway network.

PT network Pieriga

The philosophy for Pieriga is to use the existing train network as the backbone for transport and spatial development. Essential for an attractive train system is the introduction of faster regional connections with regular intervals and easy to remember departure times. Furthermore, the focus is on good access to and from the train stations and the tram stations on the outskirts of Riga.

train network

The accent for the train network is on moving people between Pieriga and Riga; inside Riga people use non-motorised transport or the dense and frequent network of tram, trolleybuses, buses and minibuses. The train network will be redesigned to a fast metro-like system, operated as 'Sprinter' with a clear network and timetable with regular intervals of 30 minutes or more frequent.

To attain shorter travel times, the elimination of speed restrictions is included as RPMP measure. Furthermore, additional measures are necessary to improve the rolling stock, accessibility of the trains and stations and the connection to car and other PT modes, including Park and Ride facilities. The Pieriga train network is operated with electric trains. On not-electrified lines, diesel trains can be used, although it could be considered on the longer term to use hybrid trains that are able to drive in an electric mode where catenaries are available.

train network as a backbone

The future train network is based on the existing electrified lines from Riga to Tukums, Jelgava, Aizkraukle and Skulte. As a backbone of the Pieriga transport system, this serves passengers in a fast way to travel from suburbs in Pieriga to Riga. Closure of stations with very few passengers (e.g. less then 100-200 per day) is recommended. This leads to shorter travel times for most passengers and decreases operation costs and investments in platforms (lengthen up to 162 meters) and stations. A renewed railway station Riga Tornakalns nearer to new developments on the Daugava West bank is proposed in line with the Riga city development plan.

Rail Baltica

The Rail Baltica, connecting the capitals of the Baltic states by rail, is not considered as a project within the time frame of the RPMP. However, the recommendation is to further build international support for this rail link. It could prove a real asset for the transition to sustainable mobility, saving passenger kilometres by aeroplane and enhancing the connectivity within the Baltic states and between the states and the rest of Europe.

regional bus

Regional buses have an important function for Pieriga. With increasing car ownership it will become more difficult to operate a dense public transport network in Pieriga. On the important corridors to Riga where investments in the train system make this more competitive to car and (mini)bus lines, direct parallel lines of (mini)bus and train should be avoided. This means that the public transport authority should be restrictive with transport concessions for regional bus on the following corridors:

- Tukums – Riga Central Station;
- Sloka – Jurmala – Riga;
- Aizkraukle – Riga;
- Skulte – Riga;
- Sigulda – Riga.

The connections of the regional bus network to the train system should be improved. This is necessary to create a cost-effective train system. Villages in Pieriga that are currently only served by bus should get a faster connection to Riga via a transfer on the train system. This is only possible after the planned upgrade of the railway network. Nowadays many bus connections are faster than the corresponding train, e.g. Tukums – Riga or Sigulda - Riga. Creating transfer points with an easy transfer from bus to train and vice versa also leads to a more efficient network. Villages in Pieriga not directly situated at one of the railway lines can benefit from a faster connection to Riga and at the same time support the train system by increasing its usage. This in return will enable an increase in train frequencies.

transfer points between bus and train

A direct link between regional buses and trains should (at least) be realized at the following stations: Aizkraukle, Ogre, Sigulda, Jelgava, Tukums, Sloka, Majori. Not all buses will be redirected to another station instead of Riga. A new routing, including a transfer from bus to train, must be faster than the direct route. A feasibility study is necessary to study the possibilities. These transfer points can be of great importance for the municipalities in Pieriga: improved shuttle buses or existing bus lines, connected to these stations can shorten travel times for commuters and students travelling to Riga. This must be further studied as described in the Fact sheet public transport system of municipalities of Pieriga, with Tukums as an example.

For an optimal alignment between regional bus and train, the operation of the regional network should fit the following conditions:

- there must be an integrated schedule, with bus and train connections;
- there must be an integrated tariff system, so switching from bus to train can take place directly;
- there must be a comprehensive and integrated public transport authority (PTA) .

The measures also do include an improved and more comfortable bus station in central Riga, on the east side of the central railway station. Plans for more bus stations around the city centre are in line with the RPMP.

PT marketing and promotion

This section presents the PT marketing strategy for the RPMP.

Why marketing for public transport?

The current situation in Riga and Pieriga is that the market share of public transport as a whole is decreasing. The number of cars is expected to increase by approximately 60 % till 2025. People who buy these cars will also use them for the majority of their trips. Without measures this will lead to more congestion for both the private cars as well as for PT. This causes an increase of travel times for public transport and makes public transport less reliable, thus leading to lower attractiveness for passengers. This will even result in a larger decrease of passenger volumes than caused by an increase in private car ownership itself.

Explicit marketing for public transport can help changing this trend. Marketing in this way must be a lot more than just travel information and communication. It is about knowing what people want and then converting this knowledge into an attractive product/transport system. In the right form marketing can help to encourage car-owners to keep using public transport for certain trips and encourage existing customers to keep using public transport instead of buying a car.

An important part of marketing is image building. This is an often under-estimated aspect. Some people think public transport is only for poor people who do not own a car. The image can refrain people from using PT, because it is 'not done' to travel by public transport. The image of PT can be influenced by good looking vehicles, fast reliable connections, service friendly staff. Cities like Vienna, Hamburg and Zurich are very successful in creating a positive image. The image should make it possible for car owners to tell that they have used PT instead of their own car without feeling ashamed to tell.

Main targets of marketing in Riga and Pieriga:
1. keep a 35 % market share of transport movements in Riga;
2. keep a 50 % market share on city-centre related trips within Riga;
3. arrive to a market share of 50 % on all trips from Pieriga to Riga city-centre in 2025 (public transport and combination of car and use of Park and Ride).

These targets can only be achieved with a strong focus on the attractiveness of the public transport system for car owners, especially on connections with the city centre.

SWOT-analysis
A SWOT-analysis has been used to outline the Strengths, Weaknesses, Opportunities and Threats of public transport in Riga and Pieriga, related to the perception of travellers. This SWOT analysis gives tools to measures and improvements. Table 5.4 presents the SWOT-analysis.

table 5.4. SWOT analysis of public transport in Riga and Pieriga

strong aspects:	**weak aspects (bottle-necks):**
1. the public transport network is very dense (but less in Pieriga); 2. there are many direct connections; 3. public transport is rather cheap; 4. travel times are competitive with other traffic; 5. the frequencies of trolleybuses and trams are high; 6. rolling stock of the trolleybus and bus network is relatively new; 7. e-ticketing is easy-travelling; 8. the public transport company of Riga has a good accessible website.	1. it's hard to get (detailed) travel information (e.g. for tourists); 2. travel information on the vehicles is often not present or unclear; 3. the dense network makes it difficult to find the best connection; 4. the tram network is old and does not meet current needs; 5. the image of the public transport system could be better; 6. the network is a collection of isolated lines without sufficient interconnection; 7. limited integration of train/tram/bus fares.
opportunities	**threats**
1. Riga is a busy city with traffic jams every morning; 2. Riga is mono-centric and the city centre is an area to be proud of; 3. road traffic unsafety is a problem, caused by for instance drunken drivers of passenger cars; 4. public transport contributes to reduction of air pollution, CO_2 emission and other environmental problems; 5. the dense network makes it possible to travel everywhere; 6. positive political attitude towards PT.	1. increase of car ownership of about 345 cars/1000 inhabitants towards 565 cars /1000 inhabitants in Riga and Pieriga; 2. the car is more than just a transportation mode: it is also a status-symbol of individual development; 3. the financial situation of the government is growing weak; 4. the quality of the PT system is declining, because of more congestion in Riga.

5.6.2. Non Motorised Transport

Non motorised transport (NMT) has a significant role for sustainable transport development. Part of the RPMP is a bicycle and pedestrian network. In this section the focus is on cyclists. Nevertheless, most measures also apply to pedestrians.

Several studies and surveys have shown that the bicycle can become a substantial mode in Riga and Pieriga. Cycling instead of going by car has all kind of advantages, for individuals and the society. In the RPMP the main focus is to improve the conditions for using the bicycle in mandatory trip making, i.e. going to work and to school. It can be argued that students and pupils going to school are not regular car drivers, but they might be car passengers and for establishing a bicycle culture young people play a key role. Obviously, cycling to work on the other hand, will temper the pressure on roads to Riga and roads to and within the city centre.

In Pieriga the focus is to pilot with high-standard park and ride facilities next to railway stations. Next to the possibility to park your car in a safe manner, it should also be reassured that the facilities are accessible by bicycle, including the provision of guarded bicycle parking. Also in Pieriga it is important to improve crossings of state roads and railways for pedestrians and cyclists. In collaboration with CSDD an inventory and prioritisation will be made on the short term.

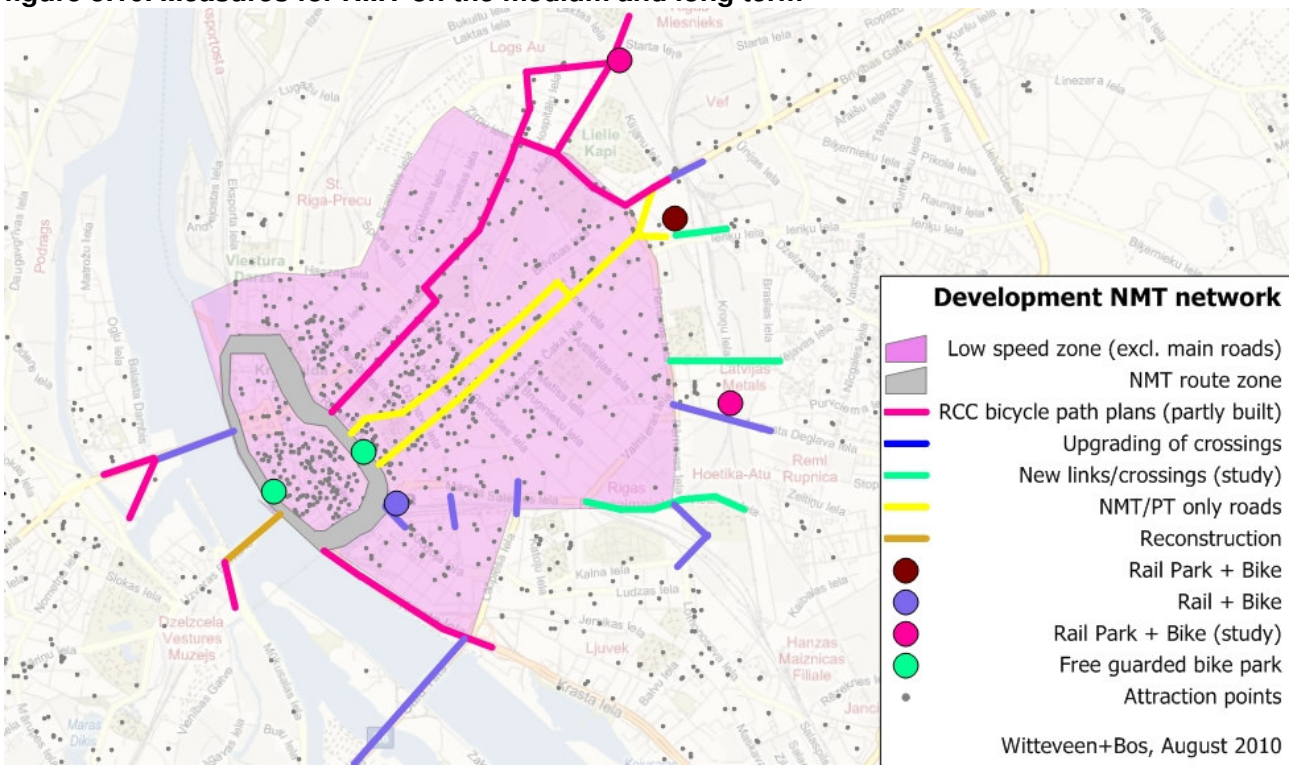
For Riga Riga City Council worked out a plan to make the city centre more accessible by bicycle, coming from all kind of directions. One of the routes being built is the route between the old town and Jugla, via K. Valdemara iela and Brivibas gatve. The plan fits very well with the RPMP, although the budgets for this plan are not incorporated in the RPMP for the short term. Instead, for the short term low-cost measures are suggested in the RPMP:

- start implementing a bicycle network by signposting and marking the routes;
- stimulate companies to establish rental and guarded parking facilities, e.g. next to Zemitani station, Central station and the old town;
- upgrade existing river and railway crossings and access roads with proper marking, lighting, lowering high curb stones at the end of walkways etc. Since for NMT there should be as many routes as possible, all crossings need to be reviewed;
- start a marketing campaign, involving important stakeholders like libraries, sports facilities, city council, schools, major companies, to discuss options to get more employees and pupils/students on the bicycle. Recent campaigns by CSDD can be used as example;
- when conducting road maintenance and major road works, e.g. eliminating black spots, include the bicycle in the plans.

Figure 5.10 provides an overview of measures for NMT. On the medium term some new links will be established, like a proper railway crossing at Zemitani, also avoiding pedestrians and cyclists to cross the railways at ground level. Also, the border zone around the old town will be further developed to promote cycling and walking. Currently, the river boulevard is not well connected to the city centre, with only two guarded crossings in place. In the case of a closure of 11 novembra krastmala, NMT should play a major role in reconstruction plans. An important missing link is the connection between the Central station/market and the river side. If the river side is going to be developed, such a connection will become imperative.

An important part of the NMT network is the connection between Zemitani railway station and the old town, and further over Akmens bridge. This route will be established by reconstructing Terbatas iela, K. Barona iela and Akmens bridge as 'PT/NMT only'[16]. Around the old town some free-of-charge, guarded parking facilities will be installed, and at Zemitani station there will be a park+bike facility. The figure suggests that the number of NMT routes is limited and north-south routes are lacking. This is not the case. In fact, all non-major roads in the city centre are part of the network, especially when the traffic calming is implemented and traffic safety is reassured. For stimulating the usage of certain links, signposting and marking is needed instead of expensive NMT facilities. Along major roads in the city centre, like the city centre ring and K. Valdemara iela, special attention has to be given to (informal) pedestrian crossings. Just as in the case of Pieriga an inventory study will be conducted to work out where measures such as fences and refuge areas are needed.

figure 5.10. Measures for NMT on the medium and long term



5.6.3. Traffic management and control

In the existing situation there are all kinds of local optimisations at many intersections to achieve a maximum throughput capacity. Examples are the temporary left turn prohibitions at e.g. the Valdemara iela and Brivibas iela. But also e.g. the green wave on the Valdemara iela at the right bank of the Daugava River. Furthermore, there have been experiments with traffic information services by private companies e.g. the travel time information on the internet. Latvian State Roads has developed a Traffic Information Centre to provide society with relevant road condition information. In other words, several initiatives have already been taken to implement traffic management measures.

[16] NMT/PT only in the context of Terbatas and K. Barona iela does not mean that cars are not allowed. It is possible to drive on sections between two intersection, but driving further is prohibited (see the corresponding fact sheet).

It is suggested that, due to rapid developments in communications and IT-systems, it could be that most communication between 'roadside' and 'motorists' or travellers will be by smart phones or Personal Digital Assistants (PDAs), with applications for navigation, travel planning, incident information, actual travel times etc. The trend which is visible in Europe is that these developments are done by private companies as selling point for their smart phones. The role for the government is to provide already available data to these companies.

Related to the actual traffic and transport network there are no locations available on which variable message signs can be used to prevent or substantially reduce traffic overload. Minor benefits by slightly reducing queues can not be recognized by the public and will not bring any refunds to authorities (in comparison: even minor bus priority can reduce costs of exploitation). Therefore the installation of roadside VMS systems is not included in the RPMP. However it is advised to purchase mobile variable message signs for informing and diverting traffic e.g. in case of an emergency or large event.

For the RPMP period till 2025 there are a couple of additional traffic management measures proposed:
- implementation of public transport priority at public transport axes to improve travel speed which leads to a reduction of exploitation costs and increase attractiveness for travellers;
- implementation of adaptive traffic control in stead of fixed time control to improve flexibility;
- setting the basis for a traffic monitoring system.

Setting up a central network control system is considered as useful, but possible effects must not be overrated as recent examples in for example Vilnius show. Newly installed intelligent transport systems tend to show a lot of profit mainly due to the update of the transport system and only partly from the system itself. The main profit of a central control system will be in later years because it will automatically update the traffic control system based on actual vehicle counts instead of the current situation with manual local optimizations. The current situation in Riga is a network with a few isolated very severe problem locations and in the rest of the network sufficient capacity. Next to that traffic control on intersections is almost everywhere where profitable simplified by small measures like prohibited left turns, exit bans etc. Considering this situation, it is expected a central control system can raise the capacity a bit on the major problem locations. With basic measures as public transport priority and local adaptive traffic control there can be made a progress already. Next to this, the necessary vehicle detection system for adaptive control sets the basis for a central traffic control and monitoring system. In renewal of traffic light controllers, hardware preparations for including the traffic light controller into the central control system must be demanded for the suppliers.

5.6.4. Parking policy

Parking policy is supportive to the street network and can be a powerful instrument to reduce traffic flows by influencing modality choices of travellers. In the planning horizon of the RPMP a growth of car ownership is foreseen in 2025 of nearly 60 % compared to 2007. This will increase the demand for parking places in Riga and Pieriga as well. Without a proper parking policy, this will most probably lead to parking problems in the future and/or an uncontrolled growth of private initiatives to open parking lots at several locations.

In general, parking policy is a task of the local municipalities. They need to act as regulating authority not only for existing city centres, but also for developments in e.g. city boundaries as well as at rural areas. The main reason for this is that the local municipality is held responsible by the public for providing enough parking places, but also to ensure an uninterrupted traffic flow. Given the knowledge that a short term parking place at a city centre (or shopping mall etc.) can generate up to 6-10 passenger car trips per day, it becomes clear the location of parking places interacts with the traffic flow and traffic volume at streets leading towards the parking place. Therefore parking policy is not only dealing with providing enough parking places, but also supporting the proposed use of the street network and the usage of public transport.

Municipality of Riga

Today's situation in Riga is a combination of on-street paid parking in the city centre and off-street parking lots or garages which are mostly privately owned. With the rapid increase of car ownership and usage, this has led to a rapid growth of private initiatives to develop parking lots since there is a market for providing parking places (see example pictures below). Although this has most certainly been a good short term solution for the municipality of Riga, the downside is an uncontrolled and fragmented network of parking places all over the city and extra traffic at e.g. the old town due to 'temporary' parking lots which have been opened there.

In order to cope with future demands for parking places there is need to control the development of parking lots in the city centre so that a further fragmentation will be stopped. On-street parking needs to be restricted. New developments should be served as much as possible with a limited number of off-street parking places based on the construction regulations. Therefore the main objective for the parking policy in Riga is:
'To provide a well balanced (paid) parking supply for visitors, inhabitants and workers by means of shifting from on-street parking places to off-street parking places in parking garages, extra parking places should be located outside the city centre by means of e.g. Park and Ride'.

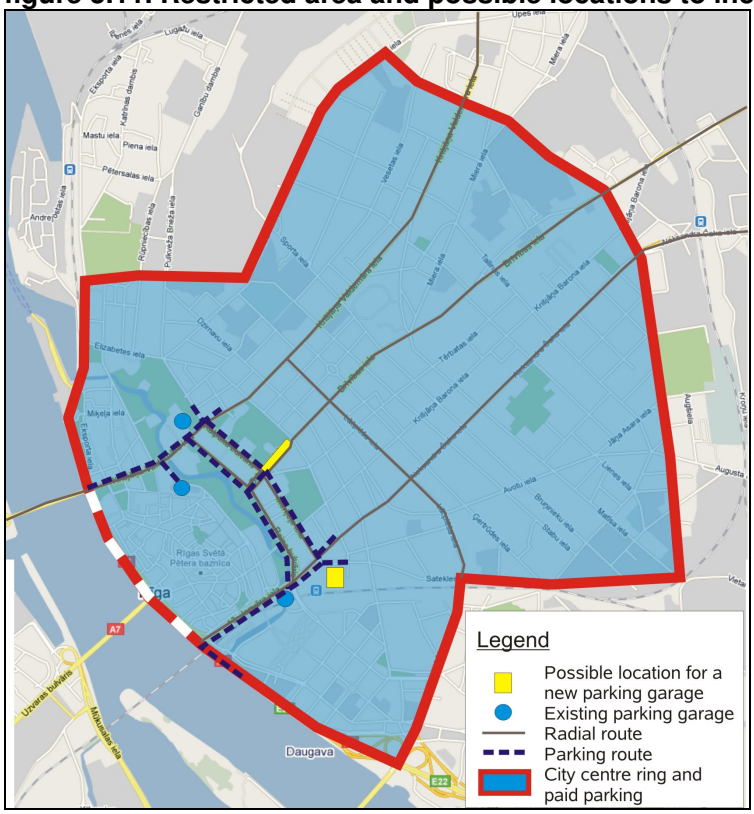
Increase of parking places in the city centre should be limited or better avoided. Apart from the policy concerning development of public parking places, a dialogue with relevant employers has to be started to persuade employers to implement mobility management measures such as:
- providing parking places at their own property for car-poolers;
- sponsored Park and Ride tickets;
- (financial) promotion of the use of public transport.

Another way to provide sufficient parking facilities is by opening private parking space for the public at office buildings in the evening and/or weekends when the offices are closed. In Western Europe there are examples around stadiums or concert halls where surrounding closed private parking lots are opened for the public for paid parking during concerts or sport matches.

In order to achieve the main objective, paid parking in the city centre as it exists at present day needs to be expanded to the city centre ring as well. A trigger for installing paid parking or raising tariffs is an average occupancy rate of 85 % at working days. Bandwidths in parking tariffs following the on-street tariff will be set for commercial parking operators to prevent from undermining the parking policy for a specific location or area. In the city centre the increase of parking places has to be restricted to parking places at new developments and municipal approved or initiated construction of new parking lots/garages. These new parking lots or garages are mainly planned to free up the adjacent streets from parked cars and to store them in an underground parking garage. Therefore, opening possible locations with new parking places might be:
- parking garage at the Brivibas iela located near the Russian orthodox cathedral using the space made available by installing one way traffic at the Brivibas iela. The main objective for this garage is to remove on-street parking at the Merkela iela, Kalpaka bulvaris and the Raina bulvaris and to add some extra parking spaces for nearby living residents and workers. An estimated 250 places per layer can be built here. One layer seems to be sufficient for removing the on-street parking at e.g. the Raina bulvaris, Kalpaka bulvaris and Merkeja iela;
- parking garage in combination with new developments next to the central station. An estimated 200 places per underground layer can be built here.

The restricted area, existing and possible locations for new parking garages together with a parking route for signposting are indicated on the map in figure 5.11.

figure 5.11. Restricted area and possible locations to increase the amount of parking places



Park and Ride

Before elaborating on P+R systems in Riga the overall strategy is explained. In line with the transition to sustainable mobility the first aim is to stimulate the inhabitants of Pieriga to use public transport when coming to Riga. If public transport is not competitive for their trip, the aim is collect the travellers at P+R systems at stations in Pieriga, after which trips are continued with public transport. The remaining car travellers from Pieriga can be accommodated at P+R facilities outside the city centre of Riga. The locations are planned upstream of the bottlenecks where the congestion into the city centre starts. At these locations it is attractive to switch from car to public transport. A total of four Park and Ride locations with in total 1,750 - 2,000 parking places is recommended as a start:

- Alfa (500 parking places): near the terminal Smerlis (trolleybus lines) and a tramway stop of the new tramline Jugla – Central Station (future extension to the Airport);
- Dole (near Rasa's iela): (500 parking places) at small extension of tramline 7;
- Dreilini (250 parking places, extendable until 500): near Saharova iela;
- Spice (500 parking places): after realisation of the new tramline to Riga Airport, on the longer term a larger P+R can be built near the planned Exhibition Centre that will be realised in cooperation with the Frankfurter Messe;

The proposed amount of parking places for Park and Ride locations is based on lessons learned from examples in Europe. Unfortunately there is no formula the calculate the number of parking places based on e.g. the amount of passenger cars passing by the Park and Ride. This depends on a number of criteria such as the location of the Park and Ride, benefits for the traveller, pricing, marketing of the system. Lessons learned that it's better to start small and expand when proven succesful. A good marketing strategy and pricing policy from the very first start is crucial for success. Some cities like Amsterdam choose for a few Park and Ride locations and let them grow, where others like Paris or Munich choose to develop a dense network of relatively small Park and Rides. Both examples started small and expanded afterwards.

After proven to be successful, the Park and Ride locations can be expanded in the longer term at e.g. Rumbula (south-east), Brivibas gatve near Jugla (east), Mangali train station (north) and Sosciems (south-west). In figure 5.12 the Park and Ride locations are visualised. Several P+R locations are planned at larger shoppings malls. Design and implementation should be done in cooperation with the shopping malls. The proposed number of places is additional to the already existing places. It is recommended to start without parking fees. In the future it might be possible to introduce parking fees, however, these should be considerably lower than the parking fees in the city centre to keep the P+R facility attractive.

The main target groups for Park and Ride are workers and visitors/tourists from outside Riga travelling by car. Since the P+R locations are situated within free parking zones, the best option is to provide free parking at the P+R location. Specific public transport ticket fees for daily workers and a special arrangement for visitors/tourists coming with more than one person in a car should be developed to make the P+R attractive for the public. This strategy should be further developed in the first project implementation period. RCC should take the lead since it is part of the municipal strategy to control traffic flows in the city.

figure 5.12. Short/Medium term Park and Ride locations and long term Park and Ride locations

Pieriga municipalities

Also in Pieriga, parking policy is a local responsibility and should include requirements for creating the appropriate amount of parking places in their building regulations, if this is not already the case at present day. For Pieriga municipalities the trigger of occupancy rates of 85 % or higher to expand the amount of parking places, and start implementing paid parking or raising of parking tariffs should be applied as well. In this plan the creation of so called origin Park and Ride locations at many train stations in Pieriga is included.

5.6.5. Road pricing

From a network perspective, a road pricing scheme is feasible (road pricing in this context can be either on streets and/or roads). The basic measures for the RPMP include a package with public transport measures, including P+R facilities and improvement of infrastructure for transit traffic. This package gives car drivers a better alternative, but is not available at this moment. If a road pricing scheme is combined with new infrastructure for cars and trucks, it is more accepted than as a solo measure.

It is a possibility to implement road pricing or toll on the central bridges to push traffic to the outer crossings (NTC and Southern bridge) and the ring. This system can be combined or replaced with area licensing or electronic cordon based pricing, with which the cordon could lie on the inside of the city centre ring. A combination will avoid internal car traffic using the freed capacity. Moreover, it can be combined with the parking system. The cordon based pricing can be seen as an electronic charge for parking. If a car driver decides to park at a municipal parking space, the cordon charge will be reduced from the parking fare. Hence, car drivers who park in the city centre at public space do not pay anything extra. Transit traffic, on the other hand, does not get parking charges reimbursed, and therefore pays for passing through the city centre. The same might apply to car drivers parking at private parking lots. Exemptions are necessary for dwellers, companies, subscription holders parking garages and possibly distribution traffic.

Further traffic calming and environmental benefits can be established by introducing a distance or time based pricing, so that drivers tend to drive along the city ring as long as possible before entering the pricing area. This would prevent car traffic within the area on both river banks. On the other hand, it might lead to extra car kilometres, and less reduction of car traffic directed to the centre. In the case of time based pricing the parking system needs to be restructured. The fare will be minimal for ultra short parking and maximal for long stay parking and will be collected electronically, instead of via parking meters. For both distance and time based pricing, a more complicated system needs to be set up, so these options are not considered feasible. Also, facility pricing or tolling the NTC route is not considered to be a good option, since it will divert traffic to centre routes and bridges. Tolling is also not very popular anymore by banks and private investors in infrastructural measures as part of the method of financing, due to the high risks involved in the demand analysis and actual usage of the infrastructure after completion.

The conclusion is that a road pricing scheme could reinforce the street and road hierarchy and raise funds for public transport and infrastructure at the same time. According to the transport planning policies defined in the Spatial Plan of Riga 2006 – 2018 there is an idea that an option for introduction of some kind of road pricing in Riga should be investigated. This idea relates both to an efficient traffic flow management measure, improved air quality, increase of the city centre's attractiveness and generation of extra financial resources (e.g. an infrastructure development fund) for financing several infrastructural measures. Since the alternatives for car users in both upgrading public transport and provision of alternative routes with enough capacity are not ready at a short notice, introduction of a congestion pricing (or similar) scheme is questionable. The effects on economical development/restoration of Riga and Pieriga and impact on the existing public transport and road network need to be studied before a decision how and when to implement road pricing can be made.

5.7. Additional study projects

During the development period of the RPMP two additional studies were carried out:

- 'Development of infrastructure on Krievu sala for relocation of port activities out of the city centre, Assessment of impact on mobility';
- 'Development of Airport Infrastructure of Airport Riga, Assessment of impact on Mobility'.

conclusions Krievu sala port development
In the first project implementation period (till 2020) only alternative B of the Krievu sala port development project will be implemented. Alternative B consists of dry bulk handling only which is for 99 % - 100 % done by rail. The least expensive is to use the existing railway bridge in Riga for transportation of the dry-bulk from Russia. Analysis of the bridge throughput capacity indicated there will be no problems to be expected. However, due to the relocation of the port activities, other residential areas are affected by the hindrance of dry-bulk train-transport. This asks for development of a railway circle outside the residential areas in Riga, but has to be seen as long term development and certainly not necessary for the Krievu sala developments alone.

Since handling of dry-bulk is mainly done by rail, there is very little effect on the road network leading towards Krievu sala. Due to autonomous developments and the existing street network, the Daugavgrivas iela connection to Krievu sala will be overloaded in the southern direction. In the RPMP the improvement of the connection Daugavgrivas iela - K. Valdemara iela is included as measure.

After recovery of the economic situation to the levels of 2007 (before the economic crisis), alternative C which consists of adding general cargo to the location is considered to be implemented. This is not part of the RPMP. General cargo is transported mostly by road. The forecasted increase of trucks, in case of alternative C is 500 per day. This traffic is affected by the autonomous problems on the Daugavgrivas iela in the southern direction as well and will benefit from the reconstruction measures as described before.

conclusions airport infrastructure development project
This project consists of a set of measures to improve airside operations at the Riga International Airport such as renewal of runway pavements, aprons, updating to CAT II lighting system for Runway 18, construction of additional taxiways etc. The main purpose of the project is to improve airport safety, operations and environmental impact of the airport. Based on forecasts given in the feasibility study of the project, it will allow Riga International Airport to grow to 6.1 million passengers per year.

In demand forecasts made by the airport it is expected that growth mainly consists of transit passengers. Similar effects have been seen in recent years. As worst-case a scenario of 100 % growth by Origin-Destination passengers has been analysed as well (the airport expects 50 % increases in origin-destination traffic). Model calculations indicate that both scenarios (also the worst case scenario) have limited effect on the Riga and Pieriga daily traffic situation. Most problems in 2025 are due to autonomous developments of which this project has a limited share. For the airport, the passenger increase could result in the need to expand the terminal capacity. This capacity could be necessary to enable the airport to function as a hub in the Baltic region.

6. STRATEGIC ENVIRONMENTAL ANALYSIS OF THE RPMP

6.1. Introduction

Pursuant to the SEA European Directive[17] as well as to the corresponding Latvian legislation (law 'On Environmental Impact Assessment' and MC Regulation 'Procedures for Strategic Environmental Impact Assessment (SEA)', the objective of the SEA is to show the impacts and to present the guidelines for the elaboration of EIA for the projects which are planned in the given area. By its concept, and also its context, landscape enables the monitoring of cumulative impacts of infrastructure systems. By its passage through the landscape, a road directly changes the landscape factors (climate, soil, surface and underground waters, vegetation and animals), and in this way also influences the different land uses, such as residence, agriculture, forestry, nature protection, water. The impacts of roads on landscape are divided into primary and secondary impacts. Primary impacts are the consequences of road construction (occupation of space, cutting of the existing natural linkage systems, as well as land uses, storage of materials, changes in morphology, spoiling the landscape appearance), and road utilisation. The secondary impacts are the consequences of the 'opening of the landscape', which changes the economic development, intensity and direction of the future construction, with the new consequences in the landscape structure and function. Some of the possible types and intensities of environmental impacts are presented in table 6.1.

For the RPMP, the following should be realised:
- project alternatives are developed to a detail that they can be qualitatively compared (and to a lesser extend quantitatively);
- the alternatives consists of a bundle of individual projects, to be evaluated on their individual merits.

As a consequence of this, the methodology for the SEA needs to be customised for this specific circumstance. The most obvious strategy for this is to include environmental issues into the CBA model. By allocating budget for environmental investments related to the infrastructure development, it can be assured that the environment will be probably addressed. The exact (amount of) measures strongly depend on the (more) detailed design of the individual projects, which will take place in a later stage, when also the EIA procedures are carried out[18]. It should be emphasised that the purpose of the EIA procedures should be to identify full alternatives (including the environmentally friendliest option) per project.

In order to give input to the CBA model, the following activities have been performed:
- the CBA Model takes costs into account for the main environmental impacts related to the project developments;
- for each project development with a significant environmental impact, project fiches are prepared containing relevant environmental information:
  - screening against annex I and annex II of the EIA Directive and Latvian law 'On Environmental Impact Assessment';
  - overview of qualitative environmental impacts;
  - influences on nearby special locations.

The methodology used to incorporate costs related to environmental impacts is described in appendix II. The template for the project fiche is presented in table 6.1.

[17] European Directive 2001/42/EC.

[18] For 4 road projects in Riga and Pieriga projects the EIA procedure is already performed, for 1 road project in Riga is under implementation.

table 6.1. Template for environmental project fiche

project name:		
sector:	roads/rail/public transport/other	
screening		**motivation**
annex I or annex II	annex I / annex II / neither	
environmental impacts		**motivation**
flora	positive/negative/no	
fauna	positive/negative/no	
air pollution	positive/negative/no	
climate change	positive/negative/no	
noise pollution	positive/negative/no	
water pollution	positive/negative/no	
soil pollution	positive/negative/no	
waste production	positive/negative/no	
incident risk	positive/negative/no	
influence on nearby		**motivation**
urban areas	YES/NO	
Ramsar sites	YES/NO	
Natura 2000 sites	YES/NO	
national parks	YES/NO	
nature parks	YES/NO	
cultural heritage	YES/NO	

6.2. Preliminary screening

This chapter includes the preliminary screening of RPMP proposed projects, having no details on the projects.

6.2.1. Roads developments

Table 6.2 summarised the 23 road projects that are covered by the RPMP.

table 6.2. Overview of road development projects

number	description	type	screening
1	Northern Transport Corridor (NTC)	new construction	annex I
2	Hanzas Bridge	new construction	annex I
3	E22: Section (re)construction Riga by-pass - Koknese	reconstruction/new construction (upgrade)	annex I
4	E67/A7 Construction of a bypass in the A7 around Kekava	new construction	annex I
5	E67/A4 Reconstruction of Riga bypass section between A2 and A6	reconstruction	annex I
6	reconstruction of E77/A2 section between Riga bypass and Senite	reconstruction	annex I
7	Construction of a connection between the A7 and A8 (3rd stage Southern Bridge)	new construction	annex II
8	bypass for Valmieras iela in city Centre Ring between Pernavas and Satekles iela	new construction	annex II
9	Western Arterial: connection Kurzemes Prospekts –Jurkalnes iela including tunnel	new construction	annex II
10	connection of Deglava iela and eastern magistral	new construction	annex II
11	finalizing A7 connection to Southern Bridge (2nd stage Southern bridge)	new construction	annex II
12	reconstruction of Ranka Dambis –Mukusalas iela including a tunnel under the railway track	new construction	annex II

number	description	type	screening
13	reconstruction connection to Vansu Bridge	reconstruction	neither of the two annexes
14	reconstruction of city ring where necessary	reconstruction	neither of the two annexes
15	reconstruction of A.Caka street to one way into the city centre	reconstruction	neither of the two annexes
16	reconstruction Brivibas gatve to one way out of the city centre	reconstruction	neither of the two annexes
17	reconstruction of Terbatas iela and K.Barona iela to NMT/PT only	reconstruction	neither of the two annexes
18	connection innercity ring to City Centre Riga by means of upgrade of Vietalvas iela between Pernavas iela and Satekles iela	reconstruction	neither of the two annexes
19	reconstruction Daugavgrivas iela north of Valdemara iela including connection to Valdemara iela	reconstruction	neither of the two annexes
20	downgrading of Akmens Bridge	others	neither of the two annexes
21	traffic calming city centre	others	neither of the two annexes
22	traffic management upgrade	others	neither of the two annexes
23	additional budget for traffic safety measures	others	neither of the two annexes

The four new construction projects (1-4) fall under annex I of the EIA Directive and the law 'On Environmental Impact Assessment. For these projects, full EIAs according to EU and Latvian procedures should be performed (two EIA Report have been already prepared and one is under preparation).

The other six new construction projects (7-12) are listed under annex II of the EIA Directive and the law 'On Environmental Impact Assessment'. For these projects the screening procedure should be performed to assess the need for full EIAs.

The two reconstructions projects (5 and 6) in Pieriga (E67/A4 Reconstruction of Riga bypass section between A2 and A6 and Reconstruction of E77/A2 section between Riga bypass and Senite) fall under annex I of the EIA Directive and the law 'On Environmental Impact Assessment'. For these projects EIA Reports have been already prepared. The other seven reconstructions (13 -19) and four other projects (20-23) are not listed as annex I or II of the EIA Directive and the law 'On Environmental Impact Assessment'.

The environmental fiches for the road projects falling under annex I of the EIA Directive and law 'On Environmental Impact Assessment' are presented in appendix IV. An overview of their influence areas is presented in table 6.3.

table 6.3. Influence areas of road development projects

Project	urban areas	Ramsar sites	Natura 2000	national parks	nature parks	cultural heritage
Northern Transport Corridor (NTC)	X		X			X
Hanzas Bridge	X					X
E22: Section (re)construction Riga by-pass - Koknese	X					X
E67/A7 Construction of a bypass in the A7 around Kekava	X					
E67/A4 Reconstruction of Riga bypass section between A2 and A6	X					
Reconstruction of E77/A2 section between Riga bypass and Senite	X		X			

The impact of the roads in general and with specific attention for these special areas should be/are carefully examined during the EIA and the results should be incorporated in the design of the road. Special attention should be paid in the EIA process for assessing the potential impacts on NATURA

2000 sites and the potential harm to them. With a potential impact on NATURA 2000 sites are linked below mentioned two of the 23 RPMP road projects.

The place foreseen for construction of I stage of Nordic Transport Corridor (NTC) motorway is situated nearby Nature Reserve „Jaunciems" included in Latvian NATURA 2000 list with code LV0524600. The nature reserve area is established for protection of specially protected species, excluding birds, and habitats. For the mentioned project the EIA procedure already is performed (EIA Report is prepared), where possible impact from various alternatives on NATURA 2000 site has been assessed. It is estimated, that all three proposed options for highway construction will not directly affect habitats and protected plant and animal species of the nature reserve "Jaunciems" - NATURA 2000 site.

The RPMP includes the project for reconstruction of E77/A2 road section between Riga bypass and Senite. The road goes through the Nature Reserve „Garkalne forest", that is included in Latvian NATURA 2000 list with code LV0527400. The nature reserve area is established for protection of specially protected species (including birds) and habitats. The significant negative impact from existing road on the in EU Birds Directive Annex I included and in the globally threatened species list included green crow (Coracias garrulus) nesting populations in Nature Reserve "Garkalnes forest" have been recognized already earlier. That is in the form of adult and young birds' mortality, green crow is died in collisions with cars. in some years on the A2 motorway There has been assessed, that so far in some years by bird deaths have been affected at least 10 % of all here nesting green crows' pairs. Construction of a new high-speed motorway through 'Garkalnes Forest' Nature Reserve would be categorically unacceptable, but for road reconstruction it is not possible to assess to what extent it will increase the existing negative environmental impacts. The mitigation and compensation measures have been proposed by EIA for the site.

Attention should be paid to highway runoff (rain) water, which can contaminate nearby surface water and/or groundwater with oil products or other chemicals, particularly in case of traffic accidents. During the winter by the road spreading with salt solution (sodium chloride), is likely to worsen the ecological situation in open surface water bodies. Especially in Riga runoff (rain and thaw) water has to be collected in a closed system with adequate treatment before discharge into the environment.

In general, the development of the road projects will reduce traffic flow in the Riga Historical Centre, and the freight traffic flow trough Riga centre will be eliminated, what will improve air quality, reduce noise levels and improve city environment. Vehicle operating costs will be reduced, including fuel consumption, what will give positive impact to climate changes. Traffic safety will be improved.

In Pieriga, project developments will significantly improve traffic organization, what will enable more effective fuel use and traffic safety, thereby the accident risk and impact on environment will be reduced.

There is a possibility that within the RPMP period the HES dam might no longer be available as river crossing for freight traffic, due to the vulnerable construction. If so, the E67 and E77 routes will be diverted to the Southern Bridge. This can lead to an increase of freight traffic in some populated areas as can be seen in figure 5.9, wherewith the liveability within this route will be decreased, as air pollution and noise levels will be increased.

The construction of a connection between the A7 and A8 is planned for the second implementation period. This connection provides a direct route from the A8 to the Southern bridge, preventing traffic crossing through the residential areas. However without a new A4-A5 connection, what is planned for replacing HES-dam after 2025, the environmental impact from this freight traffic flow could not be avoided.

6.2.2. PT Developments

One of RPMP objectives is develop an efficient, attractive and competitive public transport system, with priority for electric and railway modes. The motivation for this objective is to develop a sustainable system providing good accessibility, limiting traffic hindrance, improving traffic safety and reducing environmental burden of traffic. With the priority for electric modes local environmental impact from the transport can be limited.

RPMP PT development includes rail and other public transport development.

rail developments

Table 6.4 summarises the 9 new rail projects that are covered by the RPMP.

table 6.4. Overview of rail development projects

number	description	type	screening
1	new station at urban development Westbank (replacement of Tornakalns station)	new construction	neither of the two annexes
2	P+R facilities at 50 % of all stations	new construction	neither of the two annexes
3	elimination of speed restrictions on track	improvements	neither of the two annexes
4	repairs, new sleepers and/or ballast, total	improvements	neither of the two annexes
5	upgrade of small stations: platforms of 55 cm, clocks, standardised and improved information, shelters, improve safety of railway crossings to the platforms	upgrade	neither of the two annexes
6	upgrade of lager stations: platforms of 55 cm, clocks, standardised and improved information, shelters, improve safety of railway crossings to the platforms	upgrade	neither of the two annexes
7	upgrade of Riga central station, incl new covered platforms, bicycle facility	upgrade	neither of the two annexes
8	security passenger crossings at stations/stops	upgrade safety	neither of the two annexes
9	increase safety at level crossings	upgrade	neither of the two annexes

The rail development projects are not listed as annex I or II of the EIA Directive (the EC Directive 85/337/EEC as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC) and law “On Environmental Impact Assessment”.

other PT developments

Table 6.5. summarises the 24 PT development projects that are covered by the RPMP.

table 6.5. Overview of PT development projects

number	description	type	screening
1	light rail to the Airport (Tram / Light Rail connection to the airport consisting of shortcut of 0,7 km via Barinu iela, a shortcut of 0,6 km via Maza Nometnu Iela, 5 km of new tracks)	new construction	annex II
2	tram Riga: new track (0,6km) and terminal (4 mln) in Dole at P+R (P+R not included)	new construction	annex II
3	tram Riga: new terminal of tramline 5 at Andrejsala	new construction	neither of the two annexes
4	tram Riga: transfer points to improve interchange facilities between tram, trolley and bus	new construction	neither of the two annexes
5	tram Riga, trolleybus: Park and Ride facilities in Riga at 4 locations, new 1,000 spaces in total, improvement of walkway to stops, information	new construction	annex II
6	trolleybus Riga: extend the trolleybus network from Petersalas iela to Andrejostas iela (Andrejosta)	new construction	neither of the two annexes

number	description	type	screening
7	trolleybus Riga: extend the trolleybus network from Pilsonu Iela (Kliniska Slimnika) to Marupe (Sejas Iela or Brueklenu Iela) (2700 meters) and eliminate diesel buses on the same route	new construction	neither of the two annexes
8	trolleybus Riga: extend the trolleybus network with 1,400 meters from Ziepniekkalns to Ziepniekkalns DP while eliminating dieselbuses on the same route	new construction	neither of the two annexes
9	trolleybus Riga: extension of trolleybus from Sargandauva to Aldaris, including improvement of street, new terminal in Aldaris and at Brasa	new construction	neither of the two annexes
10	trolleybus Riga: changed route for trolleybus line 18 via Dreilini and extended in Mezciems, new terminal	new construction	neither of the two annexes
11	trolleybus Riga: separate line for trolleybus line 18 in Dreilini	new construction	neither of the two annexes
12	bus and trolleybus Riga: separate bus lines, priority measures on new trolleybus lines	new construction	neither of the two annexes
13	regional buses: new bus station in Riga	new construction	neither of the two annexes
14	tram Riga: upgrade the tramway network by renewal of old tracks	reconstruction projects	neither of the two annexes
15	tram Riga: remove old tracks of tramline 2 between Tapesu iela and Lielirbes iela, tramline 5 between Exporta Ilea and Milgravis and tramline 10 between Bisumuiza and Ziepniekalna Iela	reconstruction projects	neither of the two annexes
16	tram Riga: build tramway platforms to obtain easy access to all passengers, especially older, handicapped people and parents with child buggies, be practical: combine this with the introduction of new low floor trams, reconstruction works of roads	reconstruction projects	neither of the two annexes
17	tram Riga: realise attractive shelters providing waiting comfort on 100% of tramway stops towards city centre and 80% in the opposite direction	reconstruction projects	neither of the two annexes
18	tram Riga: install dynamic displays showing actual departure times or waiting times, including hard and software in vehicles	reconstruction projects	neither of the two annexes
19	tram Riga: Central Station - upgrade and rerouting of tramway for a better connection of tram and train (route from Akmens Bridge, 13 Janvara Iela and Marijas Iela and Elisabeth Iela to K. Barona Iela	reconstruction projects	neither of the two annexes
20	tram Riga: reform the Barona Iela into an exclusive tramway domain including high quality pedestrian zone and bicycle lanes	reconstruction projects	neither of the two annexes
21	tram Riga, trolleybus: reconstruction of Gogola Iela with seperate PT lanes, new (trolley)busstops and rerouting of tramline 5	reconstruction projects	neither of the two annexes
22	minibuses: upgrade of busstation at Central Station, removal of minibus stops at Central Tirgus	reconstruction projects	neither of the two annexes
23	bus and trolleybus Riga: create a separate buslane on Brivibas Iela and A. Caka Iela in the opposite direction of the one-way direction of cars	reconstruction projects	neither of the two annexes

Three new infrastructure projects fall under annex II of the EIA Directive and law 'On Environmental Impact Assessment'. For those projects the initial EIA (screening) procedure should be performed. The environmental fiches for these projects are presented in appendix V. An overview of their influence areas is presented in table 6.6.

table 6.6. Influence areas of PT projects

project	urban areas	Ramsar sites	Natura 2000	national parks	nature parks	cultural heritage
tram/ Light Rail to the airport	X					
tram new track and terminal in Dole	X					
P+R facilities in Riga at 4 locations, new 1,000 spaces in total	X					

The planned improvements in Riga and Pieriga public transport network will assure use of trains, trams and trolleybuses (electric vehicles) as *a* ST *backbone*, and hence increase the PT efficiency and ability to compete with cars. In general, increase of using rate in mobility of the public and non-motorized transport gives possibility to reduce the intensity of traffic, wherewith avoiding congestion and reducing noise levels as well as the total fuel (fossil fuel) use and related pollution in the air. It can be significant input for sustainable transport development.

6.3. Comparison of the variants

Appendix II describes the methodology that is used to incorporate environmental costs in the CBA Model the CBA Model the main environmental impacts related to the project developments:

- costs of influence on air pollution;
- costs of influence on noise;
- costs of influence on climate change.

Appendix VI shows data on the reduction of air emissions for Variant A, Variant B and Variant C in comparison with the Reference Variant in 2025, based on the reduction of vehicle kilometres. Table 6.7 presents an overview of this data.

table 6.7. Environmental data per variant in 2025 in comparison with Reference Variant (without RPMP)*

parameter	Variant A	Variant B	Variant C	unit
CO_2	- 4,381	-1,758	-918	ton/year
CO	-136	-74	-57	ton/year
NO_x	-24	-7	0	ton/year
SO_2	-2	-1	0	ton/year
Volatile Organic Hydrocarbons (including benzene)	-28	-15	-11	ton/year
PM	-5	-2	-1	ton/year
costs/benefits for air pollution #	0.3	0.3	0.3	MEuro
costs/benefits for noise pollution #	- 0.4	-0.4	0.0	MEuro
costs/benefits for climate change #	0.1	0.0	-0.2	MEuro

negative figures are costs, positive figures benefits

* Source: calculations by the NEA Transport research and training institute (Netherland), based on the Handbook on Estimation of External Cost in the Transport Sector "ĪMPACT", written by CE Delft, INFRAS, Fraunhofer Geselschaft - ISI, and the University of Gdansk (December 19, 2007), as well as on other various sources.

For the total evaluation of the project, criteria have been defined on which the variants are scored (relative to the reference). The scores are based on expert judgement, but for air pollution and climate changes based on calculation (appendix VI). The results are shown in table 6.8.

table 6.8. Multi criteria analysis

criterion	Variant A	Variant B	Variant C
coherent road and street hierarchy	++	+	0
network robustness	++	+	0
connections of Riga Freeport	++	+	0
connection of Riga airport	++	+	+
accessibility Pieriga	++	+	+
multi modal accessibility	++	++	+
public transport development	++	++	+
congestion reduction	++	++	+
mobility	++	+	0
durability for future developments	++	+	0
concurrence with existing plans	++	0	0
traffic safety	++	+	+
Liveability* in Riga	++	+	+
use of existing infrastructure in Riga	--	-	0
effect on nature and landscape	--	-	-
air pollution	++	+	0
climate change	++	+	0
investment costs	--	-	0
travel time gains	++	+	0
EIRR	++	+	+

++/+: positive compared with reference scenario; 0: no significant difference from reference scenario; --/-: negative compared with reference scenario

* liveability in Riga includes noise and air pollution

6.4. Evaluation

6.4.1. Situation without implementation of the RPMP

air quality

Air quality limit values for NO_2, PM_{10}, $PM_{2.5}$ and benzene are regularly exceeded in Riga, according to monitoring results that available since 2003. To be in compliance with the Regulation 'On air quality' of the Cabinet of Ministers, the Action Program for Air Quality Improvements in Riga 2004-2009 was elaborated and adopted by Riga City Council on 2004. The Program stated that the main source of air pollution in Riga is road transport. As the two priority measures to be implemented was set:

- to set air quality as a mandatory criterion in formulating and evaluating City development plans, as well as planning and optimising traffic organisation in the City;
- a reduction of the total number of vehicles in the historical centre of Riga with about 35 % compared with 2002, at the same time carrying out traffic optimisation.

Unfortunately the implementation of the Action Program for Air Quality Improvements in Riga has not been successful. The number of vehicles has not been decreased in the city centre and the air quality limit values are still exceeded (see also section 3.3.2).

The changes in mobility between 2007 and the reference situation 2025 have been evaluated in case the RPMP is not implemented. The large increase in car ownership (60 %) has large consequences for the use of the road network and public transport. Compared to the base year 2007 the average car traffic volumes increase by more than 50 %, mainly due to increase of car ownership. Without large infrastructural measures the congestion and delays will increase. Freight transport grows with approximately 10 %. Another result of increasing car ownership is the decrease of public transport use. Without extra public transport measures, the number of trips is expected to decrease by approximately 30 %. In general that will lead to increased air pollution including greenhouse gases.

On January 29, 2010 the Ministry of Environment has received the European Commission's formal notice of infringement procedures Nr. 2008/2195 against the Latvian Republic on the fact that in the Riga agglomeration the threshold levels for particles PM_{10} are exceeded in accordance with prescribed levels in Council Directive 1999/30/EC, as well as the limit values for SO_2, NO_x, PM and lead in the air as stated in Council Directive 2008/50/EC on air quality and cleaner air for Europe.

As response to this notice the Riga City Council is obliged to prepare the new Action Program for Air Quality Improvements in Riga before the end of 2010.

Currently Riga City Council is working on the development of a new Action Program for Air Quality Improvements in Riga. It is clear that without implementation of a good mobility plan and solving the auto transport problems it will be not possible to improve air quality in Riga to be in compliance with Latvian legislation as well as EU directive 2008/50/EC on ambient air quality and cleaner air for Europe.

noise
Noise is a significant environmental aspect from traffic. According the first strategic noise map for Riga agglomeration (developed in 2008) about 280,000 inhabitants are living in the noise discomfort zones where noise levels in the night exceed 50 dB (A) (see more in section 3.3.3). The main noise source in Riga is traffic.

To be in compliance with the Cabinet of Ministers Regulations 'Procedures on noise assessment and management' and EC Directive 2002/49/EC relating to the assessment and management of environmental noise currently Riga City Council is working on the development of a Action Program for Noise Reduction in Riga city. RPMP can be helpful for mentioned action plan development and implementation.

Without implementation of the RPMP the noise levels in Riga will increase.

6.4.2. Evaluation of the variants
Table 6.9 ranks the variants for the key environmental parameters.

table 6.9. Ranking of variants

parameter	Reference Variant	Variant A	Variant B	Variant C
air pollution	4	1	2	3
climate change	4	1	2	3
effect on nature and landscape	1	4	3	2
liveability in Riga*	4	1	2	3

ranking from 1(best) to 4 (worst)
*liveability in Riga includes noise and air pollution

Variant A is the best variant for air pollution, climate change and liveability. The difference with the other variants is considerable. The difference between Variant C and the Reference Variant is negligible, due to the small investments that will be done.

As to the effect on nature and landscape, Variant A scores worst, because it includes the large scale infrastructure construction project (NTC).

Overall it can be stated that Variant A is the preferable variant from an environmental point of view. It has the largest investments. However, the investments turn out positive in the cost benefit analysis due to the large benefits of this variant.

6.4.3. Cumulative environmental impacts

Each variant of the RPMP consists of a bundle of projects, each with its environmental impacts. Even if the impacts of all individual projects stay within environmental limits, in theory the situation could occur that threshold values are exceeded due to the accumulation of impacts of more than one project. Specifically this could take place for environmental aspects like:

- air quality;
- noise;
- liveability.

As a matter of fact, cumulative aspects are a central issue for the development of the RPMP in the first place, as in the current situation the main traffic routes cross through Riga city centre and local centres, leading to cumulation of air quality problems, noise levels and liveability. This situation will not substantially change in the reference scenario, with the foreseen projects 'without RPMP'.

As analysed before, variants A, B and C have a positive overall impact on air quality, noise and liveability (see table 6.7 and table 6.9). From this can be derived that the cumulative impacts of the situation with RPMP will be less than without RPMP, with Variant A as the best. The volumes of cars and trucks for Riga and Pieriga in preferred Variant A 2025 are shown in appendix VII.

It is unlikely that the cumulative impacts of the individual projects will lead to new 'hotspots', if the individual projects are designed in line with local, national and international regulations, focussing on minimising the environmental impacts of the activities. This should be further detailed in the design phase of the individual projects (when the EIA report will be made).

However, cumulative impacts will most notably occur at locations where several projects are developed relatively close to each other, and close to domestic areas.

7. OUTLINES OF APPLICABLE MITIGATION MEASURES

To prevent and reduce as fully as possible the significant adverse effect on the environment of implementing the RPMP, mitigation measures have to be included in every planned project EIA and have to be taken into account during project's following stages:

- project designing;
- construction;
- utilisation;
- emergency situations.

Table 7.1 presents the main mitigation measures that can be considered for the relevant environmental aspects.

table 7.1. Mitigation measures for relevant environmental aspects

environmental aspect	possible mitigation measures
noise	- noise-protection plantations, protective walls and banks - noise-muffling windows and walls for nearby houses - road surface with noise-dampening asphalt surfaces - limiting of the speed
air quality	- ensure the smoothness of traffic flow - in case of tunnel construction the special air pollution treatment facilities for air flow from tunnel ventilation system cleaning should be planned - SCR catalyst system for trucks and buses that use diesel, - greening and landscaping - a good system of greenery along the streets may reduce vehicle-related air pollution by 30 % - use of Best Available Technology during construction
water quality	- complete rain water collection and treatment prior to discharge to surface water body - drainage around the proposed area of activity to maintain the existing surface and groundwater runoff
loss of nature	- minimise loss of nature by taking this aspect in thorough consideration during the designing of the project - compensation in cases where loss of nature can not be avoided

Furthermore, emergency response plans should be integrated in the design of the project, in order to minimise the impact of incidents.

8. OUTLINES OF MONITORING PLAN

According to the Regulations of the Cabinet of Ministers No.157 'Procedures for Strategic Environmental Impact Assessment' from 23 March 2004 the implementation of the RPMP should be monitored to prevent and control the likely negative impact on the environment. The law 'On Environmental Impact Assessment' prescribes that the competent authority (the State Environment Bureau) shall determined the time periods in which a developer shall submit a report on the direct or indirect impact on the environment of the implementation of a planning document, also the impact not anticipated in the environmental review, to the competent authority after the approval of the planning document. For monitoring of the planning document implementation, the national statistical data gathered through as well as other information that is available to the developer (e.g. of the Riga City environmental monitoring) can be used.

The State Environmental Monitoring Program, approved by the Environmental Minister Order No.121 on 19 April 2010 'On Environment monitoring program', consists of the following parts:
- air monitoring program;
- water monitoring program;
- soil monitoring program;
- biodiversity monitoring program.

Air quality and noise (aspects with the most significant impact to the environment from traffic) monitoring should be performed. Advisable indicators for air quality monitoring are shown in table 8.1.

table 8.1. Air quality monitoring indicators

indicator	measurement	source
changes in numbers of cars in the Riga centre	number of cars in the Riga Centre per day and night	Riga City Council
freenery and nature areas per inhabitant	greenery and nature areas per inhabitant (m^2)	Riga City Council
implemented P+R	number per year	Riga City Council
development of bikeway	new bikeways km/per year	Riga City Council
existing air quality monitoring stations results	annual measurements	Riga City Council LEGMC*
new implemented air quality monitoring stations results	NO_2, O_3, PM_{10}, $PM_{2,5}$, benzene	
change in number of PT passengers km	bumber of PT passengers km per year	Riga City Council MoT

For noise monitoring the Riga agglomeration Noise Strategic Maps could be used. According the MC regulations 'Order on noise assessment and management' those maps have to be revised at least ones per five years.

Specific monitoring for proposed projects have to be implemented in accordance with performed EIA.

9. CONCLUSIONS

9.1. EIA Screening and Scoping

The RPMP covers many projects, each with a different level of environmental impacts. Most definitely the largest (negative) impacts will come from the road projects. The major 6 (out of 23) road project of the RPMP can be flagged as annex I of the EIA Directive and Latvian law 'On Environmental Impact Assessment' , which means that a full EIA is needed. The other six new construction projects are listed under annex II of the EIA Directive and the law '"On Environmental Impact Assessment'". For these projects the screening procedure should be performed to assess the need for full EIAs. The remaining 11 projects are neither annex I, nor annex II.

The effects of the rail projects will be in general less than those of road projects. The 9 rail projects of the RPMP are not covered by annex I or II of EIA Directive and the law 'On Environmental Impact Assessment'. As to the 24 other PT development projects, three projects are flagged as annex II of the EIA Directive and law 'On Environmental Impact Assessment', which means that after screening could be decided if a full EIA is required or not.

Although there are some annex I projects in the RPMP, this does not necessarily mean that the environmental impacts are only negative. On the contrary is expected that the RPMP releases the pressure on the inner city of Riga and as such will have a positive effect. Nevertheless the individual projects should be carefully developed, properly addressing environmental issues in line with international and national legislation.

The main environmental parameters that are used for the evaluation of the RPMP alternatives are:
- air pollution: emissions of nitrogen oxides, sulphur dioxide, volatile organic hydrocarbons (including benzene), and particulate matter;
- climate change: emissions of CO_2;
- effects on nature and landscape;
- liveability in Riga.

9.2. Evaluation of alternatives

Within the framework of the RPMP, three alternatives are discerned:
- Variant A: sparse, high capacity main road network;
- Variant B: dense main road network;
- Variant C: use of the Southern bridge.

All of these variants have an overall better score than the Reference Variant. Hence, there is no environmental objection against the development of any one of them. However, Variant A scores much better than Variant B, ranked 2nd and Variant C. Variant A is therefore the preferred variant from environmental point of view.

9.3. EIA requirements

In planning and design of infrastructure and in the elaboration of the EIA reports for the individual projects, the following should be taken into account:

- the main approach in the design of transport infrastructure should be based on the positive legal regulations of Latvia and the European Union, addressing nature and environment protection;
- the concrete protection and prevention measures should be applied during the plan realisation;
- road layout should be adapted to topographical conditions, taking into account the border edges, margins, i.e. the delineation lines in the landscape, in order to preserve the landscape character;
- new infrastructure should avoid to a maximum degree protected areas, areas of outstanding importance for biodiversity conservation, ecological important habitats and rare and fragile ecosystems. If any such impact is expected, monitoring of species, communities and habitats during the design, construction and during the period of exploitation of the transport infrastructure, should be the integral part of the project documents.

9.4. Mitigation measures

The analysis is made under the assumption that the works will be executed in line with local, national and international regulations, focussing on minimising the environmental impact of the activities. If not covered already in the scope of work, it is advised to take as many mitigation measures into account as reasonably feasible, in order to achieve an approach as close as possible to the environmentally friendliest alternative. Examples of such measures are given in section 7 of this SEA.

A budget reservation should be made for measures that are not deemed necessary beforehand, but might become required during construction or operation to avoid exceedance of threshold values. Conclusions on the latter could be based on the results of environmental monitoring activities.

9.5. Environmental monitoring

In order to preserve the quality of environment and liveability, in addition to all necessary measurements from the domain of functionality and safety of the projects it is recommended to organise, throughout the operation lifetime, a systematic monitoring of all segments of environment which might become subject to changes possibly beyond reasonable limits, thus deteriorating the quality of environment.

10. REFERENCES

- National Development Plan, 2007-2013;
- Guidelines of transport development, 2007-2013;
- Riga Development plan 2006-2018;
- Spatial plan of Riga 2006-2018, 2005;
- Spatial plan of the Riga region, 2008;
- Spatial plan of the Riga planning region, 2007;
- Riga planning region development program 2005-2011, 2004;
- Spatial plan of the Zemgale planning region 2006-2026, 2007;
- Spatial plan of the Vidzeme planning region 2007-2027, 2007;
- Spatial plan of the Kurzeme planning region 2006-2026, 2005;
- Latvia 2030, Sustainable Development Strategy;
- EU Sustainable Development Strategy;
- Air Quality Annual Report 2008/2009, Latvian Environment, Geology and Meteorology Center (LEGMC).

Internet sources

- Riga City Council Department of Housing and Environment home page http://www.riga.lv/LV/Channels/Riga_Municipality/Executive_authority/Departamenti/Majoklu_vides_Dep/monitorings/default.htm;
- Ministry of Environment home page: www.vidm.gov.lv;
- Latvian Environment, Geology and Meteorology Agency (since 07.07.2009 named as Latvian Environment, Geology and Meteorology Centre) home page: www.lvgma.gov.lv;
- Ministry of Regional Development and Local Government home page: www.raplm.gov.lv.

BIJLAGE I Minutes of meetings

minutes of meeting

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

subject	environmental approach
project	Mobility Plan and Action Program for Riga and Pieriga
report number	SEA-1
date	October 26, 2009
time	11:00-11:45
location	Riga City Council
project code	LET106-1
prepared by	André van Kuijk
date	October 28, 2009

present	Riga City Council Traffic Department	Ms Olita Sproge
	project team	Mr André van Kuijk and Ms Silvija Sile

The project team explains the outlines of the environmental approach to Ms Sproge, who is international project division manager. She indicates that her department does not have ample expertise on environmental issues. She indicates that due to the economic crisis, some major projects are stopped, like:
- Eastern Motorway (by-pass of Riga);
- southern bridge.

These projects are of vital importance for the development of Riga and should be activated as soon as possible. No funding has been found for that yet. Furthermore, Ms Sproge makes the following remarks:
- an air quality improvement plan was developed for Riga some years ago. It was then agreed that traffic in the city of Riga should decrease with 30 % by 2009. However, no proper monitoring of this took place. The TD is supposed to be responsible for this. There were no available technical possibilities to avoid transport through Riga centre, as no additional bridges across the River Daugava were ready;
- the development of Public Transport has priority. Recently, special transport lines have been assigned on roads that can only be used by Public Transport. This system seems to work;
- P+R systems should be developed;
- green waves have been developed on some city corridors;
- Riga is in the process of developing a bicycling network;
- cars are step-by-step discouraged to move in the city centre. On one hand parking is made more and more expensive. On the other hand parking spaces are reduced (e.g. by re-designing the orientation of parking spaces alongside roads from 45 degrees to 0 degrees);
- at some locations, noise fences along roads are built.

The institute can be further involved in the project, e.g. if the Environmental State Bureau of the Ministry of Environment wants to consult them or ask for their opinion on reports.

minutes of meeting

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

subject	environmental approach
project	Mobility Plan and Action Program for Riga and Pieriga
report number	SEA-2
date	October 26, 2009
time	14:00-15:00
location	project office
project code	LET106-1
prepared by	André van Kuijk
date	October 28, 2009

present	Riga City Council, Housing and Environmental Department	Ms Dace Danilane and Mr Miervaldis Lācis
	project team	Mr André van Kuijk and Ms Silvija Sile

The project team explains the outlines of the environmental approach to Ms Danilane, who is air pollution expert and Mr Lācis who is noise expert. Mr Lācis asks if this study is an update from a project that Tebodin Latvia did a decade (or more) ago. The project team is not aware of what project he refers to, so he will check if he can find any details. Ms Danilane explains that the future of this department is very uncertain. Due to the economic crisis, it seems that their budget is lowered dramatically.

Regarding air pollution:

- data on the current situation is available. Riga is divided in 3 pollution zones. The average annual NO_2 concentration can rise up to 57 µg/m^3 (above the limit). For PM10 concentrations are slightly above the maximum value of 40 µg/m^3. For dust, the approach is to clean the streets. For NO_2, the most appropriate measure would be to abandon vehicles from the city, but this will not be feasible, a.o. for political reasons;
- Ms Danilane refers to the Air Quality Program for 2004-2009. The targets have not been achieved and a new program should be made, but has not been done. Instead, the monitoring stations are taken out of order and many experts have left the office;
- the major industrial activities are wood processing, food industry, pharma and boiler houses;
- Mr Van Kuijk indicates that the project will probably more focus on emissions (CO_2 and other combustion related emissions) when evaluating various scenarios. But of course also the creation (and also eliminating) of places where limit values are exceeded will be taken into account.

Regarding noise:

- Mr Lācis show a noise map that was prepared for the region. This is generated from a large database. He indicates that there are many places where limit values are exceeded (especially in downtown Riga) and an Action Plan has to be made. The model can calculate how many people live in noisy areas, and how this will change when new developments are made;
- the norms in Latvia are currently very strict (e.g. 40 dB(A) at night), but will probably be adjusted;
- the model is used by third parties (e.g. consultants) as well;
- outside Riga, the most dominant noise sources are highways, industries, the freeport and railways.

The institute is willing to be of further assistance throughout the project. However, this is at the moment very uncertain due to reasons as mentioned above.

minutes of meeting

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

subject	environmental approach
project	Mobility Plan and Action Program for Riga and Pieriga
report number	SEA-3
date	October 27, 2009
time	10:30-11:30
location	Environmental State Bureau (ESB)
project code	LET106-1
prepared by	André van Kuijk
date	October 28, 2009

present	Ministry of Environment	Mr Arnolds Luksevics
	Environmental State Bureau project team	Mr André van Kuijk and Ms Silvija Sile

The project team explains the outlines of the environmental approach to Mr Luksevics, director of the ESB. Mr Luksevics indicates that he heard through mass media that the project was started, but was not officially informed by MoT. Due to this, he can not give an official opinion on the project. However, he thinks that the project should be subject to SEA and that the aspect of public information should be properly addressed. If MoT informs ESB, ESB will indicate what parties should be informed.

In general, Mr Luksevics agrees with the approach as described by the environmental team. He indicates that there will always be discussion on how far and how deep analysis goes and what the size of the study area is etceteras. But he favours a realistic approach that focuses on the key elements for decision making. This is exactly what is foreseen in the scoping phase of the project.

Regarding approval Mr Luksevics states that this does not need to be complex. When the report is finaled, it should be made available to stakeholders (also public) for comments. The comments need to be addressed, upon which the report can be finalised.

Mr Luksevics indicates that much information will already be available through EIAs that are made for individual projects already in process.

Witteveen Bos | NEA a member of Panteia | HTM Consultancy

KF KONĒZIJAS FONDS

Mobility Plan Riga and Pieriga

minutes of meeting

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

subject	environmental approach
project	Mobility Plan and Action Program for Riga and Pieriga
report number	SEA-4
date	October 27, 2009
time	15:00-15:45
location	Ministry of Transport
project code	LET106-1
prepared by	André van Kuijk
date	October 28, 2009

present	Ministry of Transport	Mr Jolants Austrups and Ms Daiga Dolģe
	project team	Mr André van Kuijk, Ms Silvija Sile and Mr Oskars Zivtiņš

The project team explains the outlines of the environmental approach to Mr Austrups and Ms Daiga Dolģe, of the MoT. The environmental team summarise the meetings they had during the past two days and the general approach for the project. A short discussion takes place on the necessity for a SEA. In principle this is not directly required from the ToR, but it was already envisaged for the proposal and confirmed during the past days that this will be required. The environmental activities have been set up in order to prepare a SEA in conformity with EU regulations. However, it is not foreseen that special Latvian acceptance procedures would be needed. This will further be investigated during phase I of the project. MoT does not object to the approach as presented during the meeting.

MoT is kindly requested to inform ESB on the project, in line with the SEA regulations. Mr Austrups says he did not know this requirement, will study the SEA regulations and then will send out this official information, if deemed required.

As today is the deadline for the submission of Interim Report I, Mr Zivtiņš hand over this document, both as hardcopy as on CD.

Witteveen+Bos NEA a member of Panteia

KF KOHĒZIJAS FONDS Mobility Plan Riga and Pieriga

minutes of meeting

Mobility Plan Riga and Pieriga
Tornu iela 4, III C, office no. 203
Riga, LV-1050
Latvia
Phone: +371 7 223 144
Fax: +371 7 223 830

subject	environmental approach
project	Mobility Plan and Action Program for Riga and Pieriga
report number	SEA-5
date	January 13, 2010
time	15:00-16:00
location	Environmental State Bureau (ESB)
project code	LET106-1
prepared by	André van Kuijk
date	January 14, 2010

preset	State Environmental Bureau	Mr Arnolds Luksevics, Ms Una Zilbere
	project team	Mr André van Kuijk and Ms Silvija Sile

As a follow up of the meeting of October 27, 2009, a second meeting takes place. Mr Arnolds Luksevic (director) introduces Ms Una Zilbere, who is manager of the SEA department of ESB. They confirm that MoT now have officially informed them on the fact that the project is ongoing. Mr Van Kuijk summarises the activities performed and anticipated. He asks for the comments/opinion of ESB.

Mr Luksevic indicates that ESB can only give their opinion at the end of the project. They are not supposed to give comments or direction during the execution of the project, as this leads to commitment to the project which influences their judgment at the end. The responsibility of ESB is to safeguard that the SEA procedure has been followed correctly. As to that, they indicate that stakeholders should be informed. ESB will send a list with stakeholders that should be informed. As to NGOs, Mr Luksevic indicates that in Latvia a Board of NGOs has been established that should be informed. The Board will inform individual NGOs. In this way, no discussion will take place on who to inform and who not. Furthermore he indicates the following regarding approval:

- the final final SEA should be translated in Latvian;
- the final final SEA should be published, e.g. via Internet;
- during 40 days, the public (and other stakeholders) can give their comments;
- the consultant should make the final SEA, taking into account the comments received;
- within 30 days after submission of the final SEA, the ESB will give its opinion on the report.

ESB indicates that the Ministry of Environment is entitled to give their opinion/comments on the content during the execution of the project. As af final remark, ESB indicates that the outlines of an Environmental Monitoring Plan is considered to be an important feature of a SEA.

BIJLAGE II Methodology used to incorporate environmental costs

ENVIRONMENTAL BENEFITS OF REDUCED AIR POLLUTION

The impact of the RPMP on environment is measured by environmental benefits, compared with the environmental burden of the Reference Variant. Air pollution can be considered as the main responsible of environment damage due to transport activities. Various research programmes funded by EU allow elaborating both unit values and emissions for the following set of air pollutants:

- CO_2 Carbon Dioxide (greenhouse gas);
- CO Carbon Monoxide;
- NO_x Nitrogen Oxides (sum of NO and of NO_2);
- SO_x Sulphur Oxides;
- CH_4 Methane;
- VOC Volatile Organic Compounds;
- PM Particulate Matter ($PM_{2.5}$/ PM_{10}).

Pollutant Unit Values

The unit value (EUR/Ton) of all these pollutants, are derived from EU research programmes HEATCO (2006), ExternE (External Costs of Transport in ExternE, 2005), CAFE CBA (2005), VOLY, TREMOVE (2006) and summarised in IMPACT 1 (Handbook on estimation of external cost in the transport sector. 2007). Unit values have been elaborated considering the impacts on health (morbidity and mortality), crops and materials are estimated by applying the exposure-response relationships. These functions relate an increase in pollutant concentration level (exposure) to an anticipated damage or negative effect (response) on a particular receptor (anything which is affected adversely or positively by an increase in air pollution*)* [19].

The Handbook reports the estimated values for 27 EU countries for NO_x, SO_x, VOC and PM $_{2,5/}$ PM_{10} per ton of exhaust. Two average values have been elaborated weighting the country values with both population and GDP. A final average is then calculated averaging the above two averages. All values are in Euro on price level 2000. The resulting values for Latvia are:

- NO_x 1,800 Eur/ton;
- SO_x 1,000 Euro/ton;
- VOC 500 Euro/ton;
- PM_{10} 26,000 Euro/ton (average of 75 % urban and 25 % outside built-up areas).
- $PM_{2.5}$ 65,000 Euro/ton

The values of pollutants causing global warming have been calculated using the methodology illustrated in the handbook:

- for CO_2 the estimates of this value[20] varies from 7 $Euro_{2000}$/ton (lower value for year 2010) to 45 $Euro_{2000}$/ton (upper value for year 2010). In this study a value of 15 $Euro_{2000}$/ton is adopted or 20 $Euro_{2007}$/ton;
- the CH_4 and CO emissions are transformed in CO_2 equivalent greenhouse gas emissions, using the suggested GWP (Global Warming Potential), which is 23 in for CH_4[21] and 5 for CO. This consists of calculating the monetary value multiplying CO_2 value by CH_4 and CO GWP, obtaining:
  - 1,185 $Euro_{2007}$/ton for CH_4;
  - 257 $Euro_{2007}$/ton for CO.

Since consumption factors give an overall value for PM without distinguish between PM_{10} and $PM_{2.5}$ the average value is considered to be 52,500 $Euro_{2000}$/ton (as suggested in several studies).
Table II.1 shows all values of air pollution per ton.

---

19 The European Commission, Research funded in the framework of the Nuclear Energy Programme, External costs of transport in ExternE, 1998, pag.3.

20 See Handbook page 80, tab. 26.

21 See Handbook page 73 note 16.

table II.1. Air pollution costs per ton in transport (all modes) (x EUR 1,-); price level 2000

pollutant	HEATCO Latvia
CO_2	15
CO	200
NO_x	1,800
CH_4	920
VOC road and rail	500
SO_2	1,000
$PM_{2.5}$ road, urban	80,000
$PM_{2.5}$ road, outside urban areas	22,000
PM_{10} road, urban	32,000
PM_{10} road, outside urban areas	9,000
average $PM_{2.5}$ and PM_{10} road, urban and outside urban	50,000
$PM_{2.5}$, rail. urban	3,000
$PM_{2.5}$ rail, rural	2,000

Source: Heatco 2006

On the basis of a vehicle emission factor, the damages costs in table II.1 can be applied to obtain the specific costs per 100 vkm, as shown in table II.2, specified for a number of transport modes and types of infrastructure and recalculated on price level 2010. This table is based on the IMPACT study and on INFRAS-IWW Guide to CBA of investment projects 2006 which contains figures of the 17 EU Member States in 2000. The figures of IMPACT are much lower than the figures of the INFRAS/ IWW Guide. Therefore the consultant made an estimation, based on both sources and taking into account relatively old vehicle fleets.

tabel II.2. Costs of air pollution per 100 vehicle km (x EUR 1,-); price level 2010

	car	medium truck	PT mini-bus	PT bus/coach	PT trolleybus/ tram	passenger train (per 100 train-km)	freight train (per 100 train-km)
average p.100 vkm							
motorways 2 x 2	0.60	4.00	0.90	2.60			
main roads 2 x 2	0.57	3.50	0.82	2.35			
main roads 1 x 2	0.50	3.00	0.70	2.00			
regional roads 1 x 2	0.54	3.30	0.76	2.20			
urban streets	0.45	5.70	1.30	3.80	3.00		
railways						electr.: 9.00 diesel: 40.00	electr.: 25.00 diesel: 110.00

Source: calculation by Witteveen+Bos/NEA, based on various sources

terrain and pavement conditions

HDM software allowed elaborating for each vehicle type, terrain and pavement conditions a set of relationships relating speed (km/h) to fuel consumption (lit/km). The following formula is valid:

$$\mathbf{FC_{ijk} = a_{ijk} + b_{ijk}V + c_{ijk}V^2}$$

where:

- $\mathbf{FC_{ijk}}$ is the fuel consumption of vehicle type **i**, in a road with a type of terrain **j** and with a pavement **k**;
- $\mathbf{a_{ijk}}$, $\mathbf{b_{ijk}}$,$\mathbf{c_{ijk}}$ are the regression coefficients;
- **V** is the link speed.

Because the terrain in Riga and Pieriga is flat and investments in different pavement are not foreseen in the RPMP, the terrain and pavement conditions are not taken into account.

ENVIRONMENTAL BENEFITS OF REDUCED NOISE

Noise can be defined as undesirable sound or sounds of different duration, intensity and other characteristics causing mental disabilities in people. In general 2 kinds of negative impacts of noise in transport can be differentiated:

- irritation costs. these usually result in economic and social costs, such as restrictions on rest activities, discomfort and inconvenience;
- health costs. Transport noise may cause physical injuries of human health, such as hearing disabilities (at levels over 85 dB(A)) and stress, palpitation, high blood tension, hormonal alterations, impaired sleep quality etc. at lower levels of noise (over 60 dB(A)). Health costs include medical costs, costs through lost productivity and higher mortality.

There are three key factors that determine noise costs:

- time of the day: irritations at night are much stronger than during the day; lack of sleep can cause health problems;
- population density near the source of noise;
- existing noise levels: depending on traffic volume, type and speed.

For roads, noise depends on vehicle speed, type (share of trucks), condition, etceteras. The road gradient and surface as well as the manner of driving are also a factor of influence.

For rail, noise emissions depends a.o. on train speed, type of wagons, the state of the surface (of rails and wheels), type of wagons and last but not least maintenance. The type of brakes, train length and availability of sound walls are also of great importance.

In table II.3 the noise emissions costs for 2000, average for EU-17, are based on INFRAS/IWW (2004), IMPACT and Jaspers. The costs are differentiated by type of traffic, place and time of the day. Unfortunately only day and night are included while it is preferred that evening traffic be also considered. The data have been transferred to Latvia for 2000 and then estimated for 2008, taking account of the real GDP growth per capita in the country.

table II.3. Costs of noise per 100 vehicle kilometre (x EUR 1,-)

	car	medium truck	PT mini-bus	PT bus / coach	PT trolleybus / tram	passenger train (per 100 train-km)6	freight train (per 100 train-km)
average p.100 vkm							
motorways 2 x 2	0.11	1.50	0.40	1.00			
main roads 2 x 2	0.10	1.40	0.35	0.90			
main roads 1 x 2	0.09	1.30	0.34	0.85			
regional roads 1 x 2	0.085	1.20	0.32	0.80			
urban streets	0.15	2.00	0.50	1.30	0.90		
railways						electr: 7,00 diesel: 32,00	electr: 19,00 diesel: 86,00

Source: calculation by Witteveen+Bos/NEA, based on various sources

ENVIRONMENTAL BENEFITS OF REDUCED CLIMATE CHANGE

Climate change is caused by global warming due to exhaust of greenhouse gases like carbon dioxide (CO_2), nitric oxide (N_2O) and methane (CH_4). No less significant are the hydro-flour-hydrogen compounds from vehicle air conditioners. Among emissions released by aviation in the highest layers of the atmosphere water steam, sulphates, aerosols and nitric oxides have the highest impact.

The costs of climate change have a high level of complexity in view of the fact that they are long-term, global and very difficult to predict hazards. Therefore it is difficult to estimate transport damages on a national level.

The average price of one ton CO_2 in the second period of the European emissions trade scheme (2008-2012) will be 20-25 Euro/ton. The prices of carbon credits are linked with the goals of the Kyoto Protocol. The latest objectives after the period of the Kyoto Protocol envisage a higher percentage of reduction of the carbon emissions, (20-30 % reduction in 2020 as compared to 1990), resulting in a gradual rise of the price per ton of CO_2 as shown in table II.4.

table II.4. Expected prices per ton of CO_2 (x EUR 1,-)

parameter	2010	2020	2030	2040	2050
Climate change, average	25	40	55	70	85

Source: IMPACT Handbook on estimation of external costs in the transport sector, 2007

Cost estimation per vehicle kilometre (vkm) for a specific type of vehicle and traffic is based on multiplication of vehicle emissions per kilometre and the cost factor for the specific type of emissions. Today the average CO_2 emissions per car in the world are about 200 g/vkm. At a price of 25 Euro/ton CO_2, that makes 0.005 Euro/km. By 2030 these figures will be 120 g/vкm, 55 EUR/tons CO_2, or 0.007 EUR/vkm.

Table II.5 shows a calculation of the costs of climate change per vehicle kilometre, based on IMPACT and on much lower figures of INFRAS.

table II.5. Costs of climate change per 100 vehicle kilometre (x EUR 1,-)

	car	medium truck	PT mini-bus	PT bus / coach	PT trolleybus / tram	passenger train (per train-km)	freight train (per train-km)
average p.100 vkm							
motorways 2 x 2	0.56	3.60	0.75	2.40			
main roads 2 x 2	0.52	3.30	0.69	2.20			
main roads 1 x 2	0.50	3.20	0.65	2.10			
regional roads 1 x 2	0.46	2.90	0.60	1.90			
urban streets	0.82	5.30	1.10	3.50	2.80		
railways						electr: 8.00 diesel: 38.00	electr: 23.00 diesel: 103.00

Source: calculation by Witteveen+Bos/NEA, based on various sources

BIJLAGE III Maps

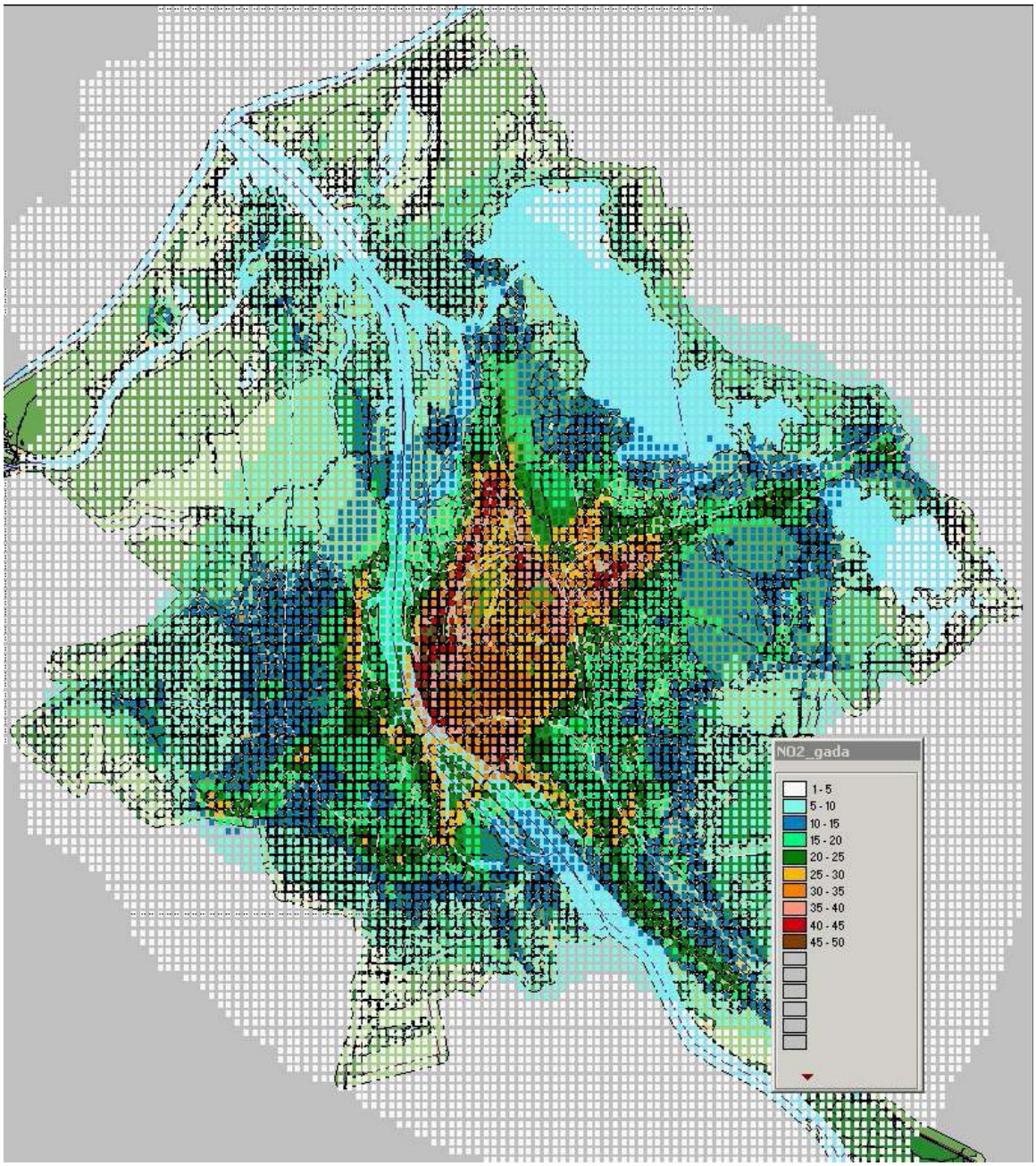
Map 1. Riga planning region – forests and bushes (% from area)

Attēls K5. Meži un krūmāji

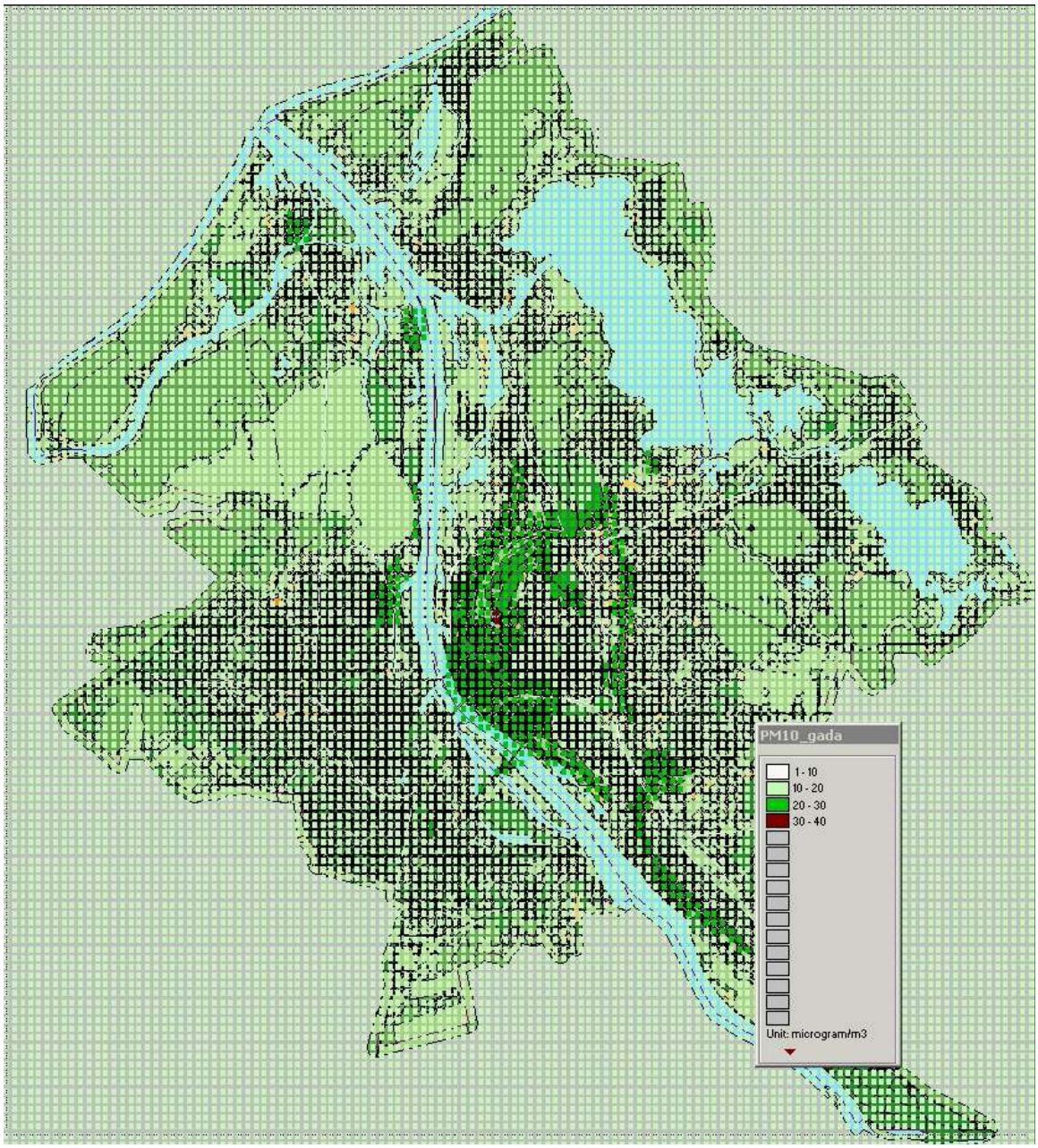
Map 2. Riga planning region - agriculture lands (% from area)

Attēls K7. Lauksaimniecībā izmantojamā zeme

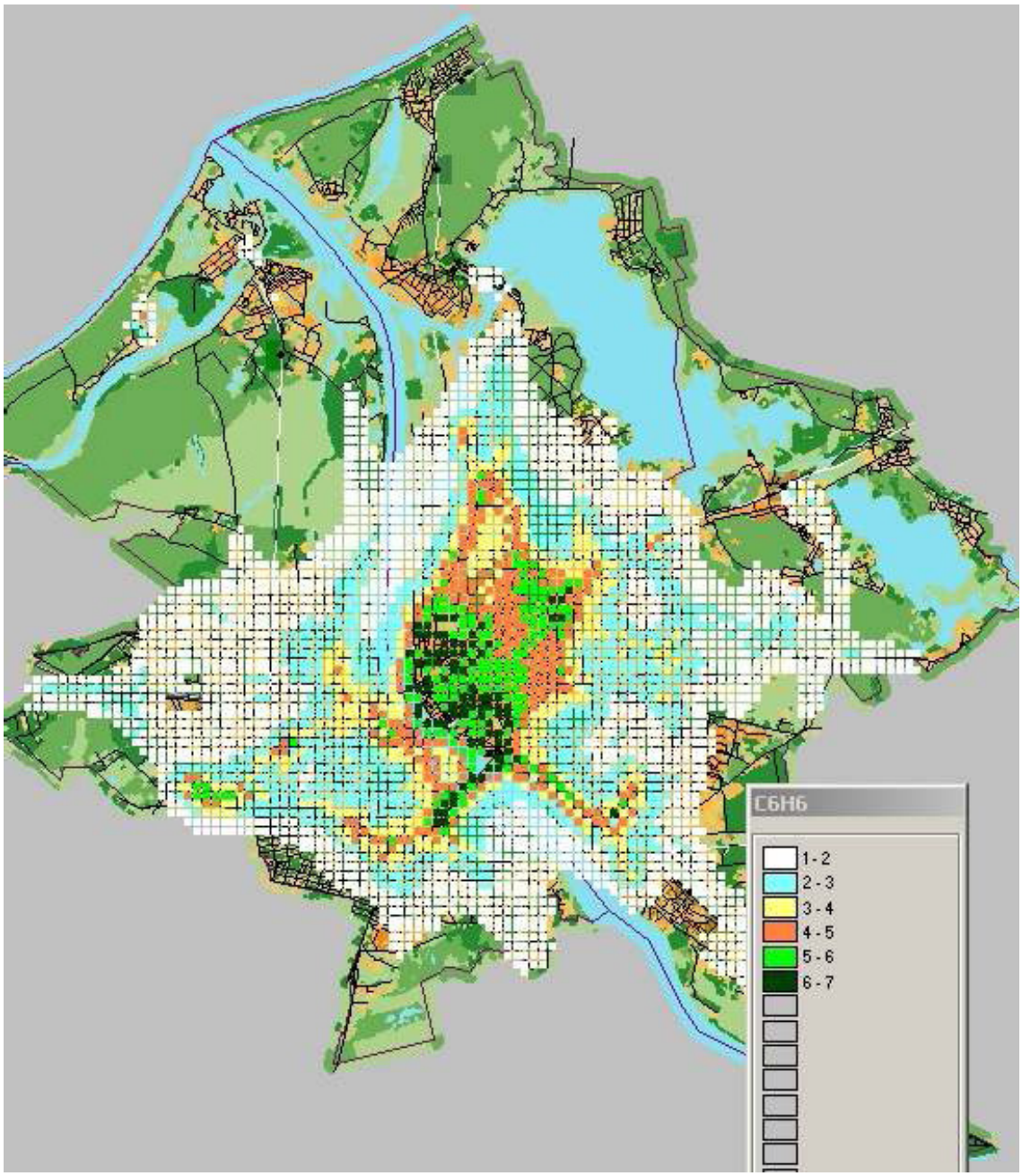
Map 3. Nitrogen dioxide annual average values (2007), Riga [µg/m^3]



Map 4. PM_{10} annual average values (2007), Riga [µg/m^3]



Map 5. Benzene annual average values (2007), Riga [µg/m^3]



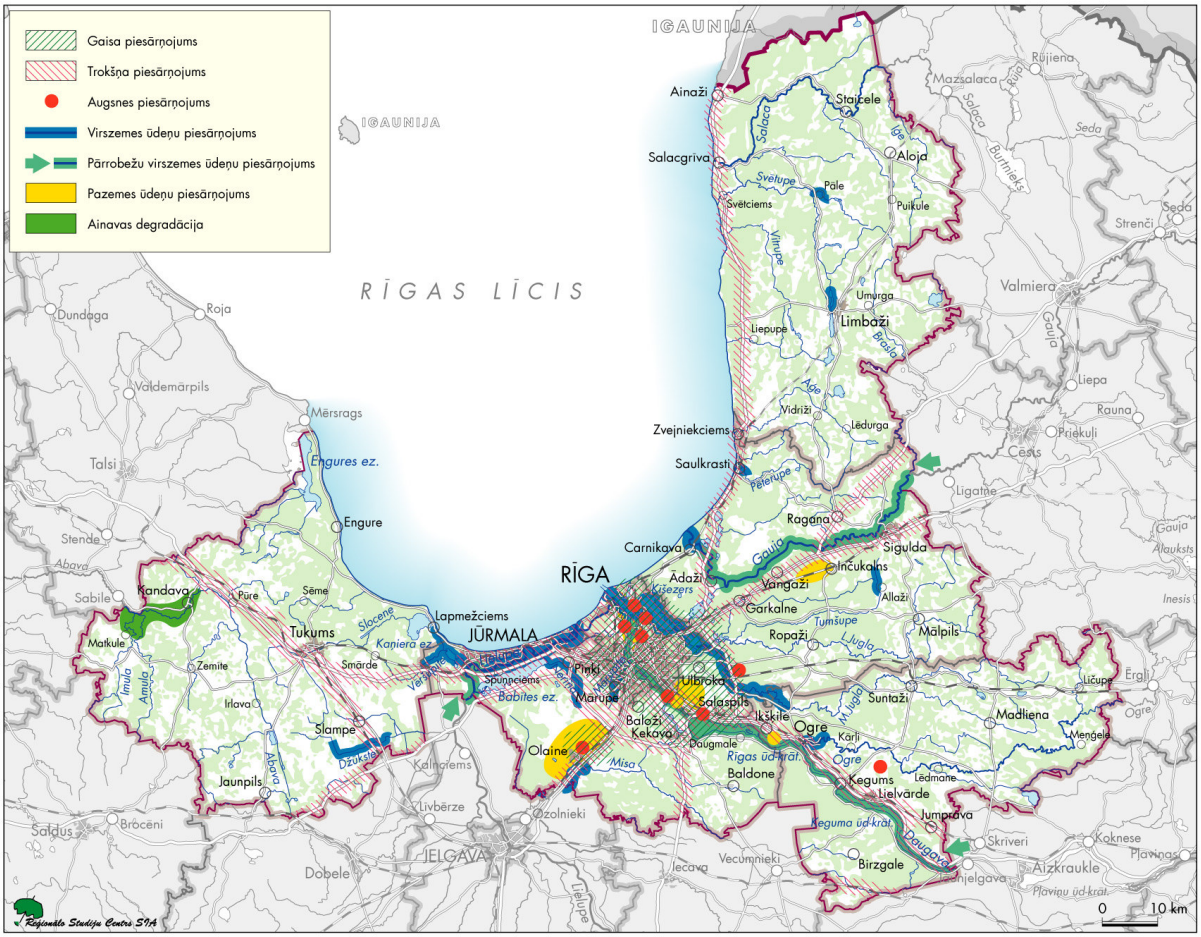
Map 6. Riga planning region - river water quality

Attēls K10. Upju ūdens kvalitāte

Levels of contamination:

- Tīrs līdz vāji piesārņots: clean up low contaminated;
- Vāji piesārņots: low contaminated;
- Vāji piesārņots līdz piesārņots: low contaminated up contaminated;
- Piesārņots: contaminated;
- Stipri piesārņots: heavy contaminated.

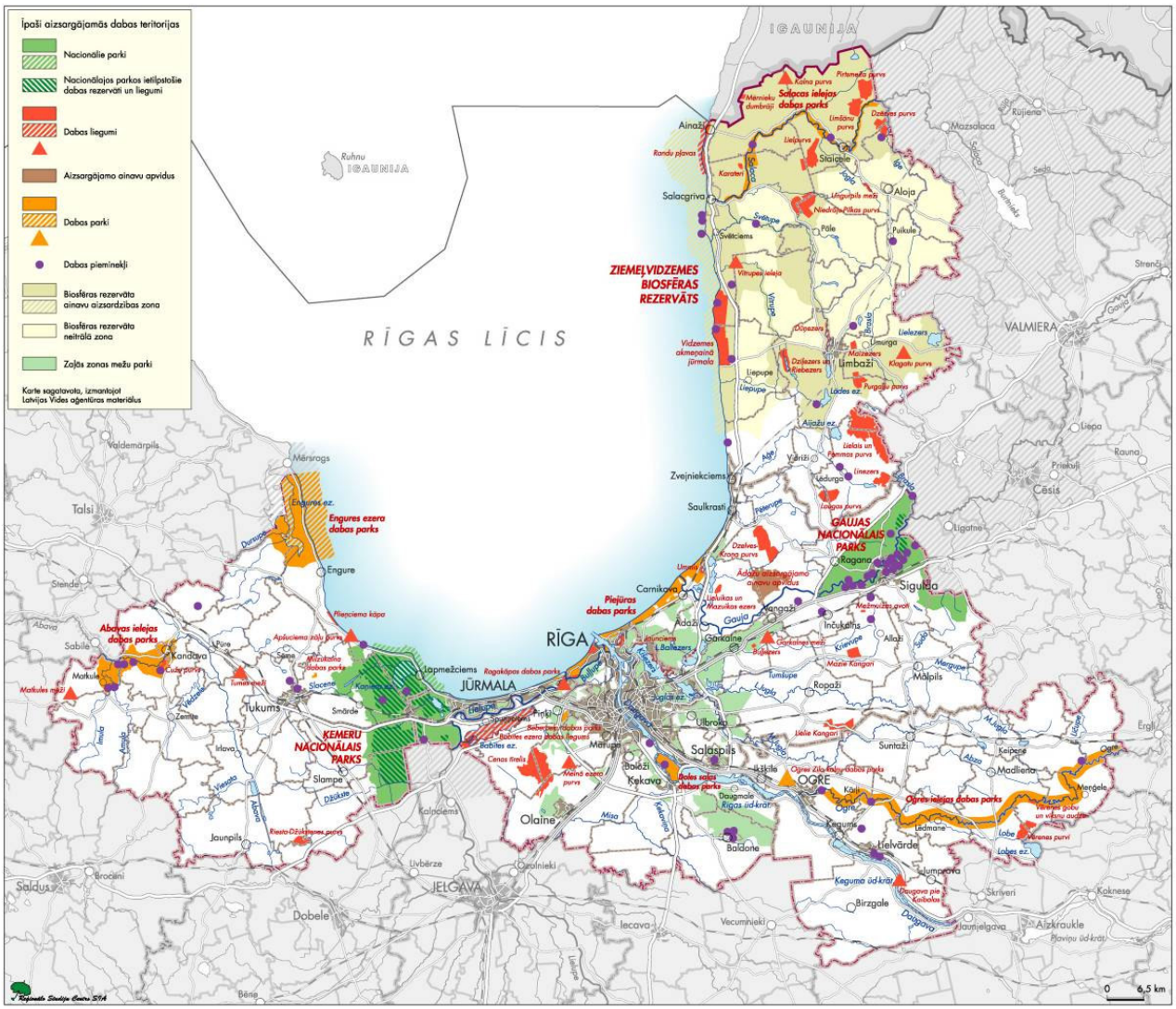
Map 7. Polluted sites and areas in Riga planning region



Attēls K8. Piesārņotās vietas un areāli

- Gaisa piesārņojums: air pollution;
- Trokšņa piesārņojums: noise pollution;
- Augsnes piesārņojums: soil pollution;
- Virszemes ūdeņu piesārņojums: surface water pollution;
- Pārrobežu virszemes ūdeņu piesārņojums: trans-boundary surface water pollution;
- Pazemes ūdeņu piesārņojums: groundwater pollution;
- Ainavas degradācija: landscape degradation.

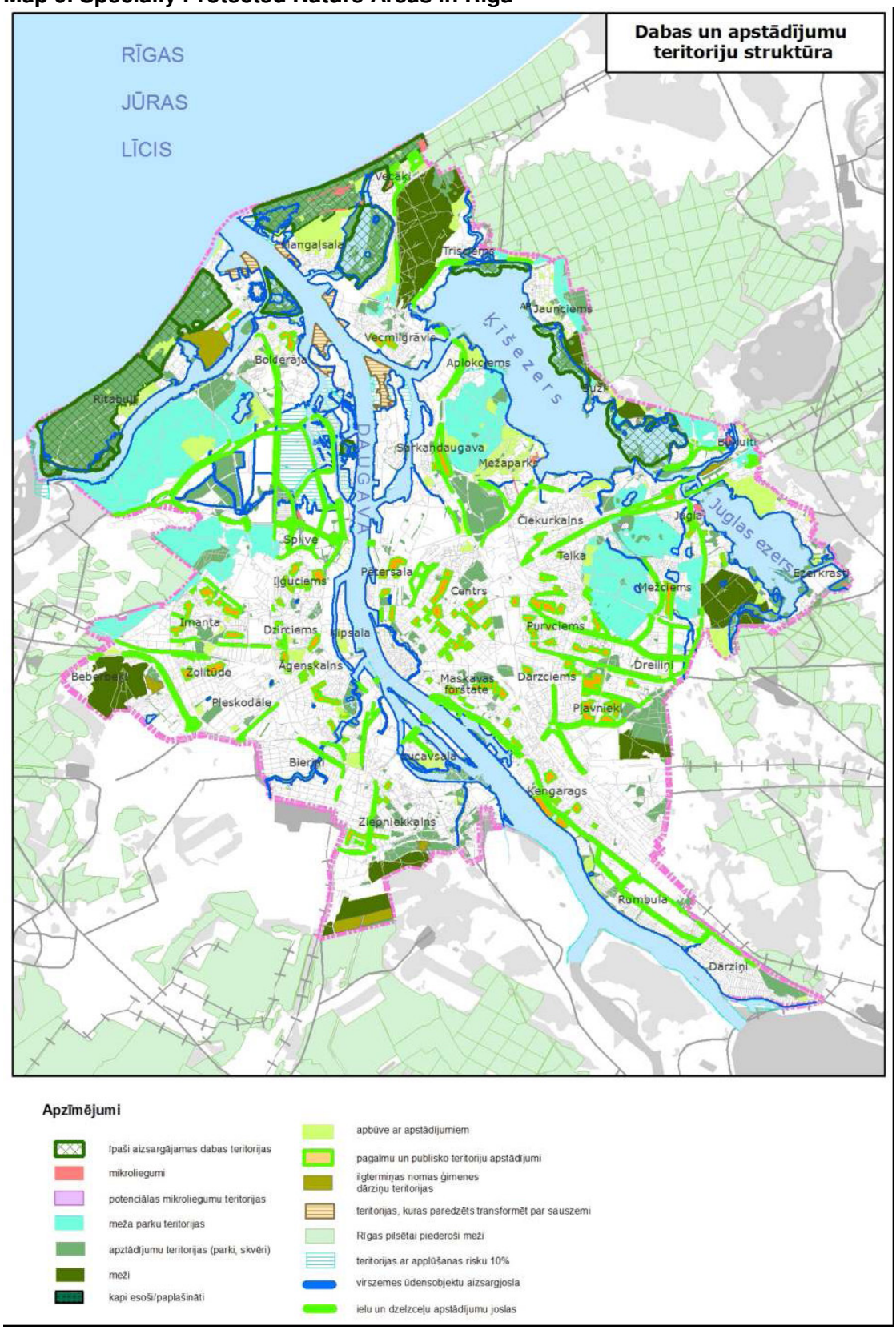
Map 8. Specially Protected Nature Areas in Riga planning region



Īpaši aizsargājamās dabas teritorijas

- Nacionālie parki: national parks;
- Dabas liegumi: nature reserves;
- Aizsargājamo ainavu apvidus: protected landscape areas;
- Dabas parki: nature parks;
- Dabas pieminekļi: nature monuments;
- Zaļās zonas mežu parki green zone forest parks.

Map 9. Specially Protected Nature Areas in Riga



Īpaši aizsargājamas dabas teritorijas: specially protected nature areas

BIJLAGE IV Environmental fiches major road projects

project name:	**Cohesion Fund Project E22: Section (re)construction Riga by-pass - Koknese**	
sector:	road	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation - Ecological corridors disturbance
fauna	negative	- species loss - devastation of underground and ground habitat - ecological corridors disturbance - decreasing of fauna migration
air pollution	positive/negative	- improved traffic organization - increase of NO_2, CO, PM_{10} and benzene emissions
climate change	positive	- improved traffic organization
noise pollution	negative	- increased noise levels
water pollution	negative	- pollution of underground and surface watercourses
soil pollution	negative	- degradation of arable land - soil sealing - erosion and contamination
waste production	no	
incident risk	positive/negative	- improved transport safety/risks caused by transport of dangerous goods or hazardous waste represent an increasing cause of concern because of the potential scale and intensity of the damage
influence on nearby		**motivation**
urban areas	YES	- spatial plan of the Riga region 2005-2011
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	YES	- memorials and cultural monuments in the vicinity

project name:	**E67/A7 Construction of a bypass in the A7 around Kekava**	
sector:	roads	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- species loss - forests fragmentation - habitat degradation - ecological corridors disturbance
fauna	negative	- species loss - devastation of underground and ground habitat - ecological corridors disturbance - decreasing of fauna migration
air pollution	positive/negative	- improved traffic organization; - pollution with NO_2, CO, PM_{10}, benzene - higher air pollution levels are expected without the project
climate change	positive	- improved traffic organization
noise pollution	negative	- limit values will be exceeded in 120 m zone
water pollution	negative	- pollution of underground and surface watercourses
soil pollution	negative	- degradation of arable land - degradation of forest - soil sealing - erosion - contamination
waste production	no	
incident risk	positive/negative	- improved transport safety/risks caused by transport of dangerous goods or hazardous waste represent an increasing cause of concern because of the potential scale and intensity of the damage
influence on nearby		**motivation**
urban areas	YES	- reduced impact on densely populated nearby areas - Kekava municipality development plan 2008-2020
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	NO	

project name:	**E67/A4 Reconstruction of Riga bypass section between A2 and A6**	
sector:	roads	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- insignificant habitat degradation - species loss
fauna	negative	- species loss - devastation of underground and ground habitat - decreasing of fauna migration - ecological corridors disturbance
air pollution	positive/negative	- improved traffic organization - pollution with NO_2, CO, PM_{10}, benzene
climate change	positive/negative/no	- improved traffic organization
noise pollution	negative/positive	- increase of noise levels by 4-6 dB - noise level with implementation of anti-noise measures zone will be reduced by 4 dB in comparison with existing situation
water pollution	negative	- insignificant pollution of surface watercourses
soil pollution	negative	- soil sealing - erosion - contamination
waste production	no	-
incident risk	positive	- improved traffic safety
influence on nearby		**motivation**
urban areas	YES	- improved traffic safety and mobility for neighbouring new villages - Garkalne municipality spatial plan 2009-2011
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	NO	

project name:	**Reconstruction of E77/A2 section between Riga bypass and Senite**	
sector:	roads	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- species loss - deforesting - habitat degradation
fauna	positive/negative/no	- species loss - decreasing of fauna migration - ecological corridors disturbance - devastation of underground and ground habitat
air pollution	positive/negative	- improved traffic organization - insignificant increase of PM_{10} and NO_2
climate change	positive	- improved traffic organization
noise pollution	negative/positive	- exceeded noise level zone increase by 15-20 % - by implementation proposed anti-noise measures nose level will within limit values
water pollution	negative	- insignificant pollution of surface watercourses
soil pollution	negative	- soil sealing - erosion - contamination
waste production	negative	- solid waste problems mainly involve the disposal of construction earth from vicinity of Incukalns North sulphuric acid tar pond as hazardous waste
incident risk	positive	- improved traffic safety
influence on nearby		**motivation**
urban areas	NO	
Ramsar sites	NO	
Natura 2000 sites	YES	- nature protected area “Garkalne forests” - mortality of Birds Directive annex I bird Coracias garrulous (green crow) on the motorway - deforesting of about 1 ha of Habitats Directive annex I Boreal Forest (9010).
national parks	NO	
nature parks	NO	
cultural heritage	NO	

project name:	**Northern Transport Corridor (NTC)**	
sector:	roads	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation - biotope fragmentation
fauna	negative	- species loss - decreasing of fauna migration - devastation of underground and ground habitat - ecological corridors disturbance
air pollution	positive/negative	- significant air quality improvement in Riga Centre - increased air pollution in the vicinity of the NTC
climate change	positive	- reduced fuel consumption due to improved traffic organization - reduced CO_2 emissions
noise pollution	positive/negative	- reduced noise levels in Riga Centre - increased noise level in the vicinity of the NTC
water pollution	negative	- pollution of underground and surfaces watercourses
soil pollution	negative	- degradation of arable land - soil sealing - contamination
waste production	negative	- solid waste problems mainly involve the disposal of construction earth
incident risk	positive/negative	- improved transport safety - risks caused by transport of dangerous goods or hazardous waste represent an increasing cause of concern because of the potential scale and intensity of the damage
influence on nearby		**motivation**
urban areas	YES	- Riga Development Plan 2006-2018, - Babite and Jurmala municipalities development plans
Ramsar sites	NO	
Natura 2000 sites	YES	- nearby nature protected area “Jaunciems” - increased noise level will have impact on four species of Birds Directive annex I birds
national parks	NO	
nature parks	NO	
cultural heritage	YES	- Riga Historic Centre protective zone - two cultural monuments

project name:	**Hanzas Bridge**	
sector:	roads	
screening		**motivation**
annex I or annex II	annex I	- construction of motorways and express roads - construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road would be 10 km or more in a continuous length
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation
fauna	negative	- species loss - decreasing of fauna migration - devastation of underground and ground habitat - ecological corridors disturbance
air pollution	positive/negative	- significant air quality improvement in Riga Centre - increased air pollution in the vicinity of the Hanzas Bridge
climate change	positive	- reduced fuel consumption due to improved traffic organisation - reduced CO_2 emissions
noise pollution	positive/negative	- reduced noise levels in Riga Centre - increased noise level in the vicinity of the Hanzas Bridge
water pollution	negative	- pollution of underground and surfaces watercourses
soil pollution	negative	- soil sealing - erosion - contamination
waste production	negative	- solid waste problems mainly involve the disposal of construction earth
incident risk	positive/negative	- improved transport safety - risks caused by transport of dangerous goods or hazardous waste represent an increasing cause of concern because of the potential scale and intensity of the damage
influence on nearby		**motivation**
urban areas	YES	
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	YES	- Riga Historic Centre protective zone

BIJLAGE V Environmental fiches major PT projects

project name:	**Tram/ Light Rail to the Airport**	
sector:	Public Transport	
screening		**motivation**
annex I or annex II	annex II	- tramways, elevated and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation, fragmentation
fauna	negative	- species loss - decreasing of fauna migration - devastation of underground and ground habitat - ecological corridors disturbance
air pollution	positive	- decreased air pollution due to increased public transport use
climate change	positive	- increased public transport use
noise pollution	positive	- increased public transport use
water pollution	negative	- pollution of surface watercourses
soil pollution	negative	- soil sealing - erosion and contamination
waste production	no	
incident risk	positive	- Reduced incident risk
influence on nearby		**motivation**
urban areas	YES	- Riga development plan 2006-2018
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	NO	

project name:	**Tram new track and terminal in Dole**	
sector:	Public Transport	
screening		**motivation**
annex I or annex II	annex II	- tramways, elevated and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation
fauna	negative	- species loss - devastation of underground and ground habitat
air pollution	positive	- decreased air pollution due to increased public transport use
climate change	positive	- increased public transport use
noise pollution	Positive	- increased public transport use
water pollution	negative	- pollution of surface watercourses
soil pollution	negative	- soil sealing - erosion and contamination
waste production	no	
incident risk	positive	- reduced incident risk
influence on nearby		**motivation**
urban areas	YES	- Riga development plan 2006-2018
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	NO	

project name:	**Park and Ride facilities in Riga at 4 locations, new 1000 spaces in total**	
sector:	Public Transport	
screening		**motivation**
annex I or annex II	annex II	- urban development projects
environmental impacts		**motivation**
flora	negative	- species loss - habitat degradation
fauna	negative	- species loss - devastation of underground and ground habitat
air pollution	positive	- decreased air pollution due to increased public transport use
climate change	positive	- increased public transport use
noise pollution	positive	- Increased public transport use
water pollution	negative	- pollution of surface watercourses
soil pollution	negative	- soil sealing - erosion and contamination
waste production	no	
incident risk	positive	- Reduced incident risk
influence on nearby		**motivation**
urban areas	YES	Riga development plan 2006-2018
Ramsar sites	NO	
Natura 2000 sites	NO	
national parks	NO	
nature parks	NO	
cultural heritage	NO	

BIJLAGE VI Emissions in comparison with reference variant

	vehicle kilometres - difference with reference variant (x 1000)							
variant	car	truck	PT minibus	PT bus	PT trolleybus	PT tram	train passeng.	train freight
A (1B)								
2025	-25.952	-1.223	277	391	204	185	3	6
B (B2)								
2025	-14.765	-450	292	412	215	195	4	7
C								
2025	-11.842	-67	291	410	214	194	3	6

type	emissions: grams per vehicle kilometre							
	car	truck	PT minibus	PT bus	PT trolleybus	PT tram	train passeng.	train freight
CO_2	160,00	1.000,00	300,00	800,00	1.200,00	1.600,00	7.000,00	6.000,00
CO	5,00	8,00	2,20	5,50	0,08	0,11	0,29	50,00
NOx	0,50	15,00	4,00	10,00	3,00	4,00	12,00	80,00
SO_2	0,05	0,50	0,12	0,30	0,40	0,50	2,50	4,00
VOS	1,00	3,00	1,00	2,50	0,02	0,02	0,06	12,00
PM	0,15	2,00	0,60	1,50	0,10	0,12	0,36	15,00

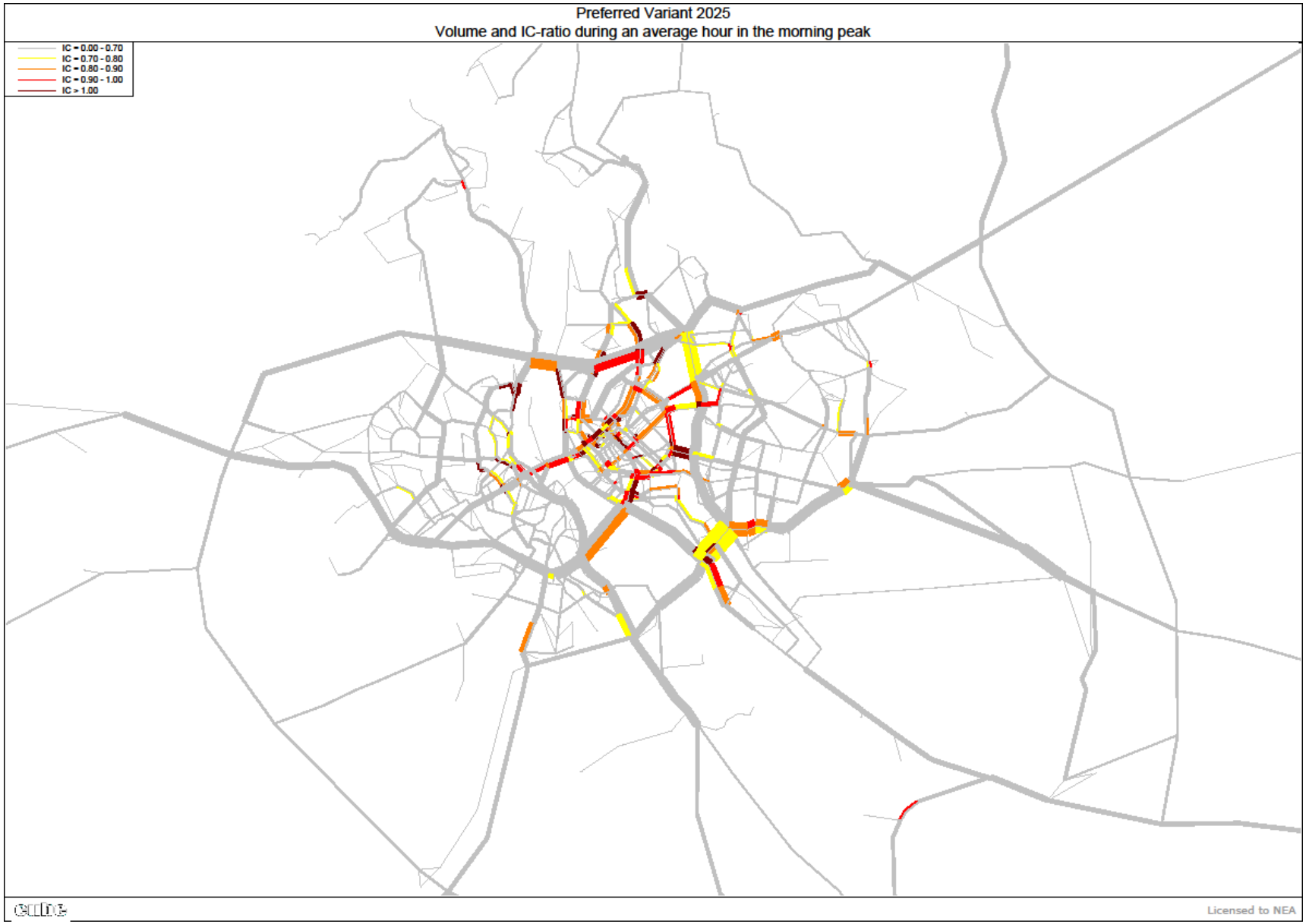
type	emissions (kilograms x 1000) - difference between variant A and reference variant								
	car	truck	PT minibus	PT bus	PT trolleybus	PT tram	train passeng.	train freight	total
CO_2	-4.152	-1.223	83	313	245	296	22	34	-4.381
CO	-130	-10	1	2	0	0	0	0	-136
NOx	-13	-18	1	4	1	1	0	0	-24
SO_2	-1	-1	0	0	0	0	0	0	-2
VOS	-26	-4	0	1	0	0	0	0	-28
PM	-4	-2	0	1	0	0	0	0	-5

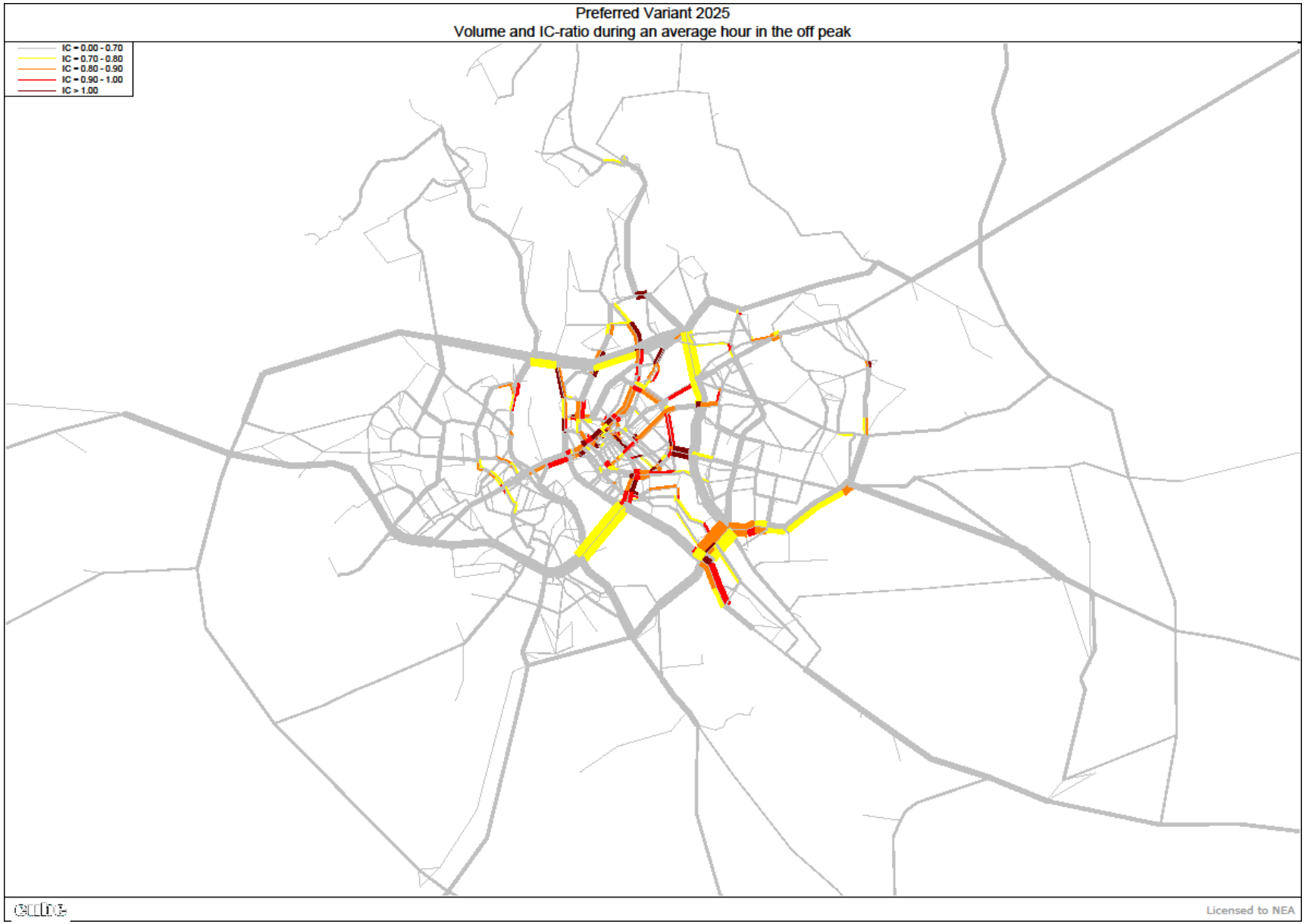
type	emissions (kilograms x 1000) - difference between variant B and reference variant								
	car	truck	PT minibus	PT bus	PT trolleybus	PT tram	train passeng.	train freight	total
CO_2	-2.362	-450	88	330	258	312	26	40	-1.758
CO	-74	-4	1	2	0	0	0	0	-74
NOx	-7	-7	1	4	1	1	0	1	-7
SO_2	-1	0	0	0	0	0	0	0	-1
VOS	-15	-1	0	1	0	0	0	0	-15
PM	-2	-1	0	1	0	0	0	0	-2

type	emissions Kilograms x 1000) - difference between variant C and reference variant								
	car	truck	PT minibus	PT bus	PT trolleybus	PT tram	train passeng.	train freight	total
CO_2	-1.895	-67	87	328	257	311	24	37	-918
CO	-59	-1	1	2	0	0	0	0	-57
NOx	-6	-1	1	4	1	1	0	0	0
SO_2	-1	0	0	0	0	0	0	0	0
VOS	-12	0	0	1	0	0	0	0	-11
PM	-2	0	0	1	0	0	0	0	-1

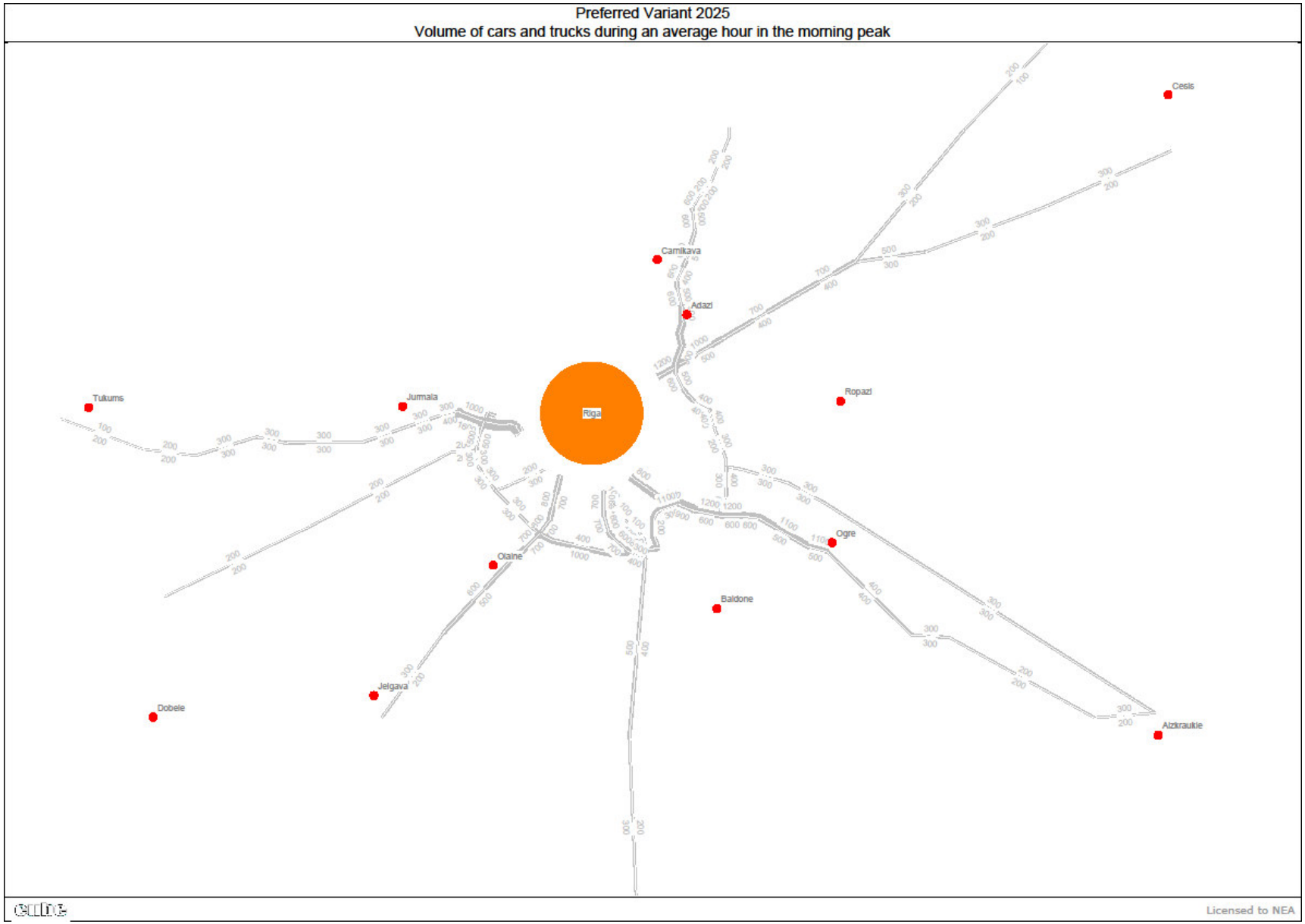
Source: calculations by the NEA Transport research and training institute (Netherland), based on the Handbook on Estimation of 'External Costs in the Transport Sector "ĪMPACT", written by CE Delft, INFRAS, Fraunhofer Geselschaft - ISI, and the University of Gdansk (December 19, 2007), as well as on other various sources.

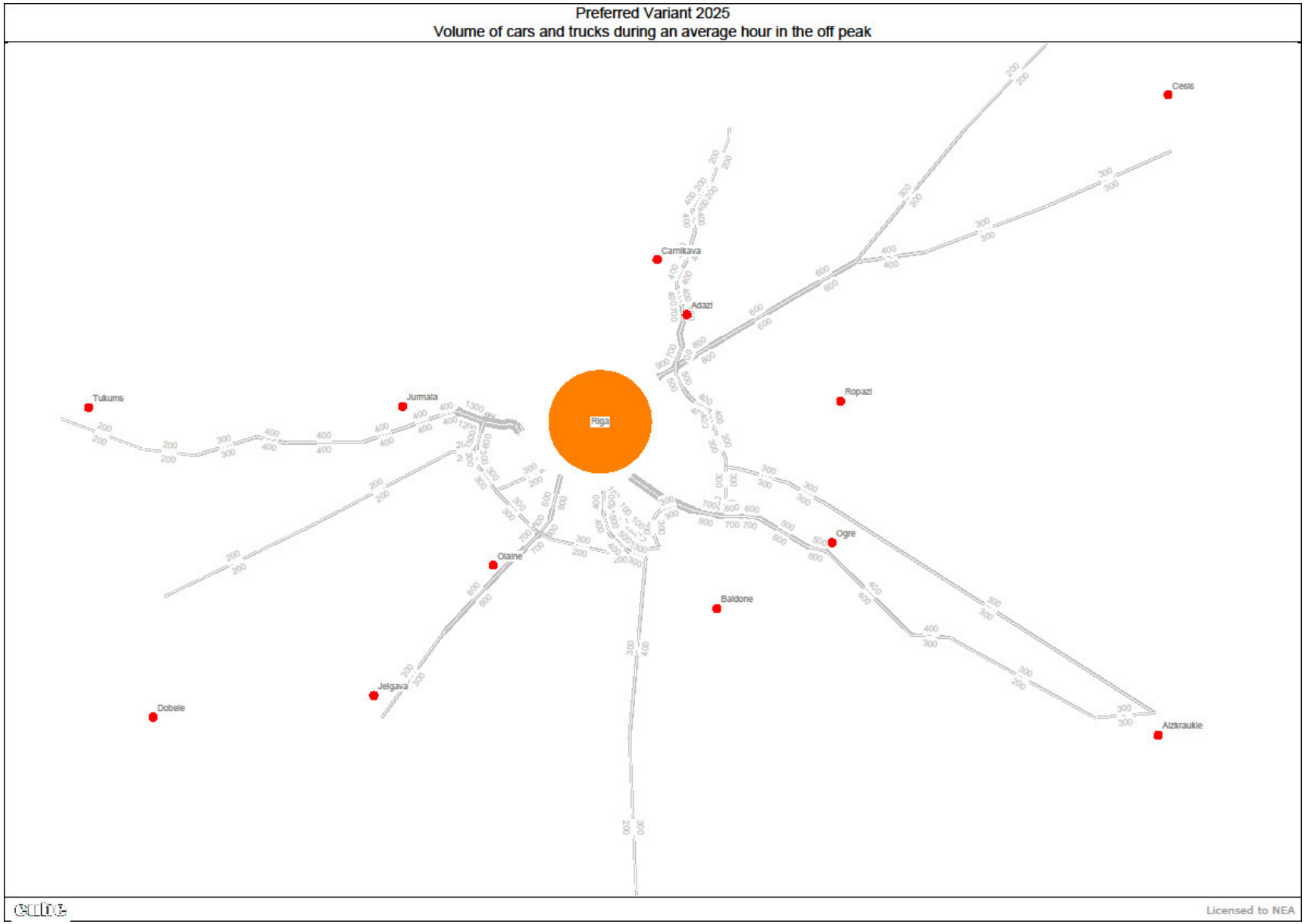
BIJLAGE VII Traffic intensities Preferred Variant 2025


Preferred Variant 2025
Volume and IC-ratio during an average hour in the morning peak
IC = 0.00 - 0.70
IC = 0.70 - 0.80
IC = 0.80 - 0.90
IC = 0.90 - 1.00
IC > 1.00
Licensed to NEA


Preferred Variant 2025
Volume and IC-ratio during an average hour in the off peak
IC = 0.00 - 0.70
IC = 0.70 - 0.80
IC = 0.80 - 0.90
IC = 0.90 - 1.00
IC > 1.00
Licensed to NEA


Preferred Variant 2025
Volume and IC-ratio during an average hour in the evening peak
IC = 0.00 - 0.70
IC = 0.70 - 0.80
IC = 0.80 - 0.90
IC = 0.90 - 1.00
IC > 1.00
Licensed to NEA


Preferred Variant 2025
Volume of cars and trucks during an average hour in the morning peak
Cesis
Carnikava
Adazi
Ropazi
Tukums
Jurmala
Riga
Ogre
Olaine
Baldone
Jelgava
Dobele
Aizkraukle
Licensed to NEA


Preferred Variant 2025
Volume of cars and trucks during an average hour in the off peak
Cesis
Carnikava
Adazi
Tukums
Jurmala
Riga
Ropazi
Ogre
Olaine
Baldone
Jelgava
Dobele
Aizkraukle
Licensed to NEA

Preferred Variant 2025
Volume of cars and trucks during an average hour in the evening peak