

Air Quality in Riga – Problems and Solutions

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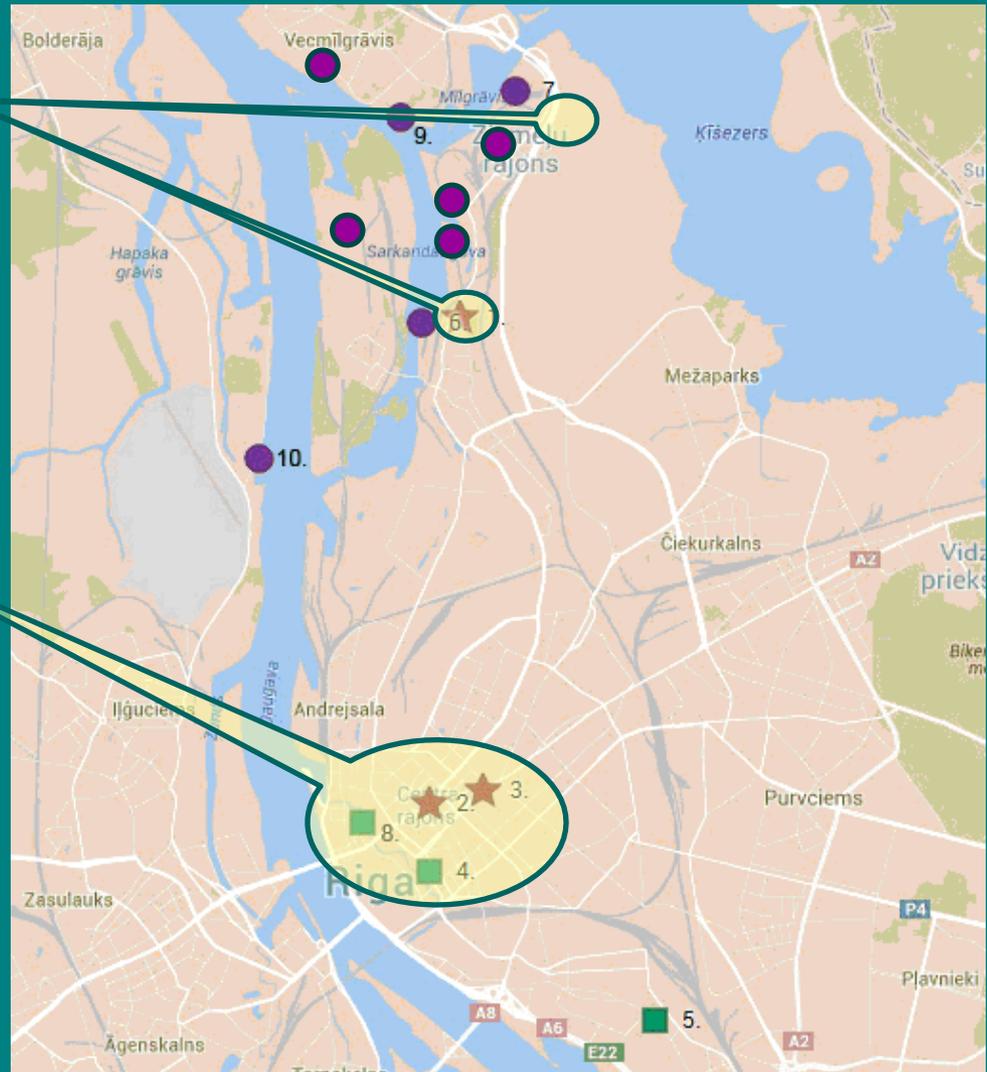
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Air quality monitoring stations in Riga - 2015

Station is changed with new and moved to new place in 2015

Street traffic stations (red stars) are in operation from 2003, instruments are outdated and need to be changed

Background stations in City Center (green squares) are placed close enough to traffic air quality monitoring stations (red stars) – distance about 800 - 1000 m.



Street canyon AQMS Valdemara and Brīvības streets
City background AQMS
AQMS in Riga Free Port

- ★ piezemes gaisi kvalitāti kontrolējošās monitoringa stacijas
- pilsētas fona gaisa kvalitāti kontrolējošās monitoringa stacijas
- Brīvostas teritorijas gaisa kvalitāti kontrolējošās monitoringa stacijas

Hotspot traffic air quality monitoring stations in Riga



Street canyon on Kr.Valdemāra Street 18 in city centre: multi-instrumental classical point type AQMS



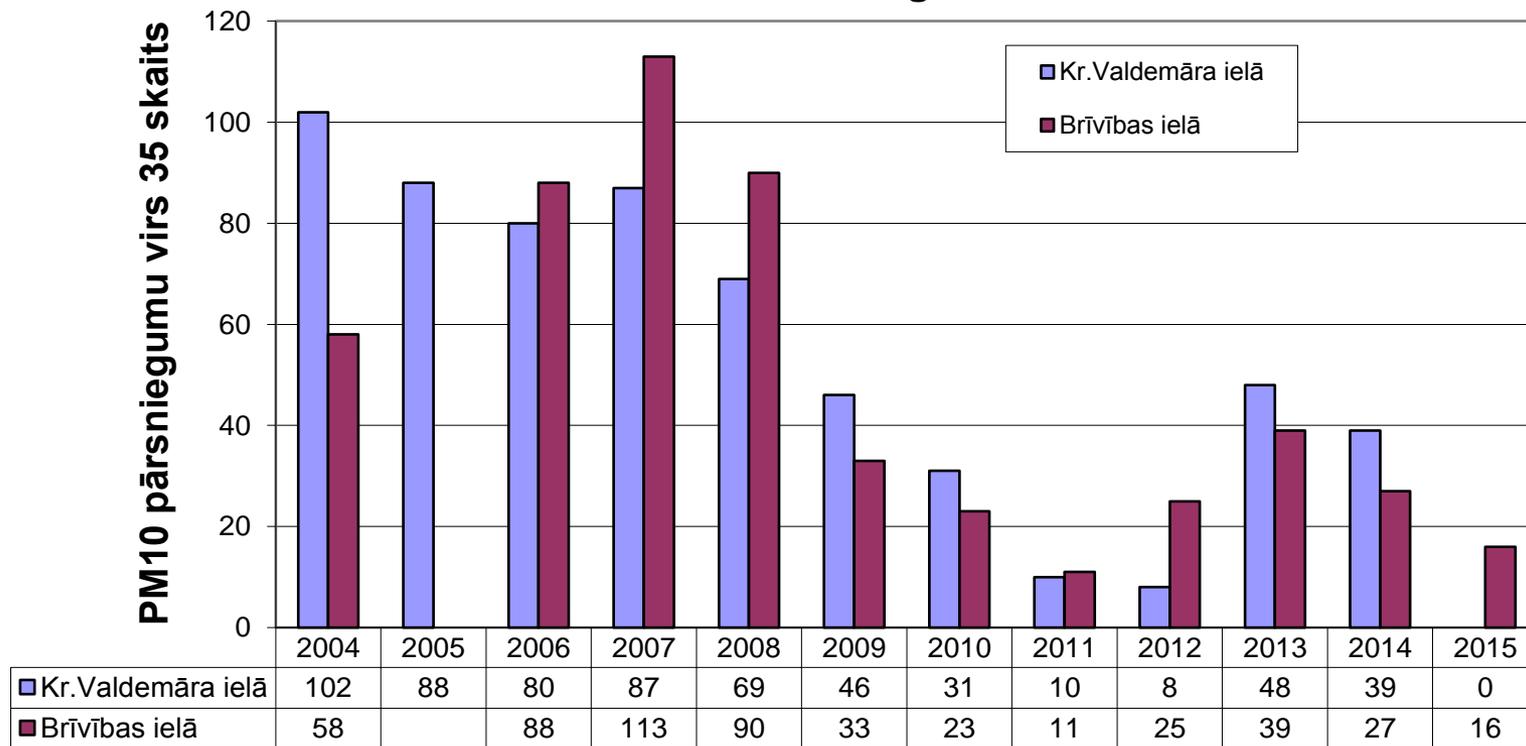
Street canyon AQMS on Brīvības Street 73 in city centre: open light beam DOAS technology, light beam 350 m



Monitoring results – traffic AQMS in Riga

All exceedances (dusty days) over 35 days authorized, without deduction of days with salt spreading, trans-boundary etc. There are no PM10 exceedances in City Center background stations.

PM10 pārsniegumi virs atļautām 35 dienām Kr.Valdemāra un Brīvības ielās 2004.-2015. gados



- 1) Exceedances of daily limit value in 2012-2013 are reduced by 50 % in comparison with 2007;
- 2) The increase in 2013, 2014 can be explained with the coldest winter periods and longer summer droughts, compared to period 2009-2012;
- 3) Exceedances are observed only on canyon-type streets with congested traffic.

Monitoring results – traffic AQMS in Riga

What are sources of particles PM₁₀ on traffic congested street in Riga?

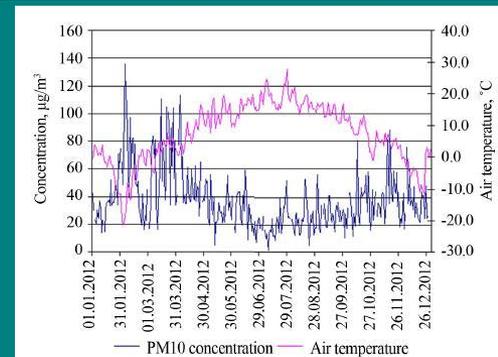
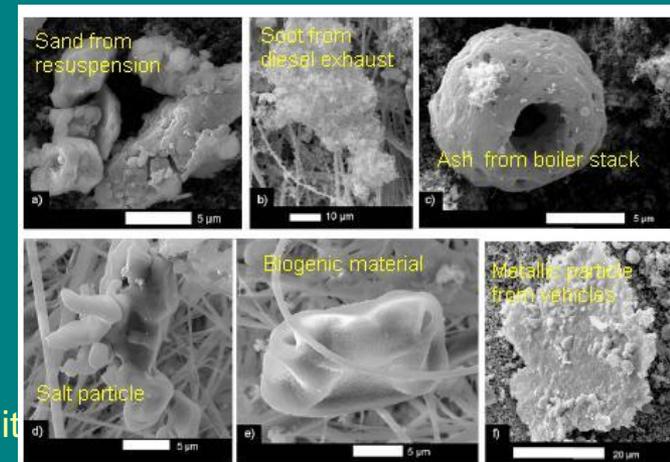
Researches based on statistical analysis of data, particle morphology and composition is done to establish the origin:

“Evaluation of Local Scale PM Pollution Levels in Typical Street Canyon in Riga” by I.Steinberga, J.Bikshe, K.Kundzins, J.Kleperis, J.Bikshe. **Journal of Environmental Protection, 2013, 4, 956-963**

“Application of SEM-EDX and Principal Component Analysis for PM₁₀ Characterization and Source Apportionment: A Street Canyon Case Study” by J.Jr Bikshe, I.Steinberga, J.Kleperis, J.Bikshe, **COST ACTION TD1105 EuNetAir; BOOKLET, Cambridge, 18 - 20 December 2013**

Some findings:

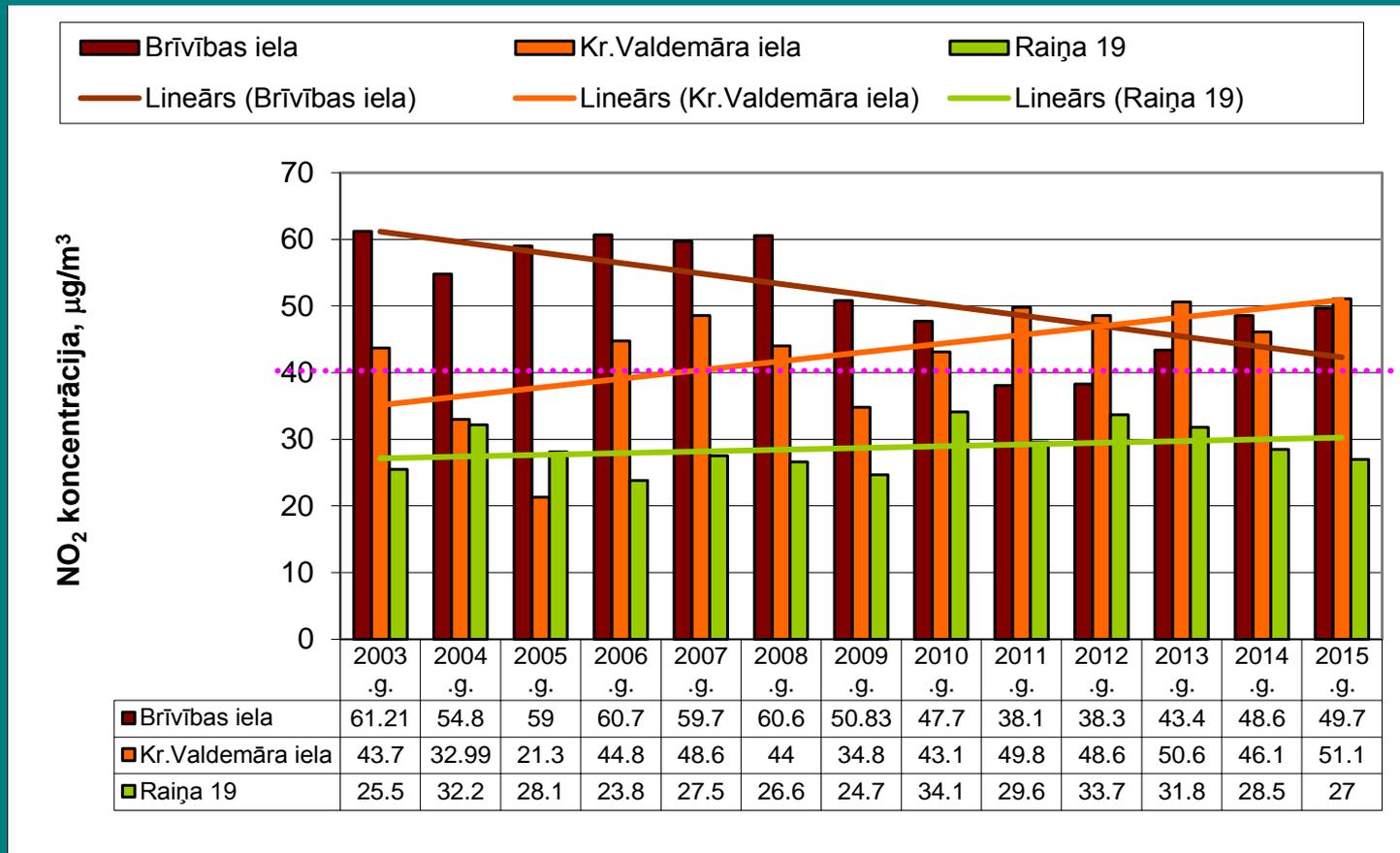
- 1) Air temperature shows strong negative correlation with PM₁₀ hourly values, which indicates ineffective fuel burning processes in car engines during cold winter season and intensive usage of anti-acers (mixture of NaCl-sand), what leads for extremely high PM₁₀ concentrations during spring time;
- 2) Low air humidity values (40% - 50%) negatively correlate with PM₁₀ pollution, quite intensive resuspension from car wheels, low air humidity and dry periods without precipitation leads to extremely high PM₁₀ pollution levels during all spring season;
- 3) About 50 % of PM pollution at urban street level could be associated with **traffic exhaust emissions** and classified as soot; from mass fraction point of view these are 70 % of pollution level; about 8 – 9 % of particulate matter pollution possible to associate with abrasion processes;
- 4) About 40 % of total PM are of natural origin (including sea salt, street sanding and resuspension).



Comparative evaluation of PM₁₀ concentrations at station Street Canyon (1) and air temperature for 2012

Monitoring results – NO₂

Nitrogen dioxide annual average value exceeds a threshold without tolerance (40 µg/m³) in the canyon-type streets with heavy traffic loads. From 2011 to 2015 (up to 01.01.2015) Latvia had the tolerance of 50% for the threshold of NO₂



In City center background station (Rainis Bld 19) there is no exceedances of Nitrogen dioxide annual average value threshold 40 µg/m³.

Action Programs to improve air quality in Riga

The first Action Program was developed for a five-year period from 2004 to 2009. Selected measures and their efficiencies:

a) To set air quality as a compulsory criterion during the development and evaluation of Riga`s city development plan – **Accomplished**: air quality as a compulsory criterion both at the level of measures and of indicators has been introduced into the Riga Long-term Development Strategy until 2025 within the Objective M14 (Clean and Green city)

b) Total reduction of the number of vehicles in the historic centre of Riga by 35% in comparison to 2002, alongside with the traffic flow optimization – **Partly accomplished**: opening of new Dienvidu Bridge in November 17, 2008 (ramps at both ends of the bridge was completed in 2013, total costs about 440 MEur), who has removed 8-26% transport of the other bridges and 8-12% of Brīvības Street in City Center (Table):

AADT	<i>Average 2005-2008</i>	<i>Average 2009-2015</i>	<i>Relation after/before, %</i>	<i>Reduction, %</i>
Salu Bridge	85405	62916	73,7	26,3
Vanšu Bridge	60367	54104	89,6	10,4
Akmens Bridge	53091	48887	92,1	7,9

Action Program to improve air quality in Riga

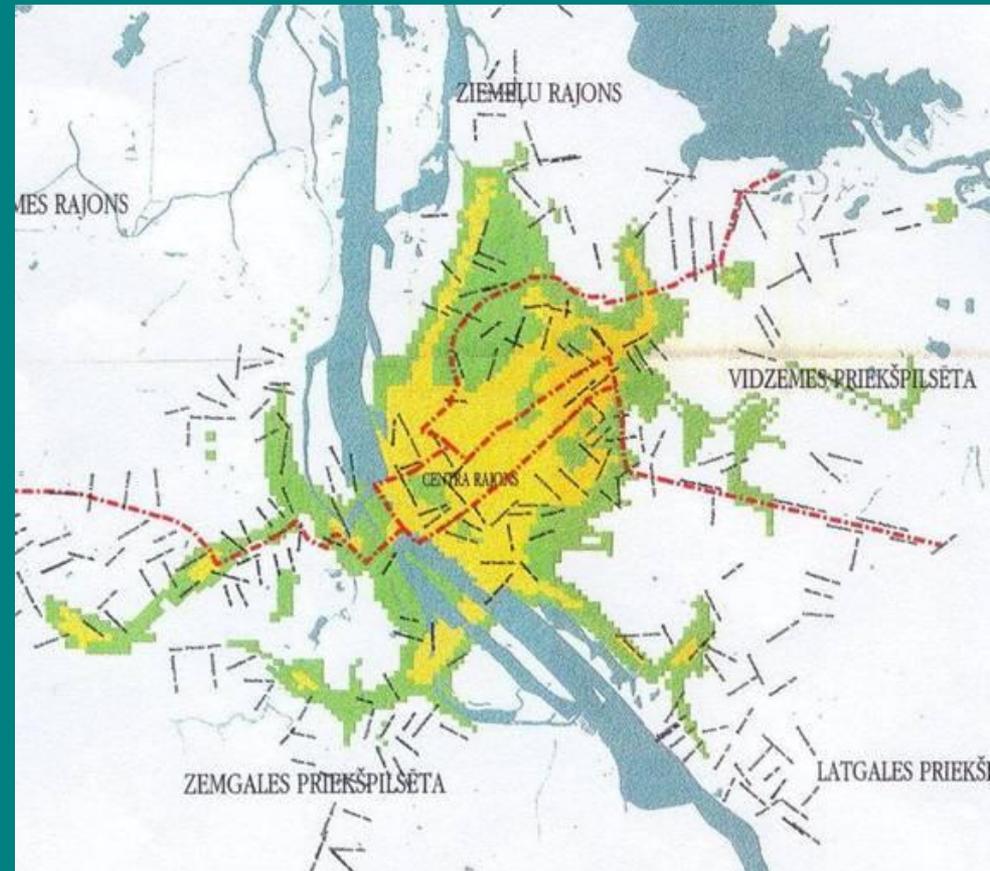
The first Action Program (2004 – 2009)

c) With reference to this programme Riga City Council Binding Regulation No 60 has been adopted that prohibits opening of new permanent pollution sources in the areas where the air pollution exceeds the set standards in conformity with the Riga City Urban Planning Map.

d) Also the Riga City Development Plan 2006-2018 contains information on the measures that will have an impact on the air quality in Riga.

Yellow zone – NO₂ annual average concentration > 40 µg/m³

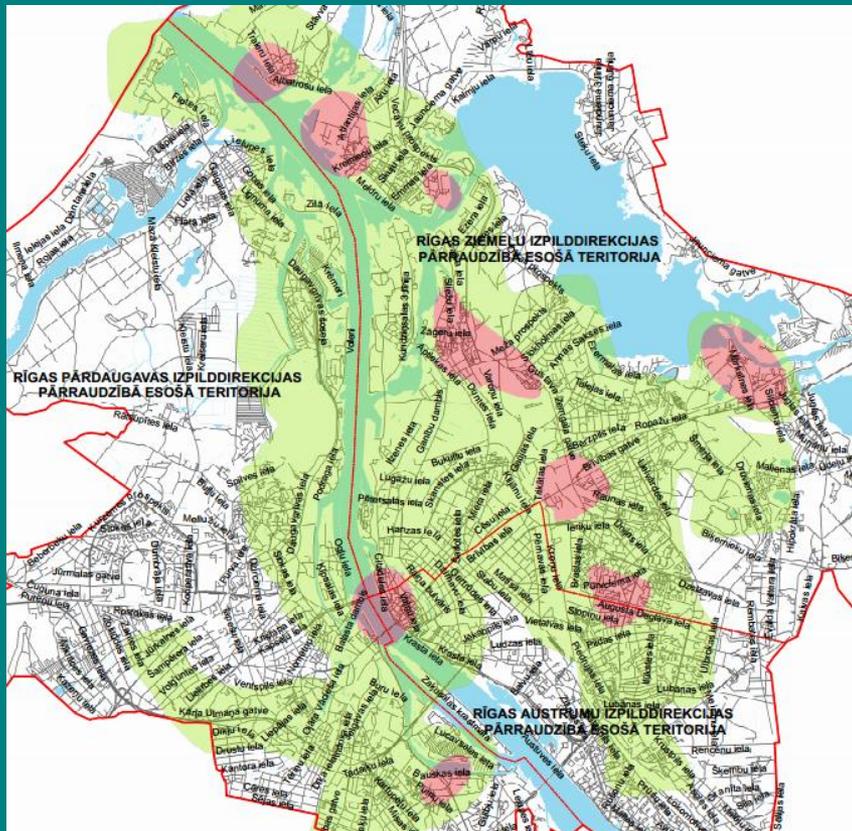
NO₂ zoning map 2008



Action Program to improve air quality in Riga

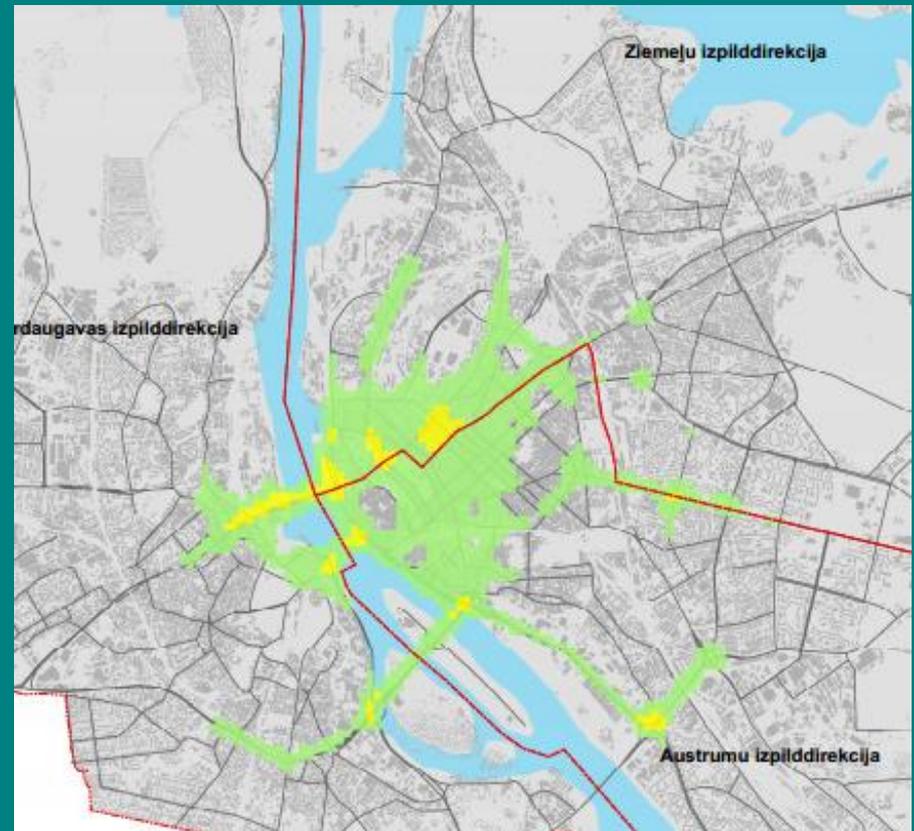
PM₁₀ zoning map 2014

Brown zones – PM₁₀ annual average concentration > 40 µg/m³



NO₂ zoning map 2014

Yellow zones – NO₂ annual average concentration > 40 µg/m³



Action Program to improve air quality in Riga

Second Action Program 2011 - 2015

was elaborated because assessment of air quality in Riga 2008-2010 shows that implementation of the first Action Program has yielded good results, although the set targets of pollution reduction in the city centre have not been achieved to the full extent due to the problems encountered in achieving the limit values of nitrogen dioxide and particulate matter:

Pollutant	1 h limit value	8 h limit value	24 h limit value	Annual limit value
Sulphur dioxide	Not exceeded	–	Not exceeded	–
Nitrogen dioxide	Exceeded within the permissible range	–	–	Exceeded in stations on Brīvības Street and K.Valdemāra Street
Ground-level ozone	Not exceeded	Exceeded within the permissible range	–	–
Carbon monoxide	–	Not exceeded	–	–
Particulate matter (PM ₁₀)	–	–	Exceeded in stations on Brīvības Street and K.Valdemāra Street	Exceeded in stations on Brīvības Street (2008) and K.Valdemāra Street (2008, 2010)
Benzene	–	–	–	Not exceeded

APPROVED
Riga City Council Decision No 3285
of 7 June 2011



Riga City Air Quality Improvement Action Programme 2011-2015

on the possibilities to reduce pollution (particulate matter and nitrogen oxides) and to improve air quality in Riga

Prepared within the framework of INTERREG IVB project "Baltic Sea Region Cooperation Network project - EcoRegion" by Riga City Council City Development Department



Developing the EcoRegion
into the 4th Year EcoRegion



Project part-financed by the
European Union (European
Regional Development Fund)



Baltic Sea Region
Programme 2007-2013



BEF
LATVIA



Action Program to improve air quality in Riga

New measures aimed at reduction of particulate matter and nitrogen dioxide pollution and improvement of air quality in Riga. Next sectors were involved:

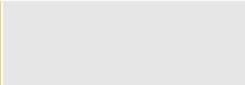
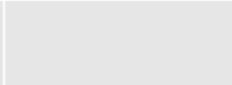
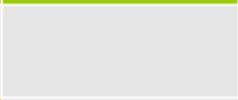
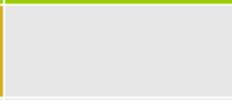
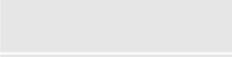
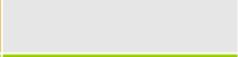
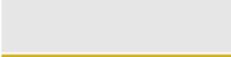
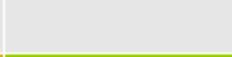
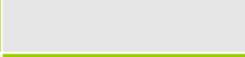
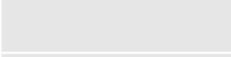
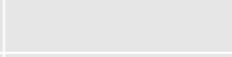
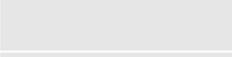
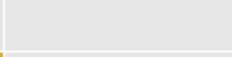
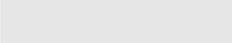
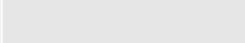
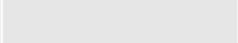
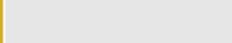
Objective		Turning Riga into a green city with high quality environment
Task		Implementation of measures aimed at improvement of air quality
MEASURES	Transport sector	<ul style="list-style-type: none"> • Streamlining of traffic flows aimed at reduction of pollution • Ensuring appropriate infrastructure to promote the use of low or zero emission vehicles • Reduction of pollution from car exhaust gases • Reduction of pollution caused by friction between car tyres and road surfaces
	Energy, industry and building sectors	<ul style="list-style-type: none"> • Considering the air quality aspects in choice of fuels • Supporting of efficient energy production • Efficient treatment of flue gases • Reduction of particulate matter emissions generated by handling of dusty materials
	Households	<ul style="list-style-type: none"> • Reduction of pollution caused by domestic heating • Reduction of heat energy consumption • Compliance with the air quality standards for building in the polluted areas
	Providing of data	<ul style="list-style-type: none"> • Maintenance of the air quality monitoring network • Providing of data needed for the air quality assessment
	Public awareness	<ul style="list-style-type: none"> • Public awareness campaigns on air quality

The measures were updated in 2014

Organizations responsible for implementation of measures and activities under the Riga City Air Quality Improvement Action Program

 active involvement

 involvement for implementation of some measures

Responsible bodies	Transport sector	Energy, industry and building sectors	Households	Availability of relevant data	Public awareness
MEPRD*					
LEGMC*					
Riga City Council City Development Department					
Riga City Council Housing and Environment Department					
Riga City Council Transport Department					
Riga City Building Board					
Riga City Energy Agency					
"Rīgas satiksme" Ltd.					
JSC "Rīgas siltums"					
"Rīgas gaisma"					

* MEPRD - Ministry of Environmental Protection and Regional Development; LEGMC - Latvian Environment, Geology and Meteorology Centre

The Northern Corridor is the most important missing element in the traffic infrastructure of Riga now

Planned construction of Northern Corridor would start in 2015 - 2018, construction completion in ~ 2022. Currently the costs are estimated more than 1 billion euros. If the Northern Corridor is not built, then in 2031 city center bridges will have 34% higher traffic volumes in the morning rush-hours, but the average traffic speed throughout Riga will decrease by 12% comparing with today (average 20 km/h, in rush-hours – 5 km/h).



Northern Corridor shall create **preconditions for balanced development** of Riga and its agglomeration, and will provide the following advantages:

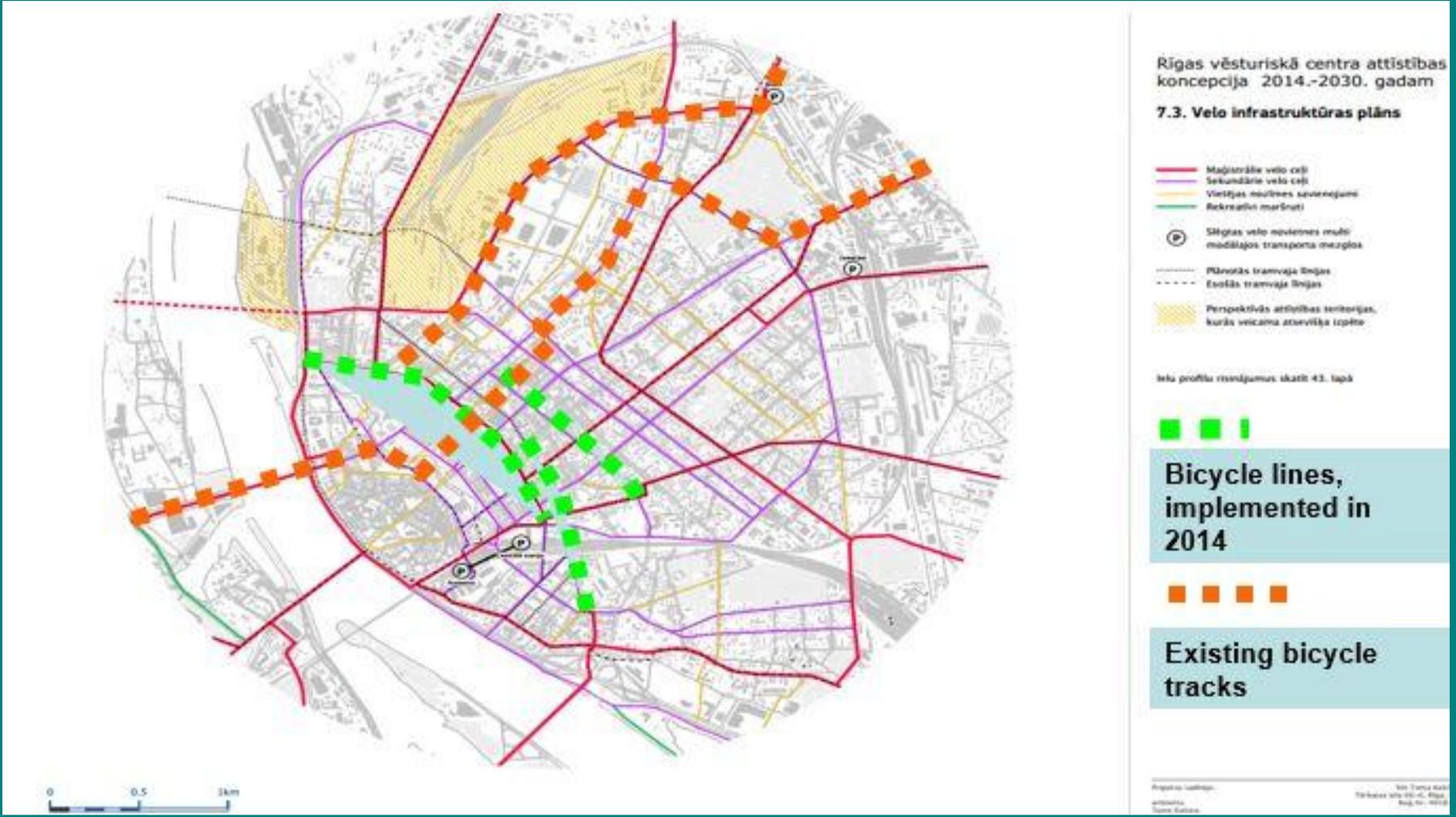
- the quality of air in the historic part of Riga shall significantly improve;
- noise pollution will be brought down;
- traffic flows in Riga city will be optimized (*providing time savings when crossing the city, lower transport running costs, higher traffic safety*).

Northern Corridor according to the Riga and Pieriga Mobility plan (*Elaborated by Ministry of Transport of the Republic of Latvia with assistance from JASPERS (Joint Assistance to Support Projects in European Regions)*) is considered as **the priority project**

Settings and Measures from air quality action plan is implemented in Riga`s planning documents through:

Mobility

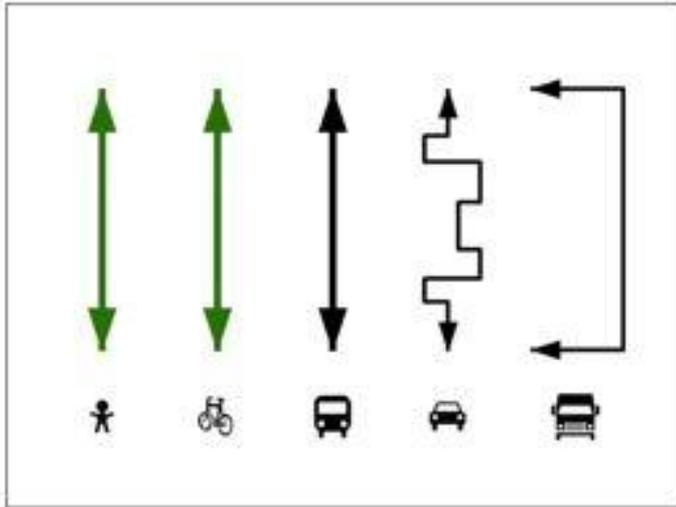
Existing and planned bicycle lines



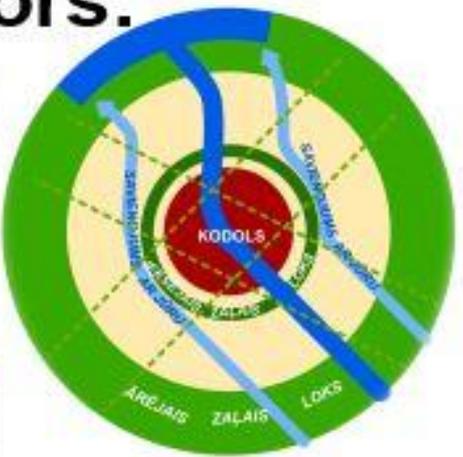
Settings and Measures from air quality action plan is implemented in Riga`s planning documents through:

Priority row:

Pedestrian – cyclist
– public transport –
private transport -
trucks



Green corridors:



DEVELOPMENT PROGRAMME OF RIGA 2014 – 2020

Integrated approach to
improve air quality in the city

- ✓ activities for 7 years
- ✓ investment projects for 3 years



Improvement of

living, working, recreation conditions in the city

STRATEGY 2030

Action Directions and projects

support from EU Structural Funds (2014-2020) will be effectively used

AD 10 Convenient international accessibility

Priorities and key principles

- ✓ Centre release from transit cargo (use of ring-roads of Riga for transit)

Investment projects:

- ✓ The Segment 1 of the Riga Northern Transport Corridor (“Brivibas Dublieris”)
- ✓ Construction of Eastern bypass (Ieriķu street – Vietalvas street section)



Supporting activities with EU co-financing

Public transport:

Low floor trams (26 trams on line in 2014)
Hydrogen engine trolleybuses (project in process)
Euro6 buses (175 in 5 years; 35 in 2014)

Municipal transport:

Electric engine vehicles (14 units in RCC, of 85 total 2015)



Under process is development of Action Plan to improve air quality in Riga 2016 – 2020

Why necessary?

Air quality monitoring results 2010-2014 showed that in Riga:

- Annual limit value for human health exceed for NO₂ and PM10 in street traffic stations;
- 24 hour limit value for human health exceed for PM10 in street traffic station;
- Upper assessment threshold for human health protection exceeded for NO₂, PM10 in city center street traffic station and background station; for benzene exceeded in industrial AQ monitoring station;
- Lower assessment threshold for human health protection exceeded also for benz(a)pyrene in street traffic stations

Action Plan to improve air quality in Riga 2016 – 2020

How to deal with ...?

In 2010, 2013, 2014 years Latvia received European Commission's notice of the infringement procedure in Case No 2008/2195 that the measures to reduce PM10 pollution are not effectively and excesses will continue.

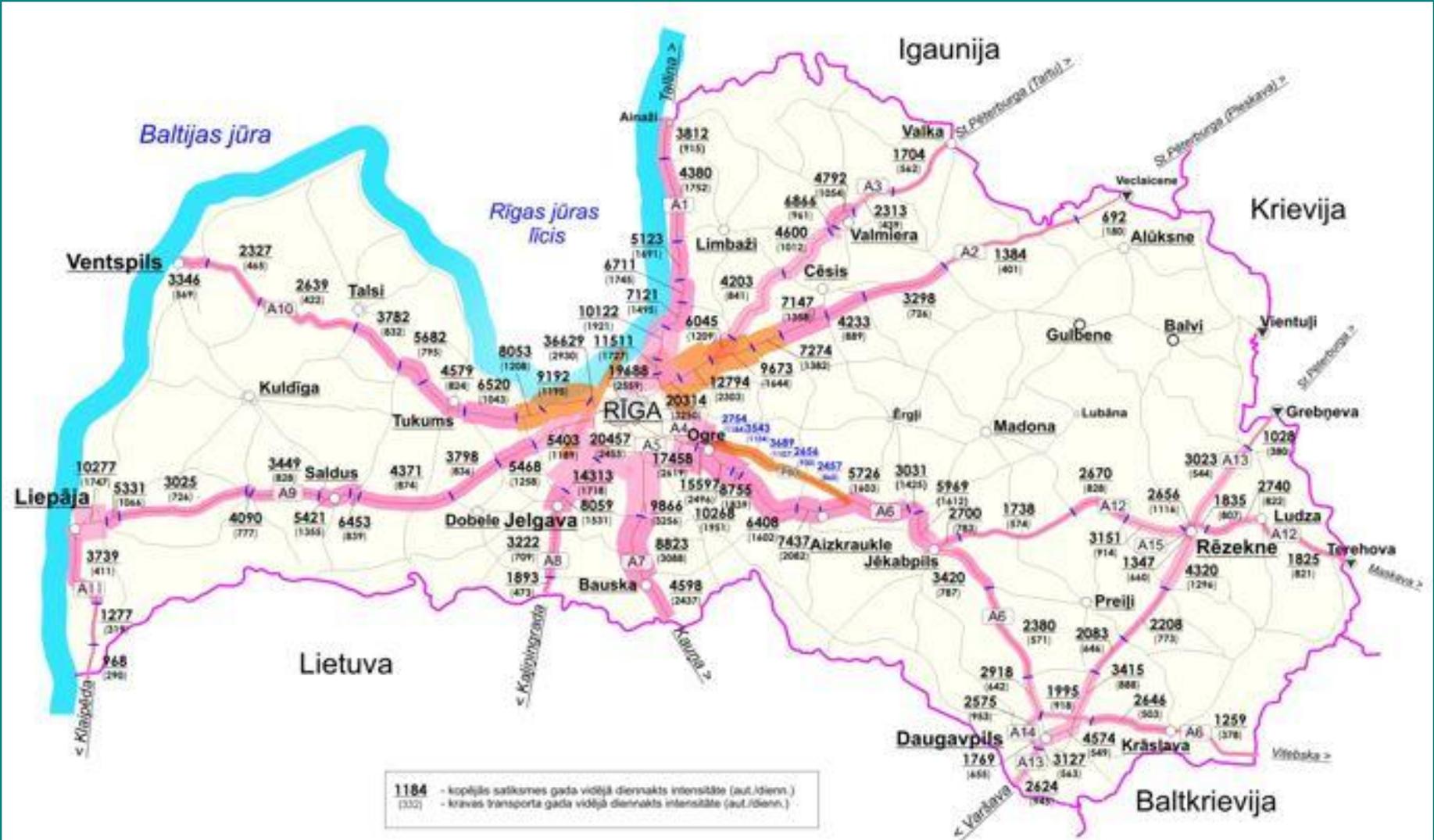
In 2010 Latvia received 50% tolerance to annual limit value of NO₂ for 4 years, but by 2015 it came to an end and as it is seen from monitoring results, we did not succeed to reduce NO₂ concentrations in city center streets;

Now we are waiting the second notice from EC of the infringement procedure that the population in the center of Riga for a long time is living in a polluted environment.

Riga – the capital city of Latvia

Traffic pressure on Riga city infrastructure is growing year by year

Annual Average Daily Traffic volumes on main roads around Riga 2013



It will take decades when new traffic infrastructure develops in Riga:

Major road projects and missing links: 



Conclusions

Starting from 2003 up to now Riga is performing air quality monitoring in city centre canyon-type streets with heavy traffic, and regular exceedances of annual limit values for NO₂ and PM10 are observed. Two realized Action plans to improve air quality in Riga (2004-2009; 2011-2015) gave small improvements, not enough to stop exceedances of limit values.

Riga has not yet tackled the traffic restriction at the center, not with the peak hours charge, and not to ban old cars to enter the center (Green Zone). The city center still can not shut down for traffic because there is no installed bypass roads. In addition, in the city center is located Riga`s Municipality and also the Government of country - the Saeima, the Cabinet of Ministers, and any traffic restrictions are politically sensitive.

There are poor developing of Park&Ride system in Riga. The city develops Public Traffic, and there are tickets incentives, but in spite of that the number of cars in the streets continues to grow. While the fuel will be burned in internal combustion engines, no decrease of NO₂ and PM10 is expected.

Questions

Is it not a mistake to make a long time air pollution monitoring in traffic congested downtown streets? Does some European City do it?

How long city can keep inhabitants in polluted environment? Can be actively living city being clean?

Whether there is a way to reasonably place air monitoring stations in city, that limit values are not exceeded and the city still is regarded as taking care of its citizens?

Does striving for Climate Change prevention and Energy Independence always go hand in hand with the reduction of air pollution? Example from Riga – local district heating enterprise want to withdraw from the heat produced by thermal power station that runs on natural gas (no PM emissions), and is building up number of new heat generation stations in city running on wood chips (PM emissions).

Thanks for attention!

Looking on air quality monitoring results in street canyons creates a depression

