



The Salaca River – How a Biosphere Reserve Reacts to Climate Change / Rīga – a Flood Prone City

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The Salaca River case study area



The River Salaca Basin (total basin area 3570 km², river length 95 km) covers the major part of the North Vidzeme Biosphere Reserve (UNESCO-MAB). It is the fourth biggest salmon spawning area in the Baltic, and internationally approved hydroecosystem with high landscape and biological diversity.



Summary of the most significant CC impacts in the Salaca River Basin



- ≡ Changes in observed **water level regime** character (occurrence of spring floods, low water periods)
- ≡ Changes in **temperature regime**
 - tendency of increase in spring temperature
 - changes in ice cover days in the River Salaca
 - decreases of snow cover days in the basin
- ≡ Changes in **extreme weather events** (winter storms in coastal area);
- ≡ Changes in **vegetation** in the river basin
- ≡ **Overgrowing** of the River Salaca
- ≡ **Fish habitat losses**
- ≡ **Decrease of recreational value** for the River Salaca

Draft Vidzeme Planning Region's Spatial Plan (2007–2027)



- ≡ **Climate change aspects are not mentioned.** There are no high risk areas in relation to floods or erosion
- ≡ **Weather aspects are only mentioned in relation to specific condition of uplands**
- ≡ **Climate and water regime aspects and biological diversity are mentioned for the development of forestry** that is an important economic branch in the whole Vidzeme region although climate change aspects are not mentioned at all.



List of the involved stakeholders



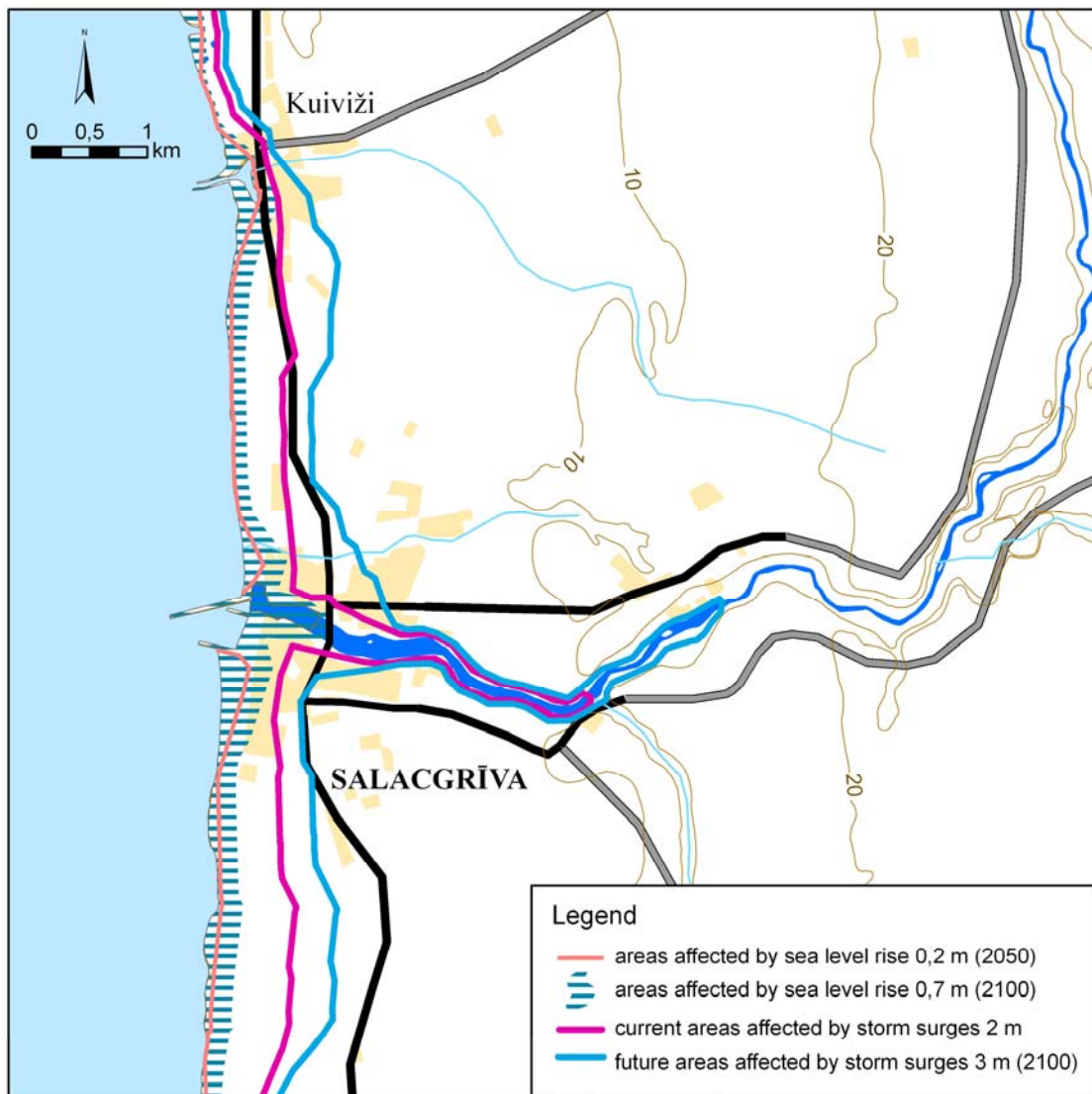
- ≡ **North Vidzeme Biosphere Reserve – administrators and scientists**
- ≡ **State institutions and agencies in the region (Regional Environmental Board and Agency, Fire and Rescue Service, Road Administration, Rural Development Service)**
- ≡ **Limbazi, Valmiera and Valka districts – administrators, planners, civil defence specialists**

Discussed adaptation measures – examples for the river Salaca Basin



- ≡ To avert damages of coastal erosion at the Baltic Sea coast:
 - construction of coastal defence structures at the dense settlement sites
 - the control or prohibit the expansion of settlement sites in vulnerable coastal area
 - to by-pass VIA Baltica motor way from the close proximity of the sea coast
- ≡ The sustainable development of the River Salaca:
 - To maintain balanced overgrown of river banks
 - Construction of stairs and footbridges in steep slopes
 - Creation of improved swimming places

Sea level rise map for the coastal zone at the River Salaca mouth



Data provided by
the ASTRA project
and Northvidzeme
Biosphere
Reserve

Description of discussions with stakeholders



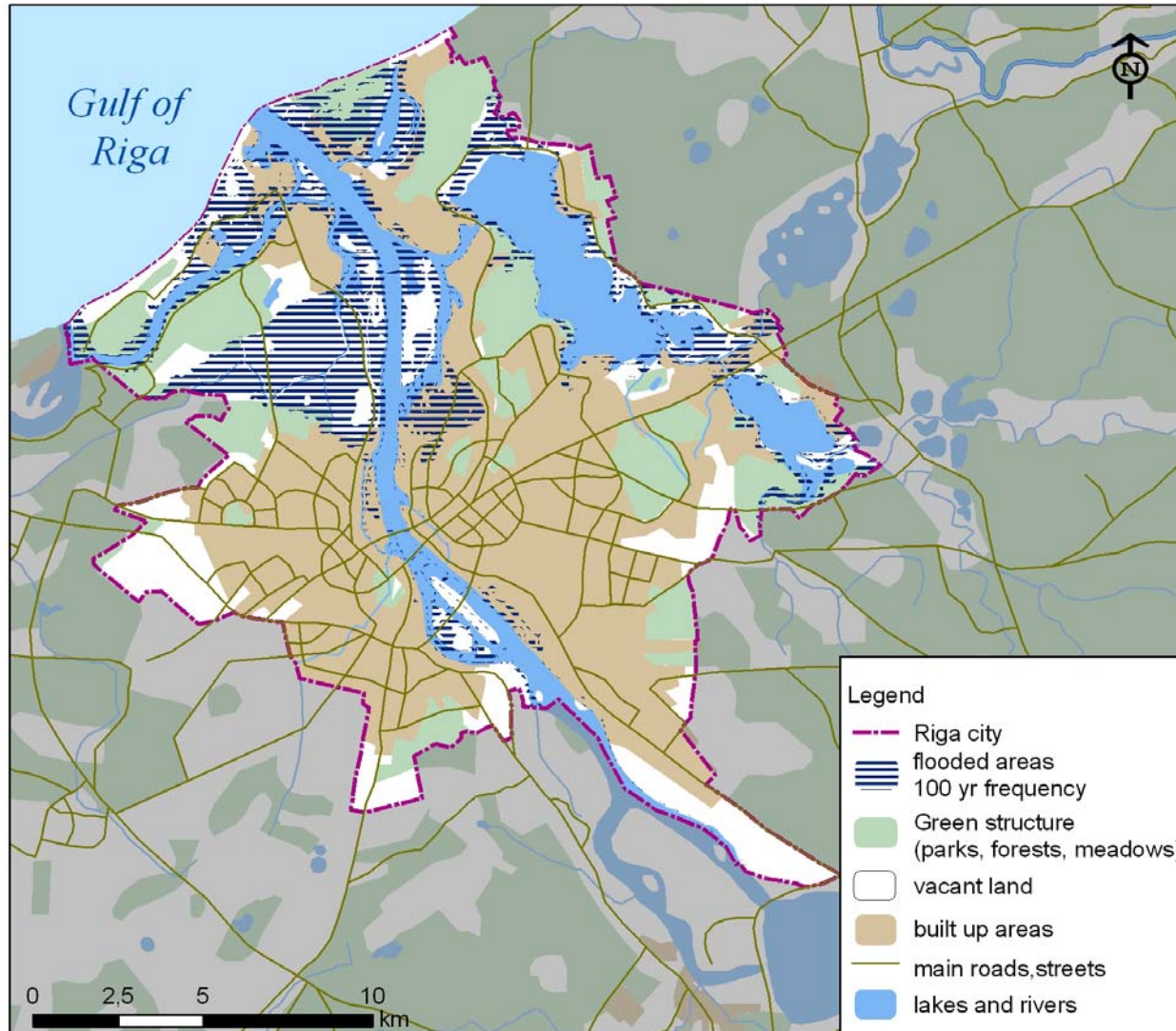
- ≡ Discussed issues were following:
 - Ecological status of the River Salaca in connection with CC
 - Environmental and Landscape Protection Plan and its role for CC adaptation planning
 - Adaptation strategies for the statutory spatial planning at various levels – cooperation with respective administrative levels
- ≡ The main findings from the seminar:
 - The interest of local people for participation in CC observations (particularly phenological observation)
 - The lack of the information about CC at appropriate spatial scale
 - The need for regular information exchange and discussions among stakeholders, particularly scientists, local politicians administrators and representatives of local mass media

Riga City case study area



- ≡ Riga City covers 307.17 km², of which
 - residential areas 21.8%
 - industrial and commercial areas 17.0%
 - streets and roads 8.0%
 - parks and forest parks 19.0%
 - water areas 15.8%
- ≡ Population density is 2434 per 1 km²
- ≡ Located at the coast of Riga Gulf and in lowland in the mouth of three major rivers: Daugava, Gauja, Lielupe

Riga City case study area



Climate change impacts in Riga City



- ≡ flood risk
- ≡ storm damage risk
- ≡ risk in groundwater level rise
- ≡ hydropower plant dam safety risks
- ≡ heat wave risk
- ≡ Affected economic sectors like - transport, recreational business,
- ≡ Affected infrastructure – coastal protection structures, water supply and canalizations systems, roads and bridges



Impacts of winter storm January 2005 in Riga City: photos: I.Kruze, M.Damberg

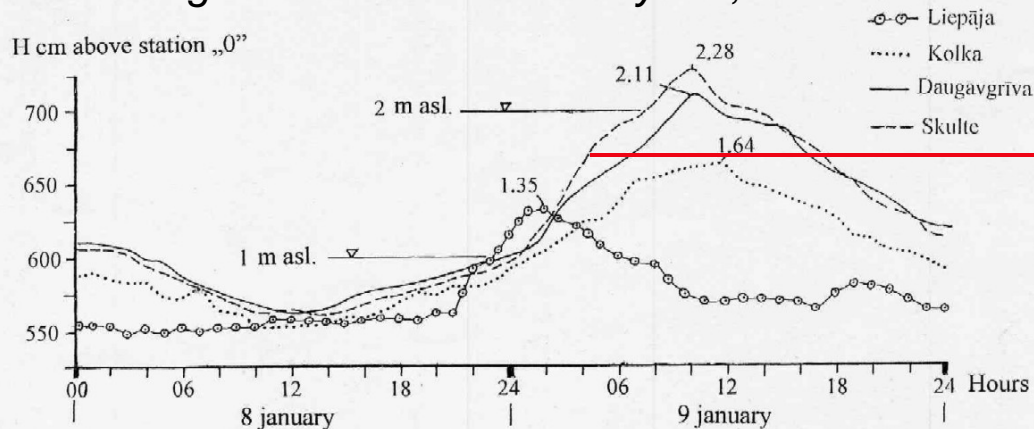
The main causes for floods in the Riga City



In Riga flood risks are associated:

- ≡ with wind-induced surges in the downstream of rivers;
 - most damaging changes (wind and wave erosion) when wind speed exceed 20-25 m/s and the water level rise by >1,5 m
 - In 1709 it reached 4,68 m in Riga (historic max)
 - In 1969 wind 40 m/s, water reached 2,29 m, in 2005 - 30 m/s and 2,13 m.
- ≡ the safety of dams in the valley of **Riga HPPs at the River Daugava** (Wieland *et al.*, 2005):
 - Limited spillway discharge capacity,
 - Need for rehabilitation of embankment dams and other minor repair works

Storm surges water levels January 8-9, 2005



Riga HPPs, volume 41Mm³

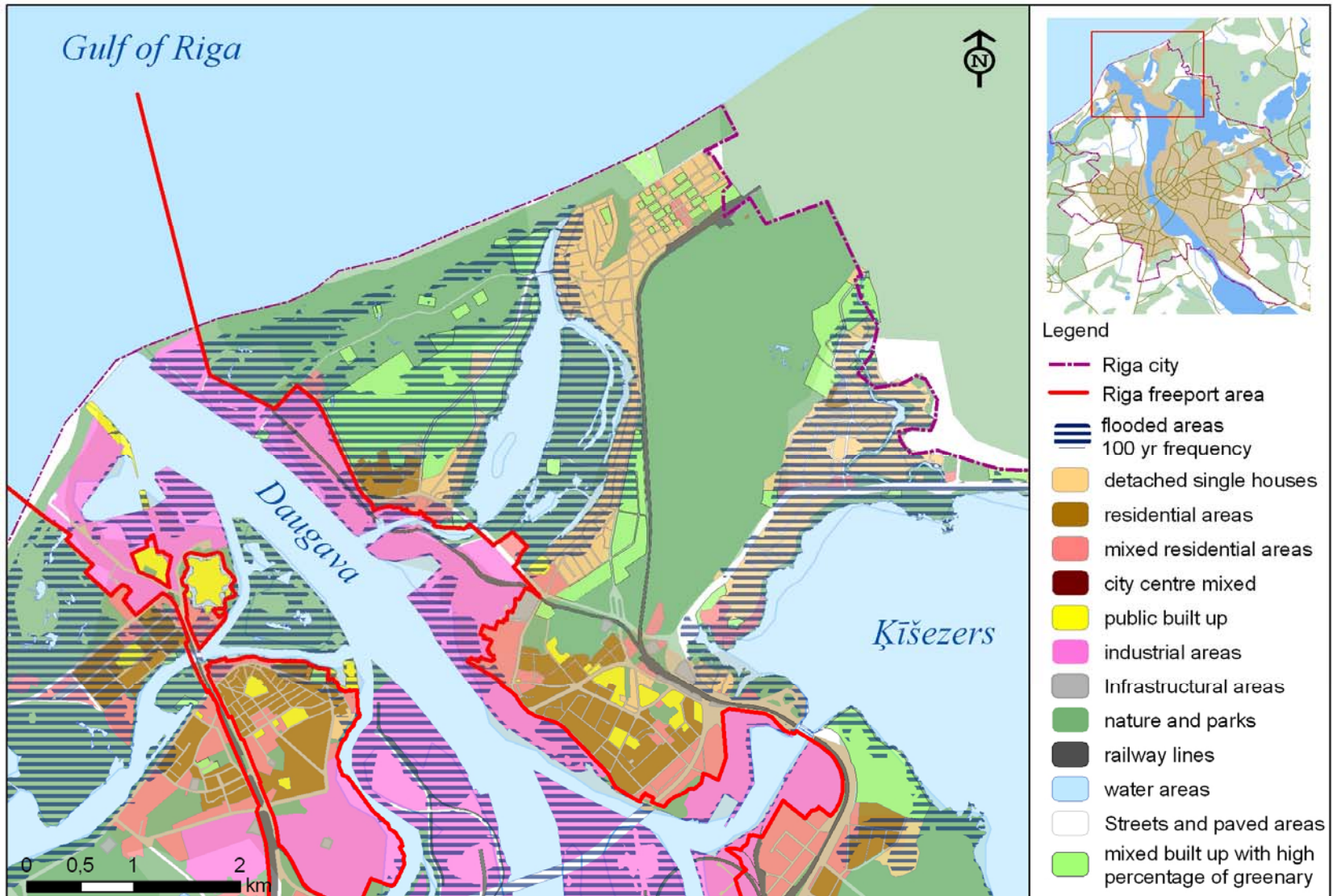


Reduction of risks by awareness and spatial planning



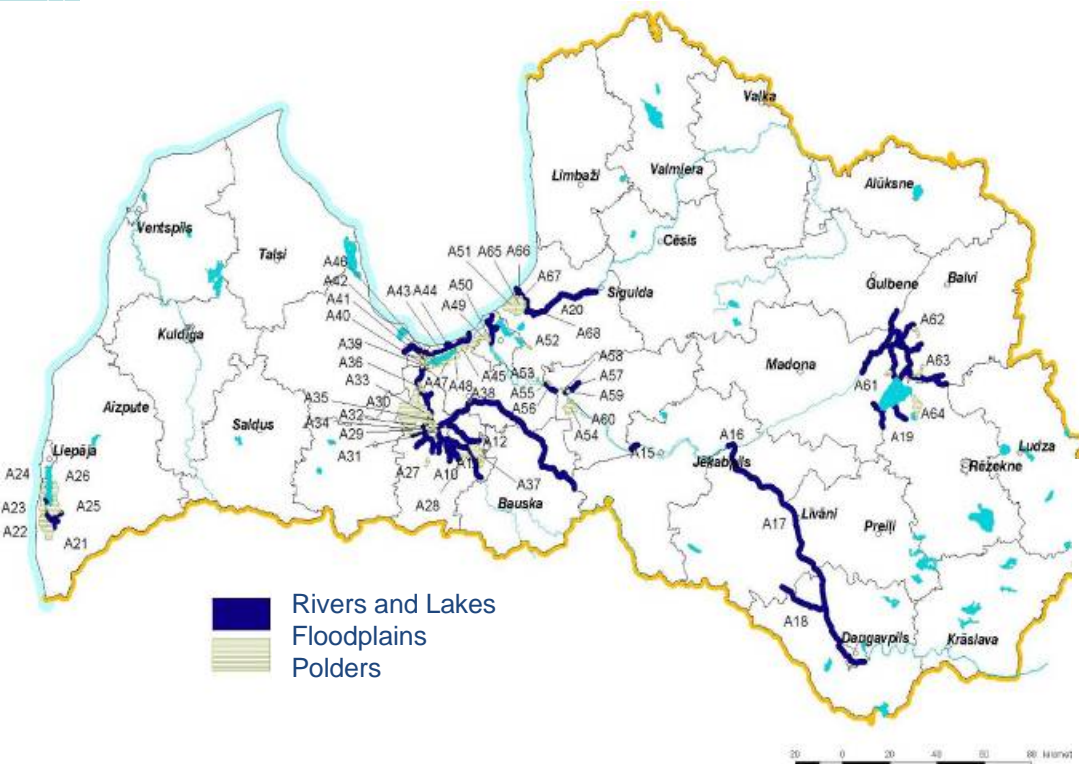
- ≡ The risk potential floodplain area can be reduced substantially by means of non-structural measures:
 - Flooding alarm system ⇒ as a key element for warning population in the flood plain
 - Land use planning ⇒ reduces of possible consequences of a flood wave damages
 - » Riga City Planning office established 125 years ago
 - » In 1994 democratic and integrated spatial planning system is established
 - » In 1995 Spatial Development Plan (1995-2006) for Riga adopted (flooded areas were not considered)
 - » In 1998 Spatial Development Planning Law adopted since (in 2002 it was replaced by the Spatial Planning Law)
 - » In 2006 new Spatial Plan (2006-2018) for Riga adopted (flooded areas indicated, climate change aspects are not taken account)



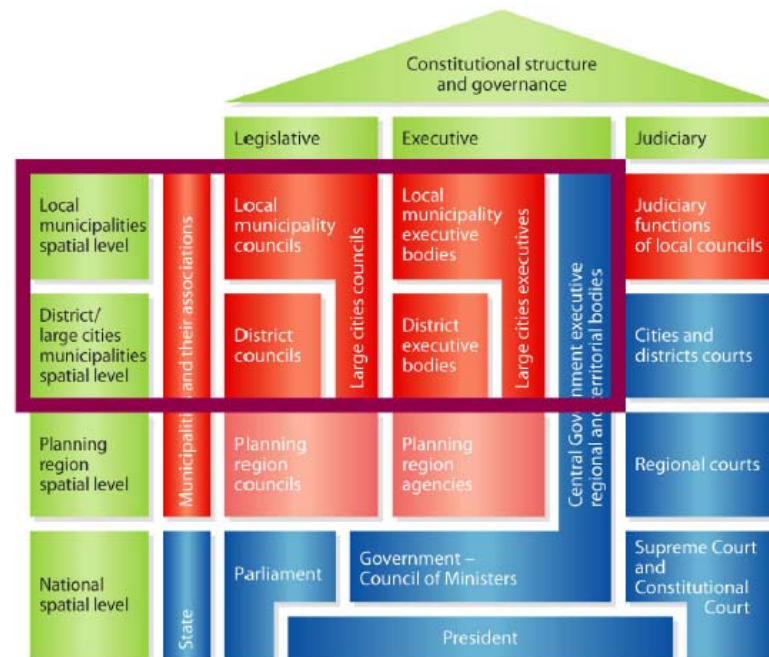


High Risk Territories of Flooding

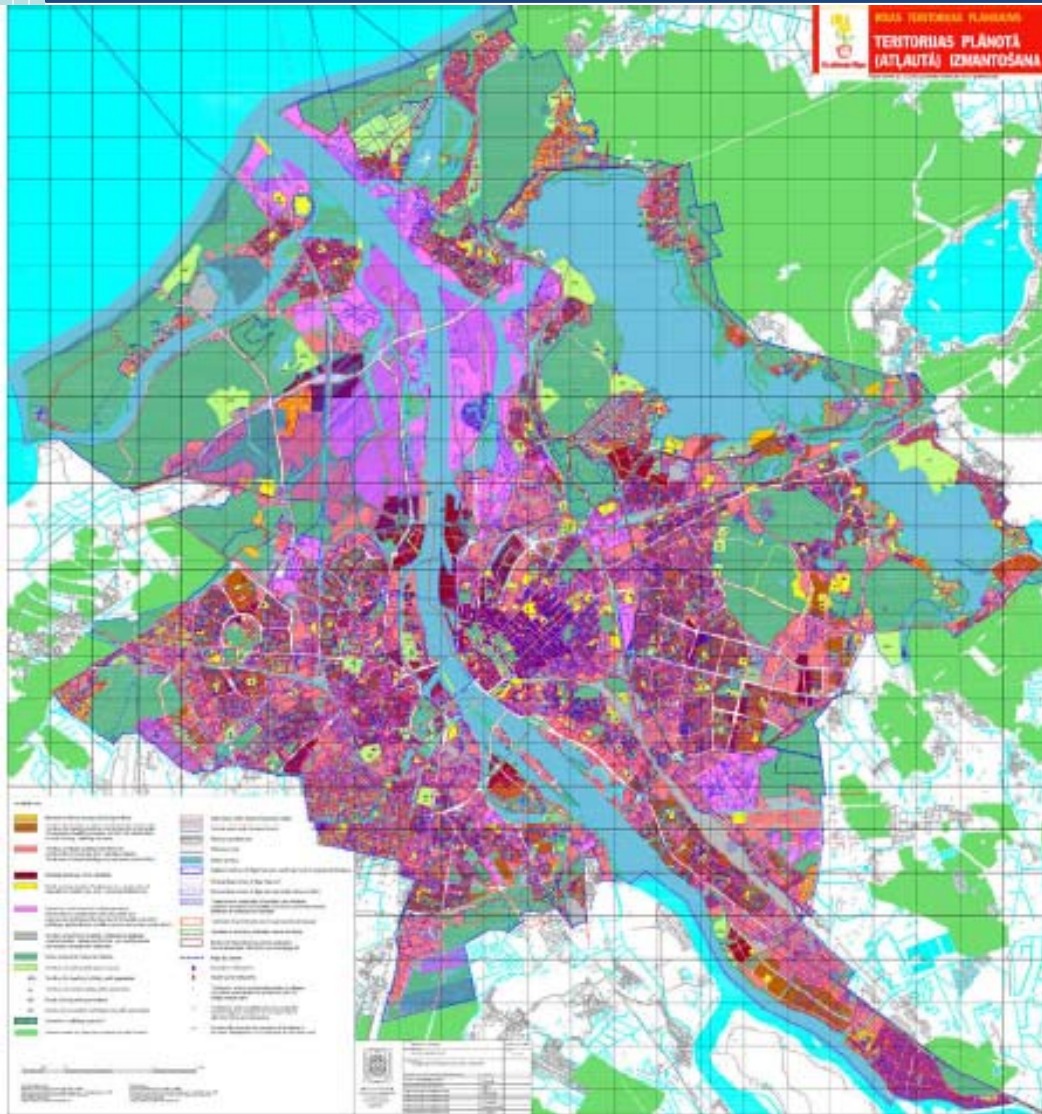
Source: Draft National Spatial Planning Guidelines, Ministry of Regional Development and Local Municipalities, 2004- not adopted



Rivers and Lakes
 Floodplains
 Polders



Riga Spatial Plan 2006-2018



Medium and long term documents:

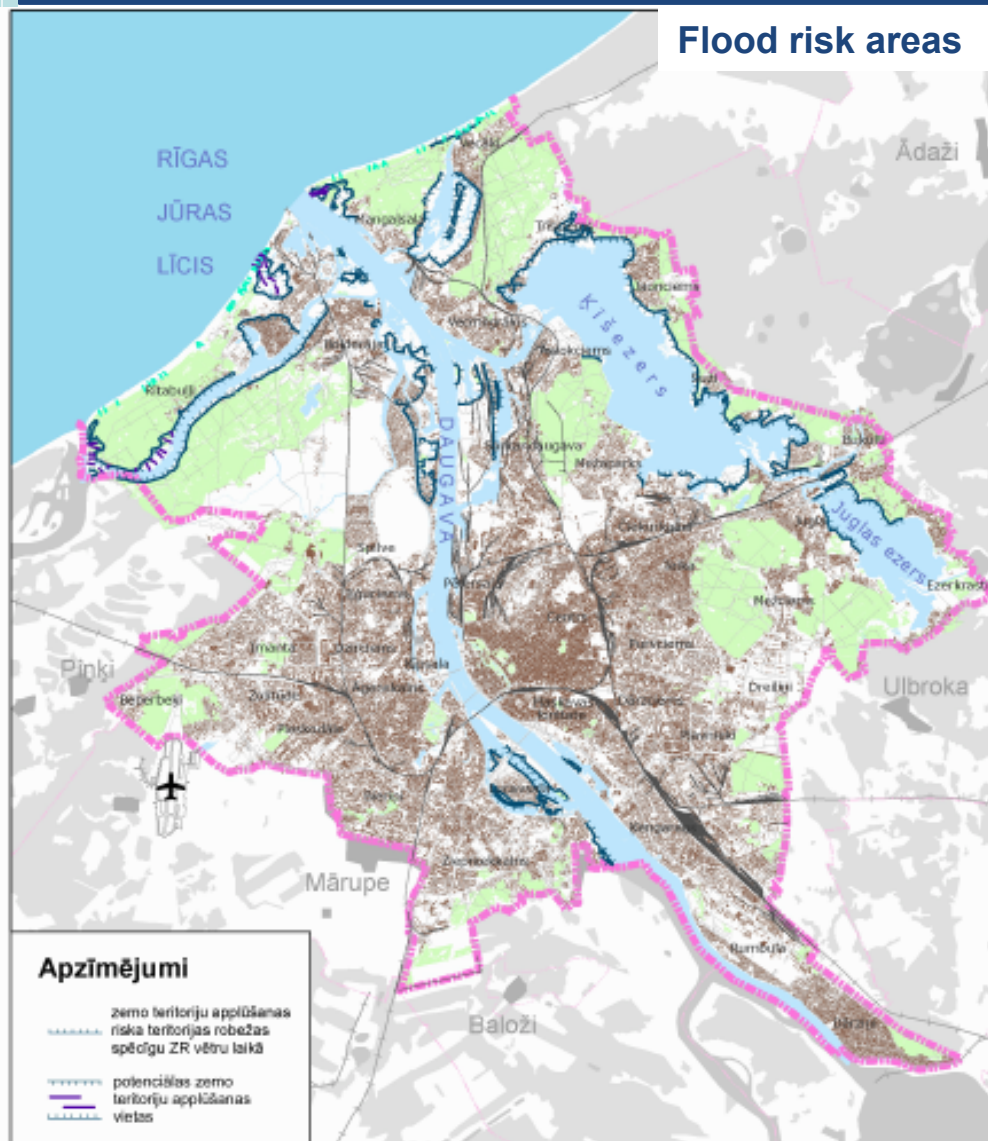
Spatial plan – 12 years;
Development (socio-economic) program – 7 years;
Long-term development strategy - 20 years.

Stakeholders and public involvement:

In the public participation round 4880 written comments, from them 1208 to keep undeveloped Uzvaras (Victory) Park – historically left without development due to flooding

High flood risk territories in Riga City

Source: Municipal spatial plan adopted 2005

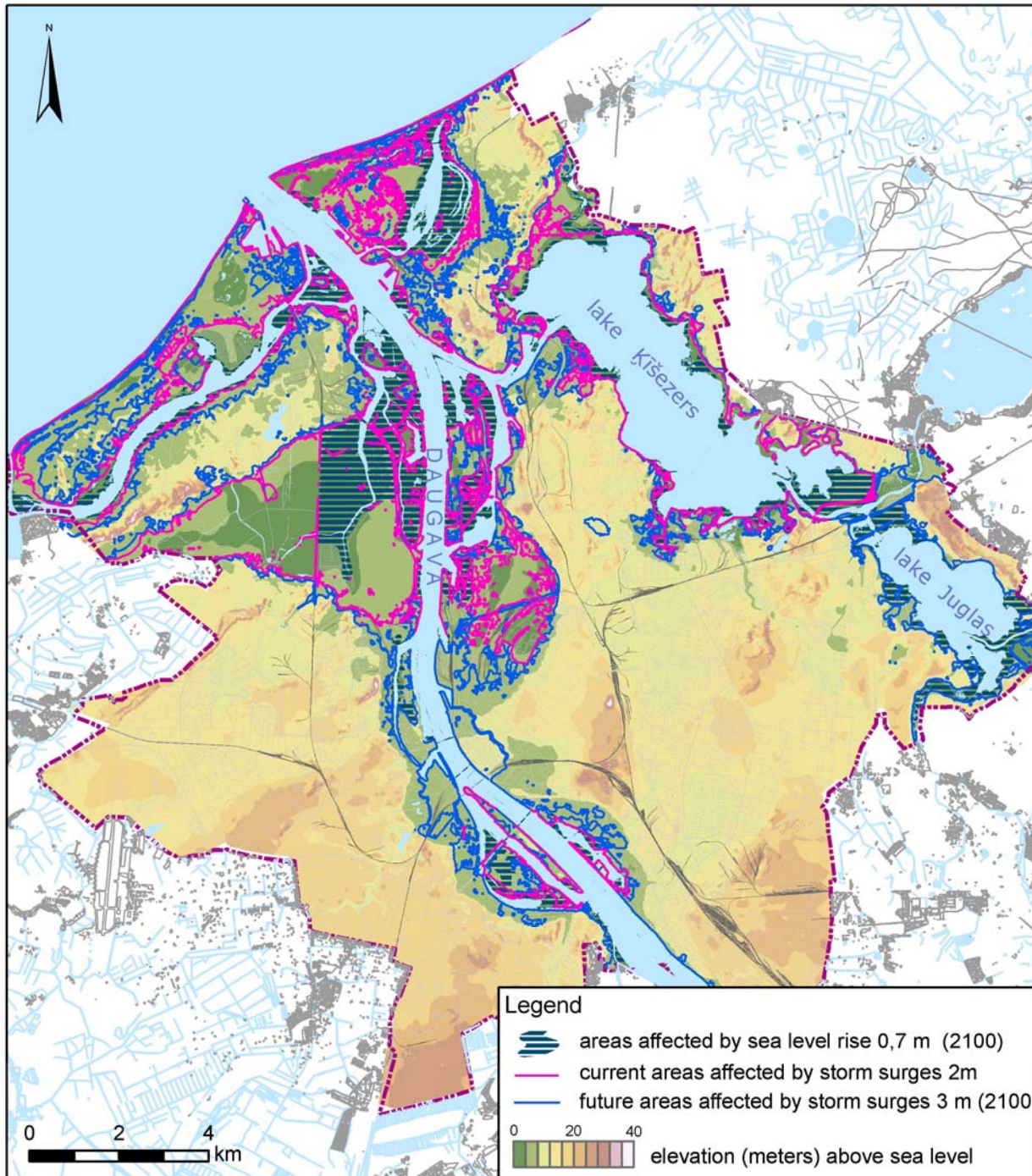


Excerpt from
Riga Spatial Plan 2006-2018

Historical flood records within territory of Riga are in areas, that traditionally have been undeveloped (pastures or green areas) or with low residential density (Spilves meadows, Purvciems, Kundziņsala, Mangaļi, Milgrāvis, Bolderāja)



*Riga from bird's-eye view
photo: J. Vitins*



Map of Sea level rise in Riga City, prepared within ASTRA project 2007

Activities performed within ASTRA project in Riga City



- ≡ Project participants and stakeholders have been acquainted with existing experiences (“success stories”) in the Baltic Sea area
- ≡ Participation in the project supported the intensification of climate change research in Latvia and involvement in research and stakeholder networking
- ≡ Winter storm “Erwin” (2005) impacts on the infrastructure of Riga have been studied. The analysis and conclusions were made for each of the different sectors affected and published on the ASTRA project website
- ≡ Sea level rise map for the Riga city was prepared based on the sea level rise model (data of Potsdam Institute for Climate Impact Research generated within ASTRA project) and the spatial information provided by the municipality of the Riga City

Our findings for the case studies in relation to the project ASTRA



- ≡ National Climate Change Mitigation Program 2005-2010 adopted in 2005 however adaptation approaches in both in national and local levels are generally missing in Latvia
- ≡ ASTRA Project Conference “Climate change and waters” and a book “Climate change in Latvia” (2007) was a step towards awareness rising at national level on adaptation strategies
- ≡ Vulnerability in respect to impacts of climate change is high particularly coastal densely built up areas like parts of Riga City and Salacgriva Town
- ≡ In Riga City planned and permitted built areas in Daugava River low coast, islands and Spilve meadows, will increase the risk of floods.

Our findings for the case studies in relation to the project ASTRA



- ≡ Awareness of stakeholders and inhabitants is low, but the interest is arising when actual and detail local information is provided – particularly the maps with potential water level rise and flooded areas for 2100
- ≡ More cooperation is needed at national level between environmental protection authorities (responsible for climate change aspects) and spatial planning authorities
- ≡ Stakeholders should be informed as early as possible (as part of public participation process) on the local climate change impacts
- ≡ Before detailed planning in built up areas, the potential flood risk assessment has to be done and the flood prevention program has to be prepared.

