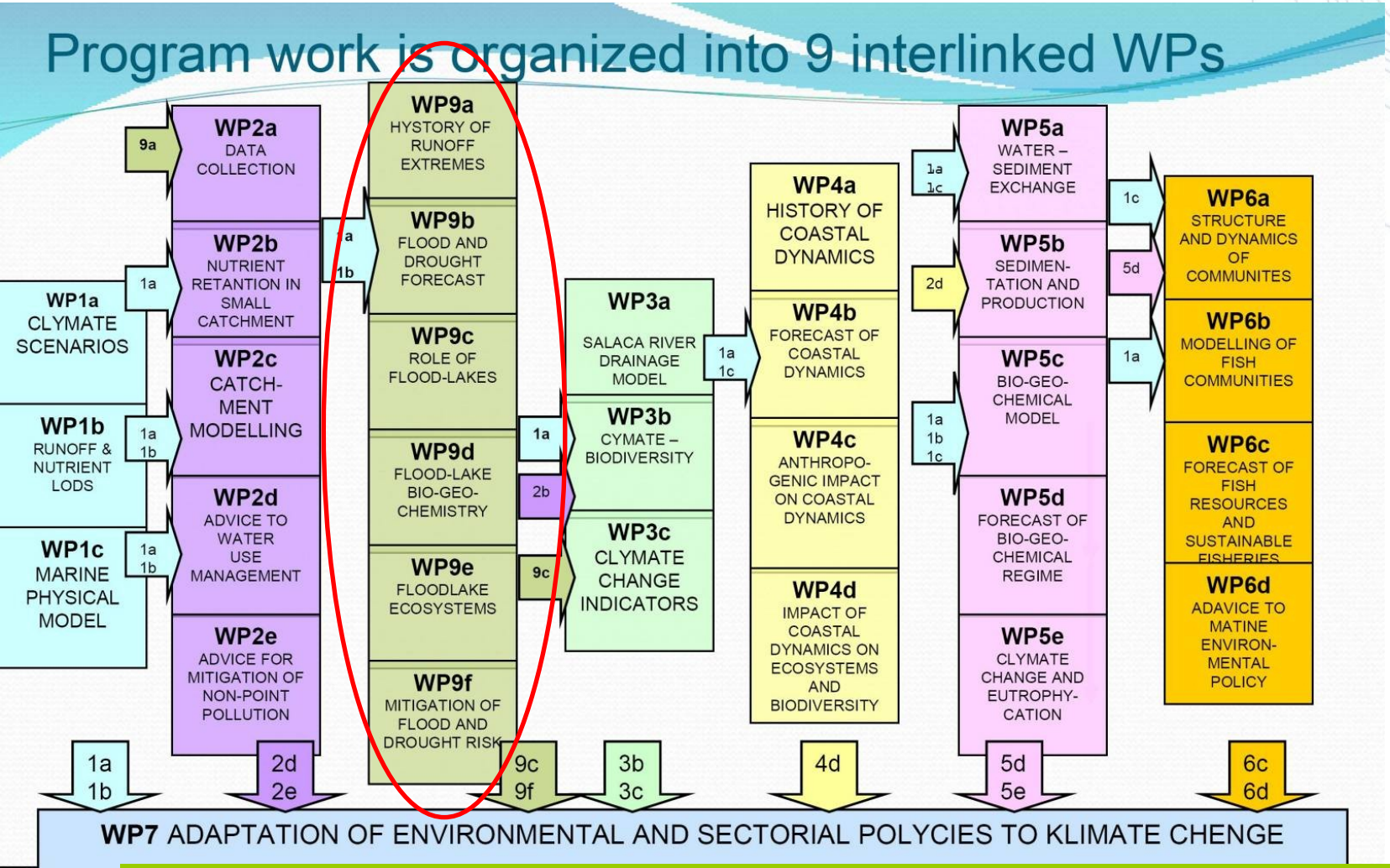
Runoff extremes caused by the climate change and their impact on territories under the flood risk

WP 9 Daugavpils University

professor Artūrs Škute

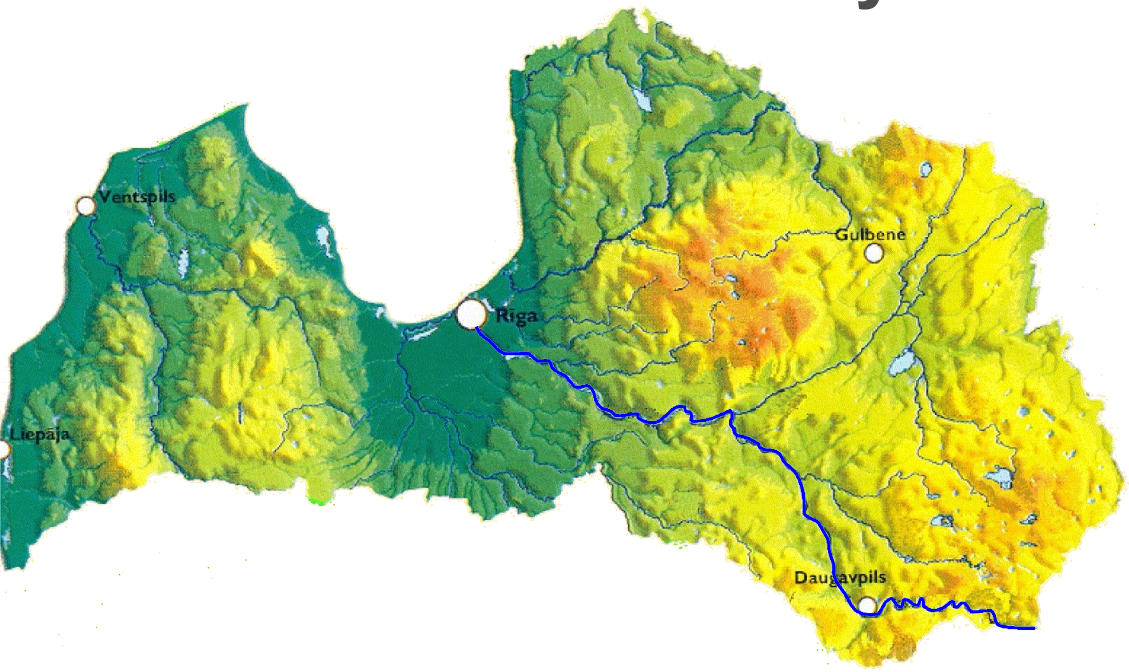
KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Relations to other WP



The aim is to forecast climate change impact on recurrence and regime of runoff extremes: floods and droughts. Identify the impact of these phenomena on flood-plane ecosystem in the Middle-Daugava region.

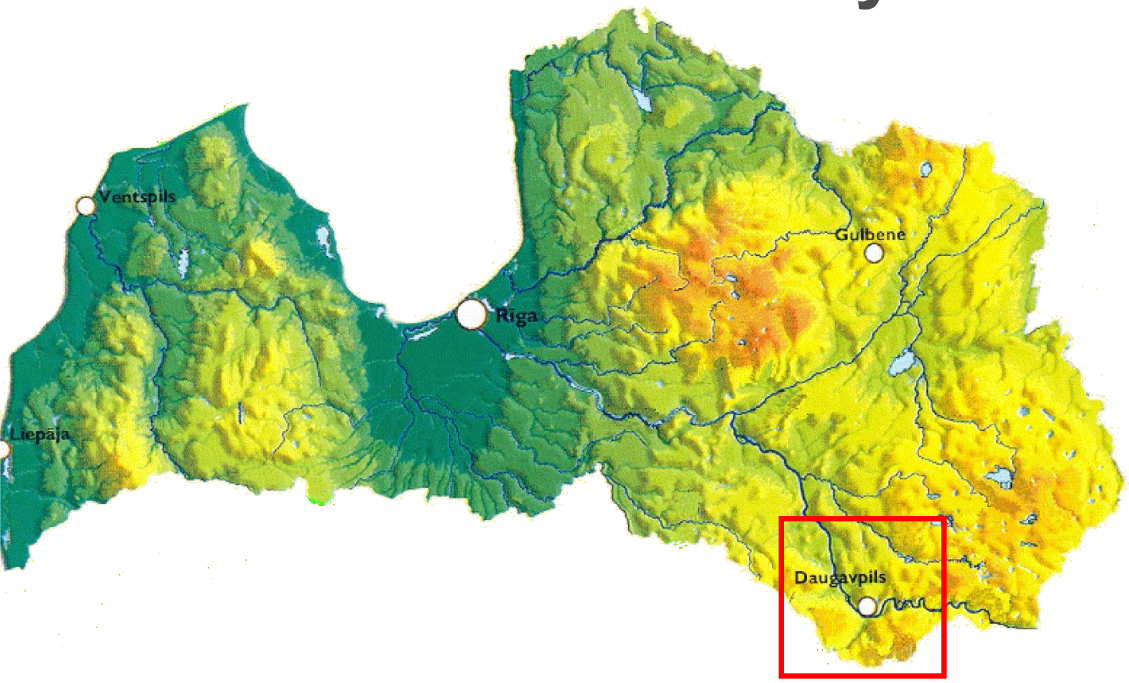
Location of study area



The Daugava (Zapadnaja Dvina) is among the largest rivers in Eastern Europe. It is about 1005 km long, flows through Russia, Byelorussia and Latvia and drains to the Baltic Sea. Its drainage area is about 87900 km^2.

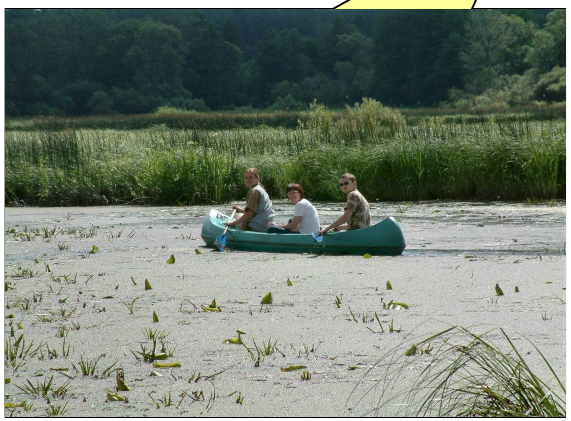
Since the second part of the 20th century, dams of three hydroelectric power stations have completely blocked river transport and migratory paths for salmon, eel and lamprey along the Lower Daugava in Latvia and initiated the mass development of the blue-green algae in summer.

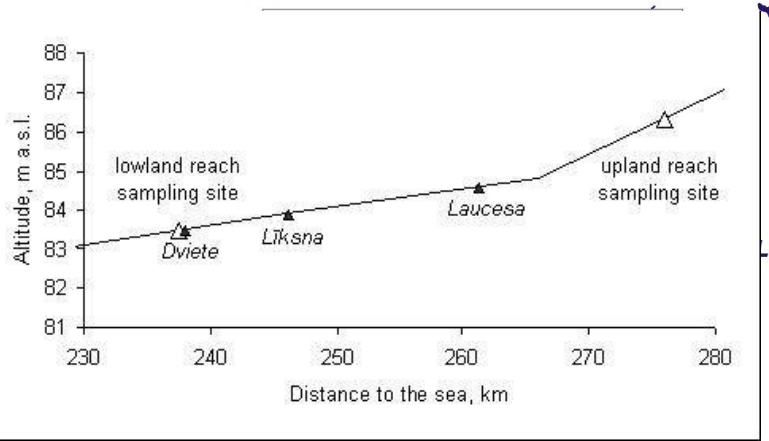
Location of study area



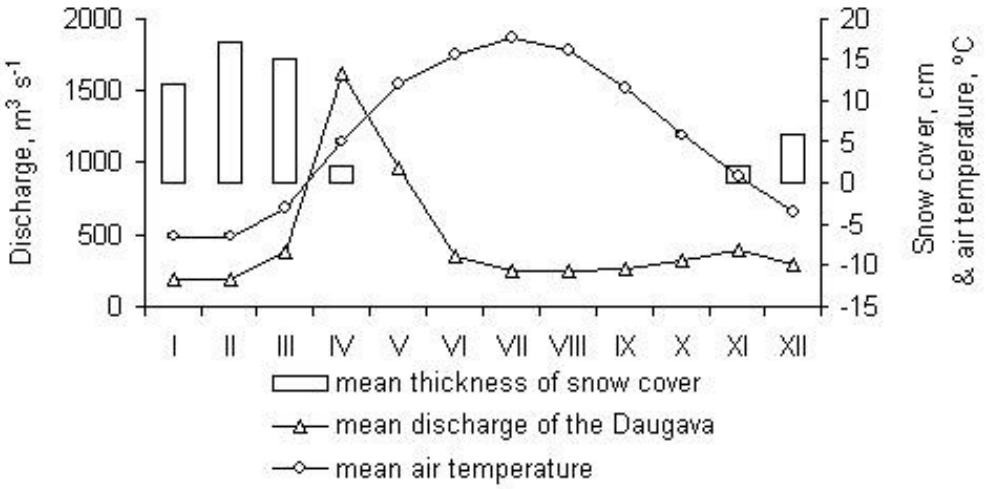
However, hydrology of the middle and upper reaches remains more or less natural, without any impact from the existing dams located further downstream. Seasonal fluctuation of the water level in this stretch is determined mostly by natural factors, such as the amount of snow accumulated in the drainage area during winter, the rate of the air temperature increase and snow melt in spring or formation of ice jams during the spring floods.

Location of study area





Location of study area



About ½ of total annual amount of the Daugava's runoff is formed during the spring floods. The largest discharge is usually observed in April, during the intense snowmelt. The mean largest discharge of the Daugava at Daugavpils City during the spring floods is about 1600 $m^3 s^{-1}$, during the summer low water period – 200 $m^3 s^{-1}$

History of runoff extremes

Assessment of historical and current frequency of flood recurrence and climate change impact on it.

- to summarise a base of the current meteorological and hydrological data,
- to carry out their statistical analysis,
- to estimate the connection of the runoff extreme regimes to the character of long-term climate changes

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Flood and drought forecast

Forecast changes in regime of floods and drought based on the scenarios of hydrological regime

Develop the Daugava floodplain digital elevation model in the Naujenes-Jēkabpils part of the river Daugava valley. On the basis of this, to determine the borders of the flood-risky territories taking into account various flood levels, and to estimate the role of the Daugava flood-plane in diminishing the flood risk.

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKMĒ UZ LATVIJAS ŪDEŅU VIDI

Role of floodplains

Identify the role of natural flood-plains in stabilizing of hydrological regime

- To further develop regular observations, launched in 2003, of hydro-meteorological regime and hydrological parameters of the Daugava middle flow where the biggest in Latvia flood-plane lakes are located.
- The aim of this study is to estimate the impact of possible climate change on the Daugava river and identified role of flood-plane and wetlands in mitigation of risk caused by runoff extremes.

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Flood-plain biogeochemistry

Determine flood and drought impact on bio-geochemical fluxes in flood-plain systems and the catchment

- To adapt a regional erosion model EuroSEM to the small confluence basins in the situation of climate and land using changes in order to estimate the transfer of nutrients and suspended substances from the upper parts of the hydrographic network into Daugava.
- To prognose the speed of regressive erosion on the basis of the data obtained from field studies.

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKMĒ UZ LATVIJAS ŪDEŅU VIDI

Floodplain-lake ecosystems

Assess the impact of floods and droughts on floodplain-lake ecosystems of river Daugava

Using collected data regarding dynamics, amount, spread, and productivity of benthos and plankton organisms, as well as changes of environmental factors, to develop models of water ecosystems dynamics, and with their help to estimate the influence of floods and droughts on the quality of flood-lake water and flood-lake ecosystems.

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Mitigation of flood and drought risk

Using results of the study and prognosis, to develop recommendations for agriculture, forestry, and territory planning bodies with the aim of minimizing the negative impact of floods and droughts on well-being of population and local economy.

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Work schedule

Tasks	2007				2008				2009			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
History of runoff extremes												
Flood and drought forecast												
Role of floodplains												
Floodplain biogeochemistry												
Floodplain ecosystems												
Mitigation of flood and drought risk												

KALME
VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

Thank you for the attention!

KALME

VALSTS PĒTĪJUMU PROGRAMMA
KLIMATA MAIŅAS IETEKMĒ UZ LATVIJAS ŪDEŅU VIDI