Social measures in the portfolio of the flood risk management: case study of Jelgava city, IMPETUS project

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WATERSIDE – A SPACE FOR WATER, LAND AND PEOPLE INTERACTIONS: PRACTICES AND CHALLENGES IN RIVER BASIN MANAGEMENT

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What do inhabitants think: main threats linked to water

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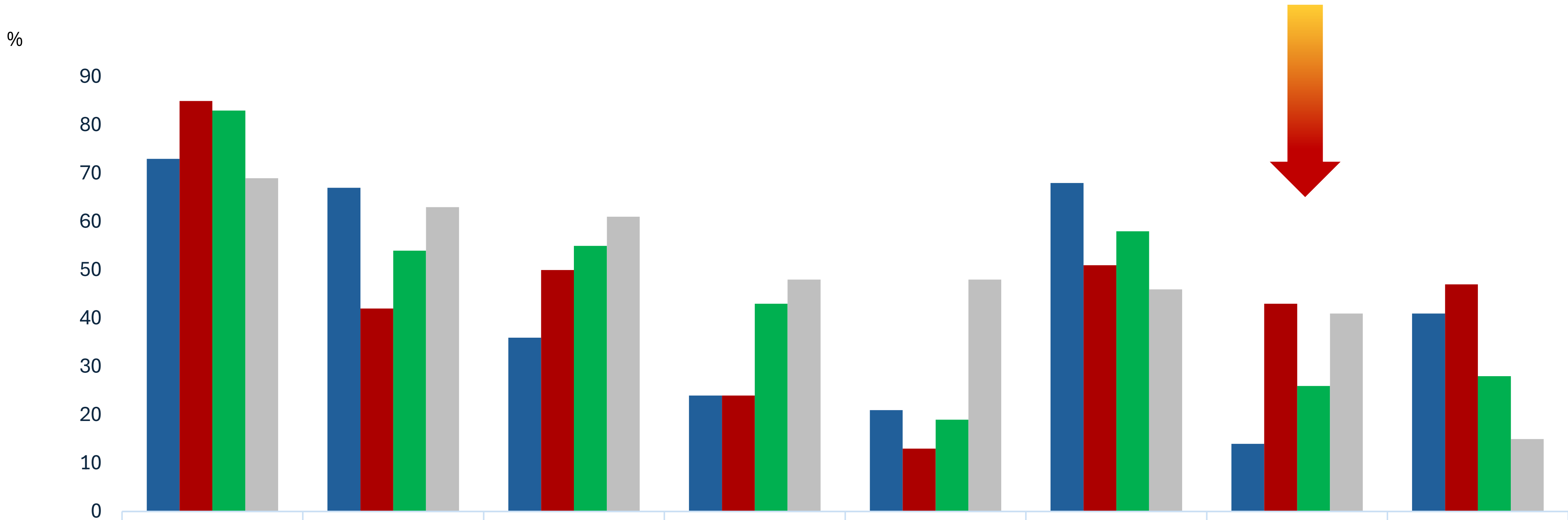

	Pollution	Overconsumption , wastage	Climate change	Droughts	Water shortages	Degradation of natural habitats	Floods	Algae growth
Estonia	73	67	36	24	21	68	14	41
Latvia	85	42	50	24	13	51	43	47
Lithuania	83	54	55	43	19	58	26	28
EU27	69	63	61	48	48	46	41	15

Estonia Latvia Lithuania EU27

Source: Special Eurobarometer 550, 2024

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Floods: the climate impact chain

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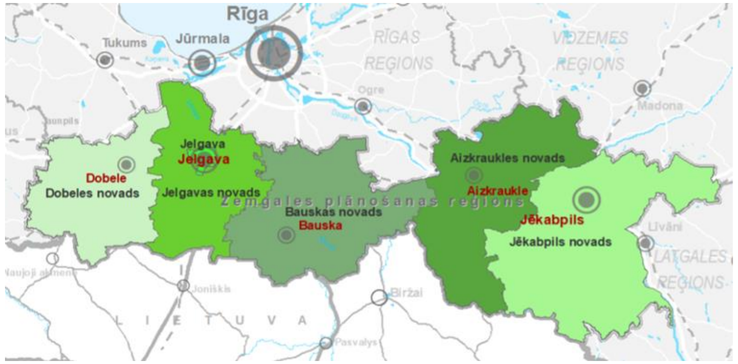
Latvia

Precipitation



HAZARDS

- Change in Temperature patterns
  - Ice jams
  - Snowmelts
- Increasing heavy rain events
  - Higher river water levels

IMPACTS

- River floods (overflowing)
- Pluvial (flash) floods (overwhelming of stormwater drainage systems)

- Transport interruptions
- Construction damages
- Road damages
- Disruption of services (electricity)
- People evacuation/supplies
- Loss of agricultural crops

- Business disruption
- Load for Rescue / Social care service

EXPOSURE

- Agricultural land
- Infrastructure networks (roads)
- Buildings
- Low-lying communities near rivers

RISKS

Loss and damages due to floods in agriculture, infrastructure, and settlements

VULNERABILITY

Sensitivity	*(Lack of) adaptive capacity*
Large areas of crop monocultures	Lack of agricultural insurance practices
Old and low-capacity urban infrastructure for rain-water management	Insufficient early warning system
Clogged rural drainage systems	Lack of water retention (NB) solutions
Impervious surfaces	Non-restrictive building permissions
High dependency on upstream river conditions (transnational river basin)	Low awareness raising of inhabitants
	Low capacity of authorities

adaptation options and pathways

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Changing climate patterns of flood hazards

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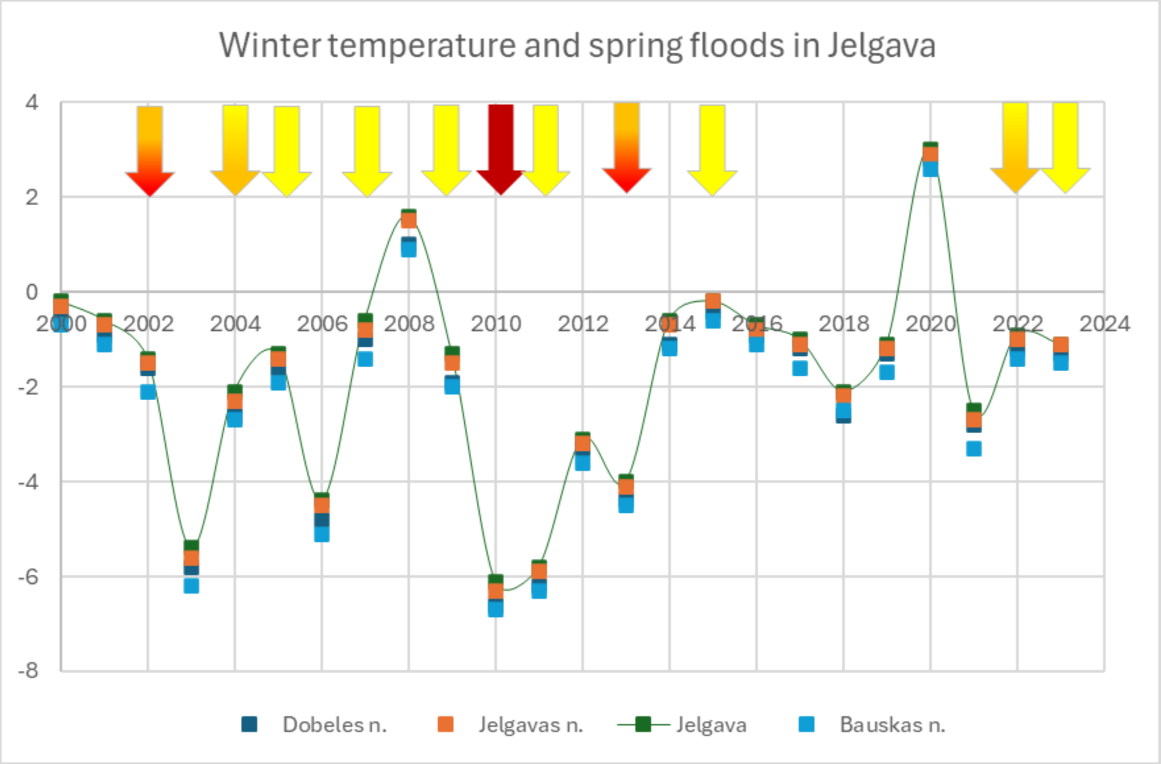
- **Spring river floods** caused by frequent and early snow and ice melt impact the entire region by raising water levels in rivers and adjacent floodplains



Average winter temperature and spring flood frequency in **Jelgava** from 2000 to 2024. (Flood warning levels above zero water level 169 cm – yellow, 253 cm – orange, 308 cm – red).

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Changing climate patterns of flood hazards

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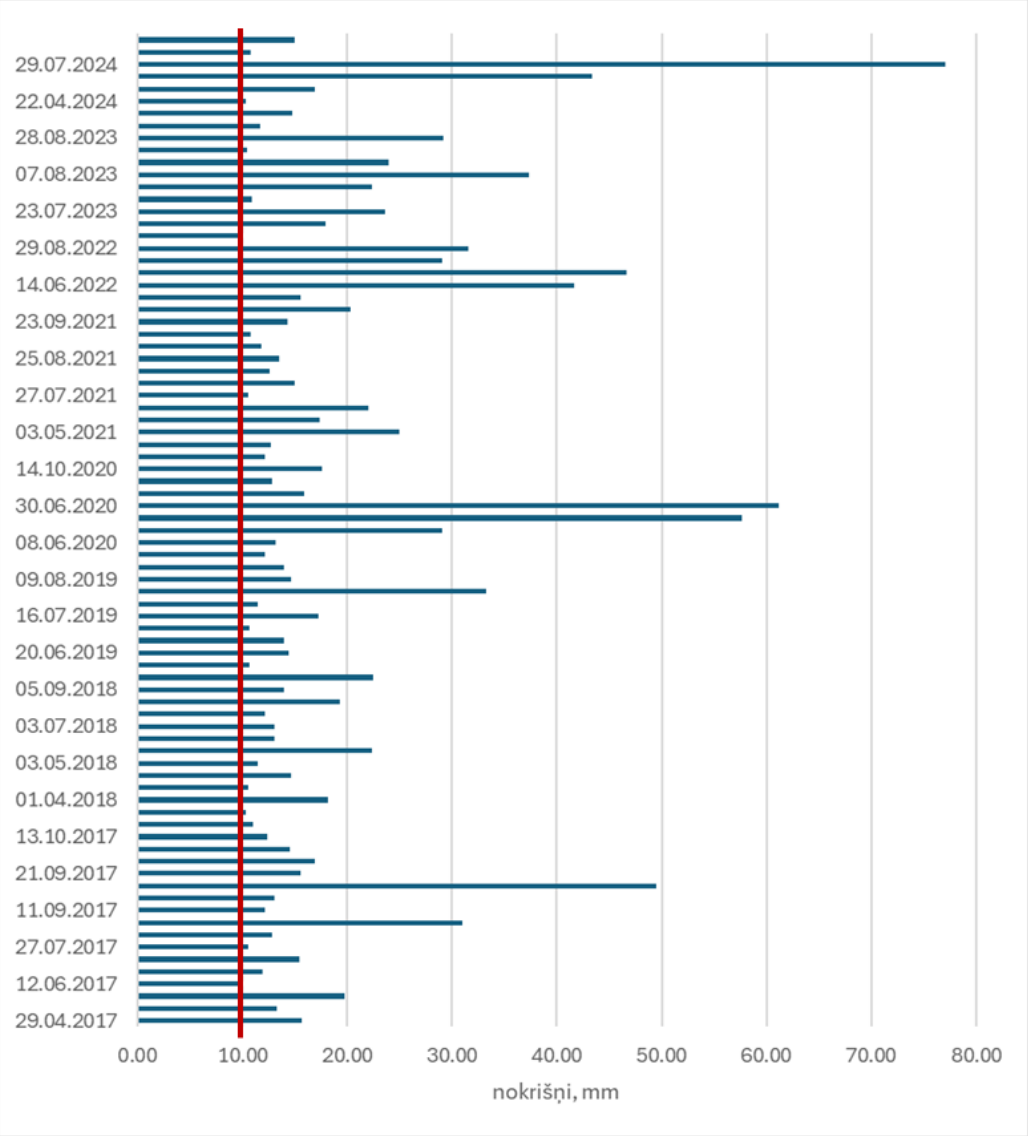
- Increased intensity in **heavy rainfall** poses a greater threat to urban areas due to their higher population density, established urban drainage infrastructure, built-up and impervious surfaces that restrict natural water infiltration and drainage.

10 mm/ 24 hours – heavy rain events in **Jelgava**



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What are critical thresholds?

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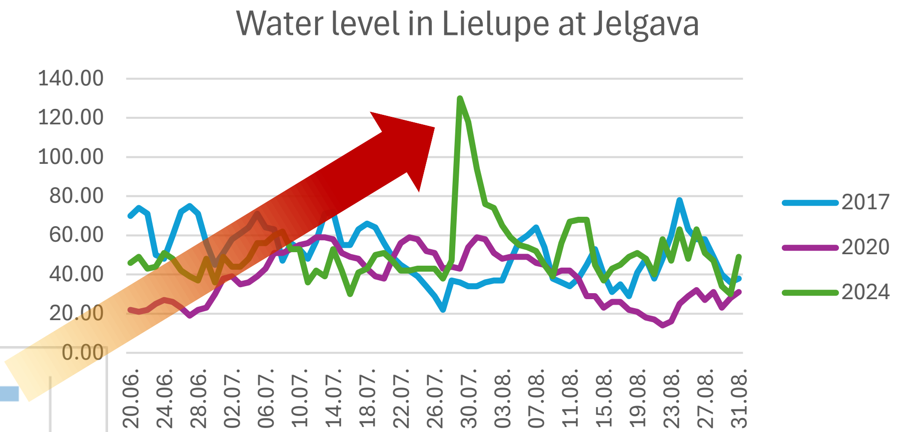
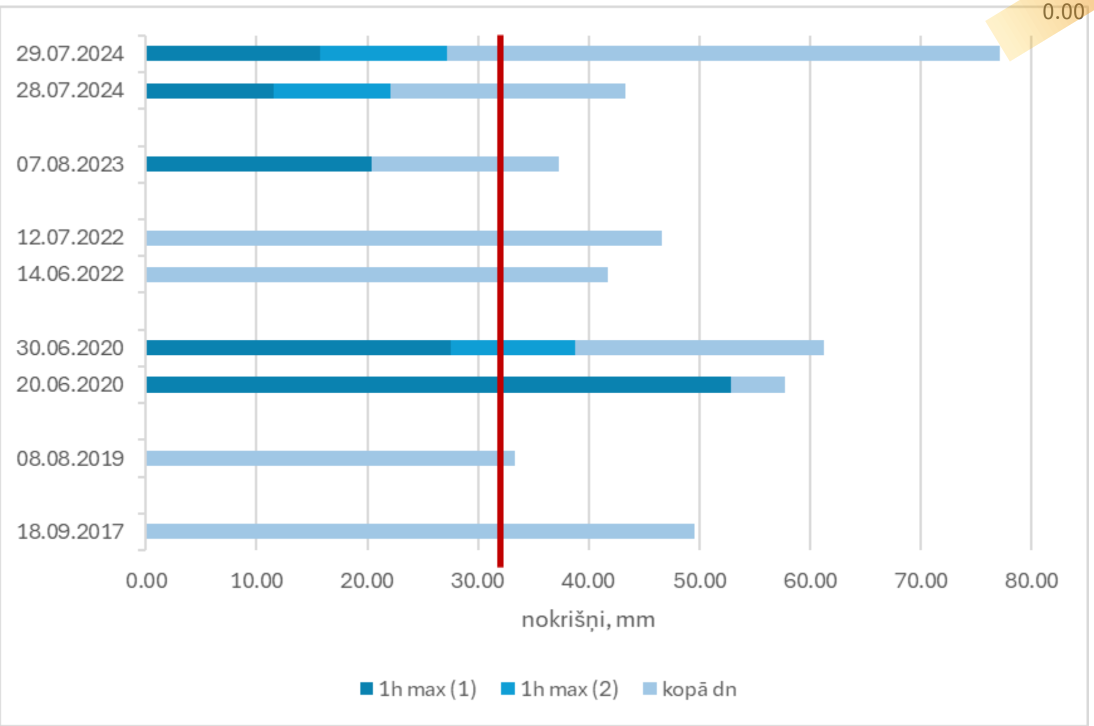
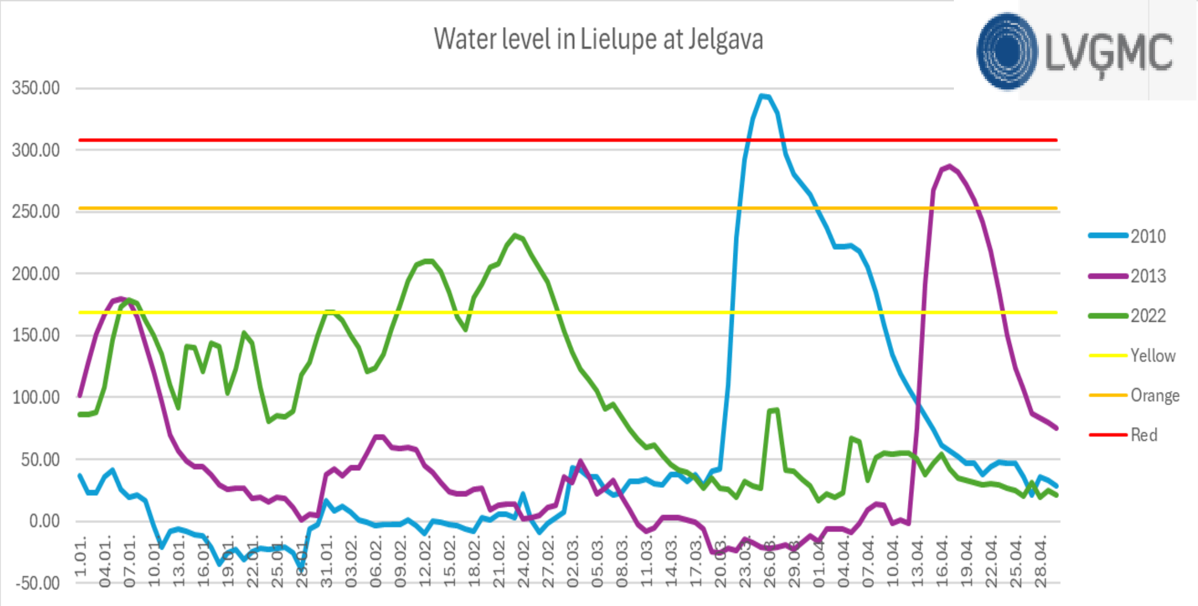
- Heavy rain- 32 mm/24 hours;
- red line – capacity of Jelgava city storm water system





Water levels in rivers:
Yellow level – every 2-5 years
Amber level – every 10 years
Red level – every 50 years



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What are the current adaptive capacities or their shortcomings?

Sensitivity	*Lack of) adaptive capacity*
Large areas of crop monocultures	Lack of agricultural insurance practices
Old and low-capacity urban infrastructure for rain-water management	Insufficient early warning system
	Lack of water retention (NB) solutions
Clogged rural drainage systems	Non-restrictive building permissions
Impervious surfaces	Low awareness raising of inhabitants
High dependency on upstream river conditions (transnational river basin)	Low capacity of authorities

Setting the objective: to support the region in better managing the risk of river floods and heavy rainfall (flash floods), ultimately reducing the frequency and extent of flooded areas in both rural (agricultural) lands and urban settlements.

Identification and selection of the adaptation option:

- «non-structural» or capacity building measures
- «structural" or infrastructure measures to reduce the risk of flash floods in urban areas and to reduce the risk of river floods/rain floods in rural areas

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Identified adaptation options

Non-structural measures

- Improving flood risk early warning system (EWS)
- **Increasing awareness of inhabitants on actions to be taken in case of flood occasions**
- Improving the efficiency of actions of competent authorities in case of flood risks
- Applying restrictions for construction of buildings in flood risk prone areas

Urban structural

- Ensuring the functionality of open ditches and culverts in urban environment
- Increasing capacity of urban rainwater collection systems and pumping stations
- Application of NBS for water retention in urban environment (wetlands, rain gardens, bioswales, etc)
- Using of water permeable surface covering materials

Rural structural

- Improvement of functionality of the drainage systems in rural areas, particularly on agriculture land
- Application of NBS for water retention in rural areas
- Cleaning of riverbeds to ensure the river flow

Methodology / Approach to evaluation of options

- co-design and co-creation with stakeholders from multi-level governance structures in Latvia:
  - local communities
  - authorities of the Zemgale region: regional institutions such as the Energy Agency and the Administration of the Zemgale Planning Region,
  - farmers and environmental NGOs,
  - national agency and ministry responsible for water and flood risk management.

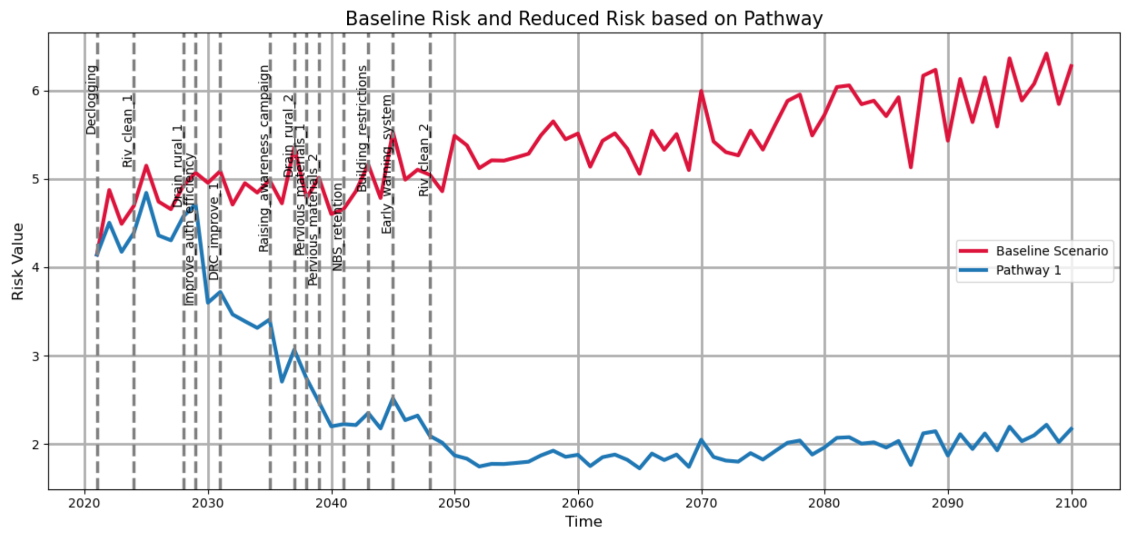
Stakeholder Workshops in 2024-2025

	Semi-quantitative approach											
Criterion	Open ditches	Rainwater collection	NBS urban	Permeable surface	Drainage rural	Cleaning rivers	NBS rural	EWS	Awareness	Capacity building for authorities	Restrictions for built up	Flood Risk Fund
Effectiveness (relevance to achieve objective)	+++	+++	++	++	+++	+++	++	++	+++	+++	++	++
Lifetime/ sell-by date/sell-by condition	++	++	++	++	++	++	++	++	++	++	++	+
Feasibility -TRL	++	++	++	++	++	++	++	++	++	+	+	+
Feasibility - SRL	++	++	++	++	++	++	++	++	++	++	+	++
Economic Costs*	- -	- - -	- -	- -	- - -	- -	- -	- -	- -	- -	- -	--
Co-benefits	++	++	++	++	++	++	++	++	++	++	++	++
Unintended effects/hidden risks	- -	- -	-	-	- -	-	- -	-	-	-	-	+
Implementation time (if needed)	+	++	+	+	++	++	+	++	+	+	++	++

Climate data and flood impact analysis derived from national and global data and information sources

Modeling and evaluation of pathways

- The Risk Emerging Problems Inference Engine (REPIE) – tool providing evaluation and quantification of risks to climate change and to the system vulnerability (in cooperation with the IMPETUS project partner NTUA, Greece).
- Vulnerability risks: residents, roads, buildings, arable land
- Evaluation criteria/ factors
  - Efficiency
  - Feasibility level
  - Total costs

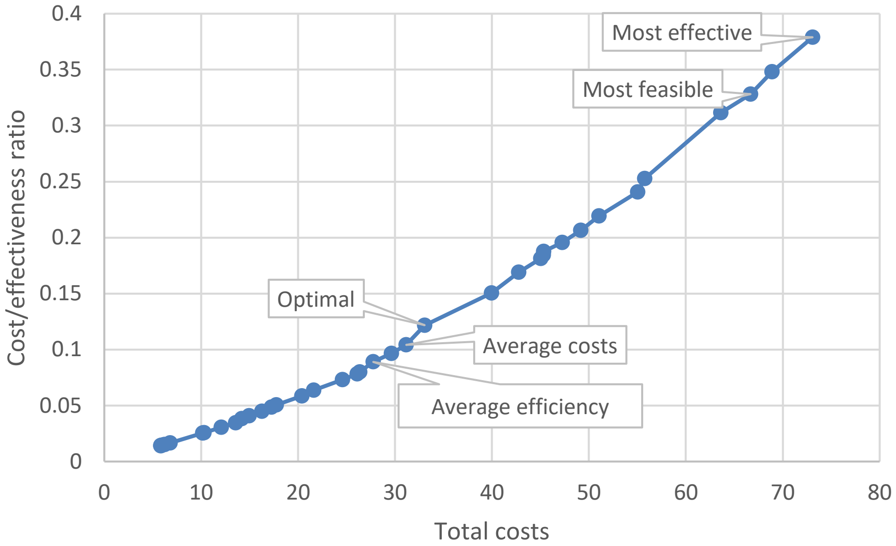


Factor	Score
Effectiveness	+++++
Deviation from Budget	+++++
Feasibility (TRL/SRL)	+
Total Cost	+

Modeling results SSP5 climate scenario

- Combinations of various measures: **37 alternative pathways**

Assessing the modeled pathways



Most effective – highest efficiency evaluation result, rich set of measures to implement
Most feasible – highest technological (TRL) and social (SRL) readiness level by the feasibility criterion
Optimal – based on efficiency and total costs interrelation
Average efficiency – based on average from 37 alternatives
Average costs – based on average from 37 alternatives

Year	Baseline (modelled risk)	Risk reduction efficiency from baseline				
		Pathway 1. Most efficient	Pathway 2. Most feasible	Pathway 3. Optimal pathway	Pathway 4. Average efficiency	Pathway 5. Average total costs
2030	4.95	1.35	1.46	1.79	1.28	1.35
2035	4.98	1.57	2.35	2.19	1.32	1.90
2040	4.60	2.40	2.17	2.03	1.14	1.72
2045	5.53	3.02	2.96	2.36	1.35	1.96
2050	5.49	3.62	2.94	2.25	1.74	1.85
2075	5.33	3.51	3.24	1.96	1.63	1.63

Type of adaptation measures (options) in the portfolio of pathways

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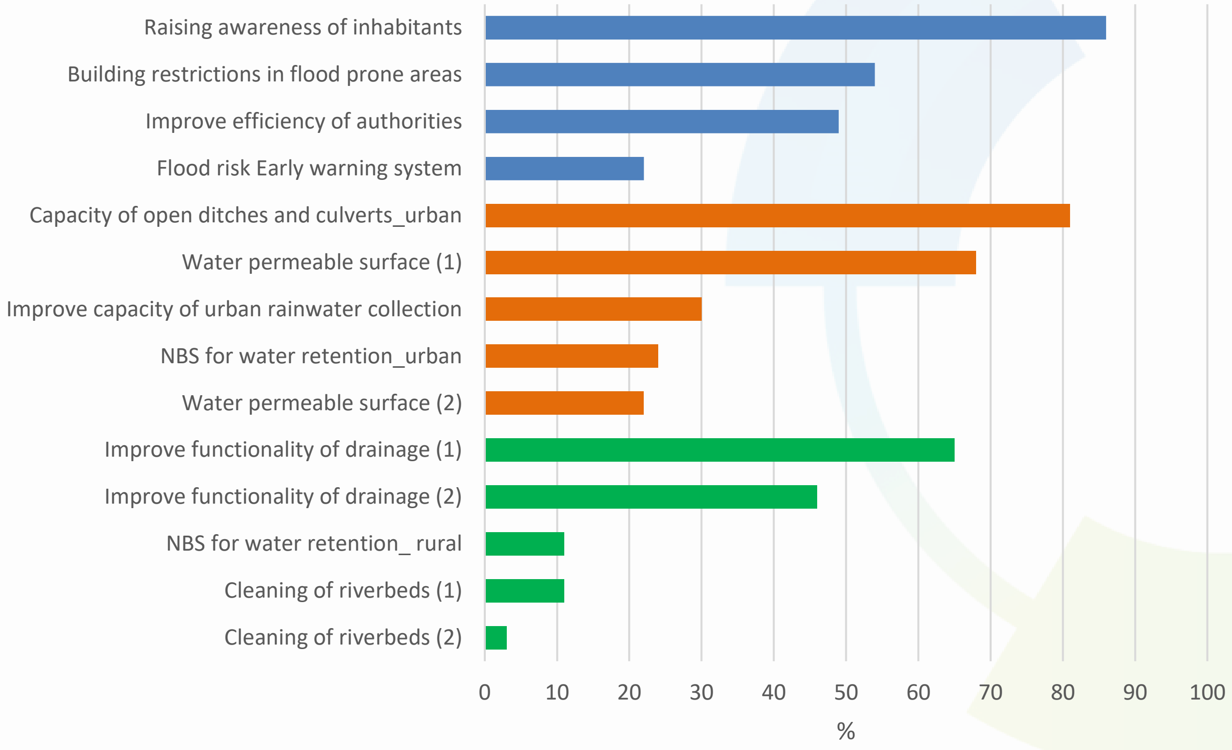

Non-structural measures

Urban structural measures; multiple application of some measures

Rural structural measures; multiple application of some measures

Raising awareness of inhabitants is the most selected measure form 37 alternatives!

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Indicative efficiency of information measures

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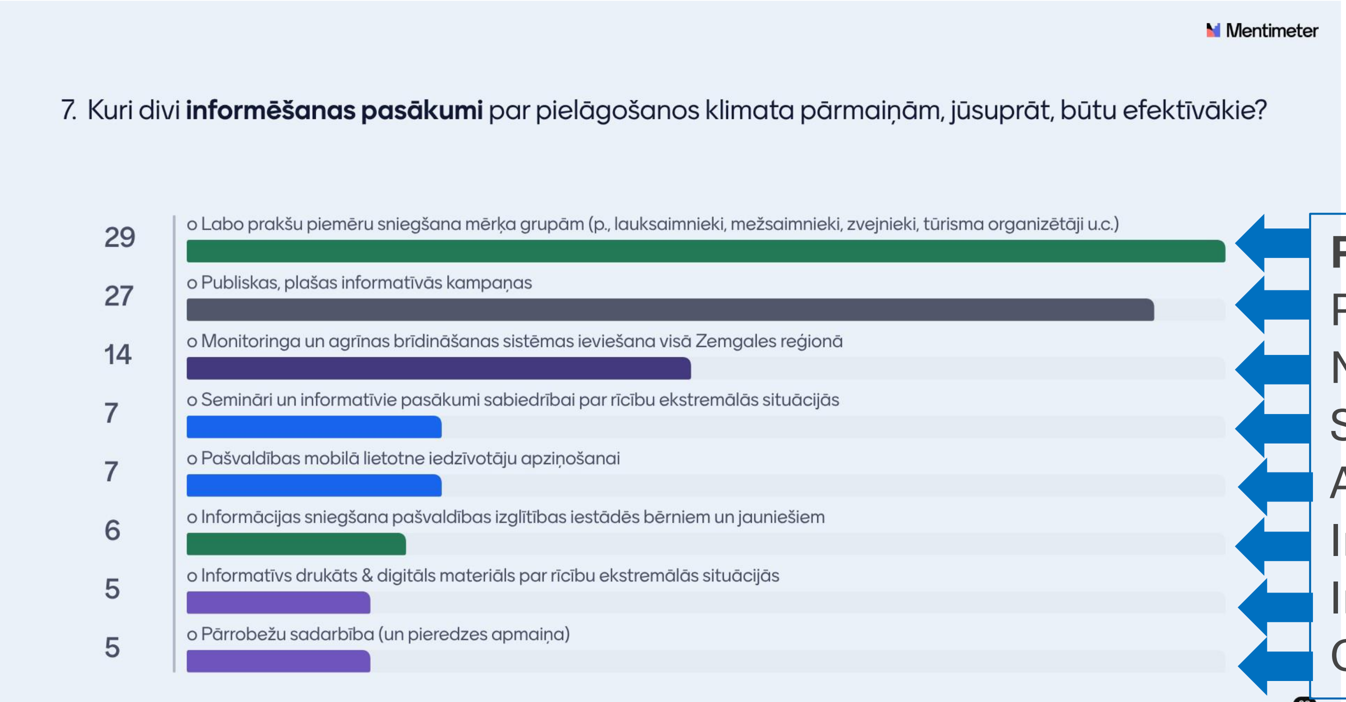

Source: survey of participants (39 responses) at the event on NBS, 05.06.2025

Provide best practice examples to target groups
Public, large-scale information campaigns
Monitoring and early warning system
Seminars and information events for the public
A municipal mobile app for informing residents
Information to children and youth in education
Informative printed & digital material on actions
Cross-border cooperation and experience exchange

Social measures to climate change adaptation and flood risk management

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Provoke interest

Climate is changing and people`s thinking must change with it.

Provide information to residents in a way that is understandable and accessible to them

Promote understanding

Climate campaigns as part of City Festivals and other events

Bringing together various focus groups to discuss future courses of action

Educate

Need to educate students, who are our future, about adaptation solutions

Starting at the school level – information, importance and consequences from climate change

Practical training

Field training to residents for specific disaster situations

Practical activities – to inform, obtain feedback and clarify further action

Source: IMPETUS meeting with SH at Joint climate, energy and environment coordination working group , Jelgava, 05.12.2024

Conclusions

- Reduction of risks related to climate change by flood risk management is best achieved in combination of structural and non-structural measures
- Social measures have prominent role in the portfolio of flood risk management options
- Raising awareness of inhabitants to flood risk management shall be directed from provoking interest to engaging in practical training

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Turning climate commitments into action

Thank you

Any questions?

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