

Interactive Data Processing, Visualization and Forecasting Environment for Flood Monitoring and Forecasting and Decision Support in Water Management

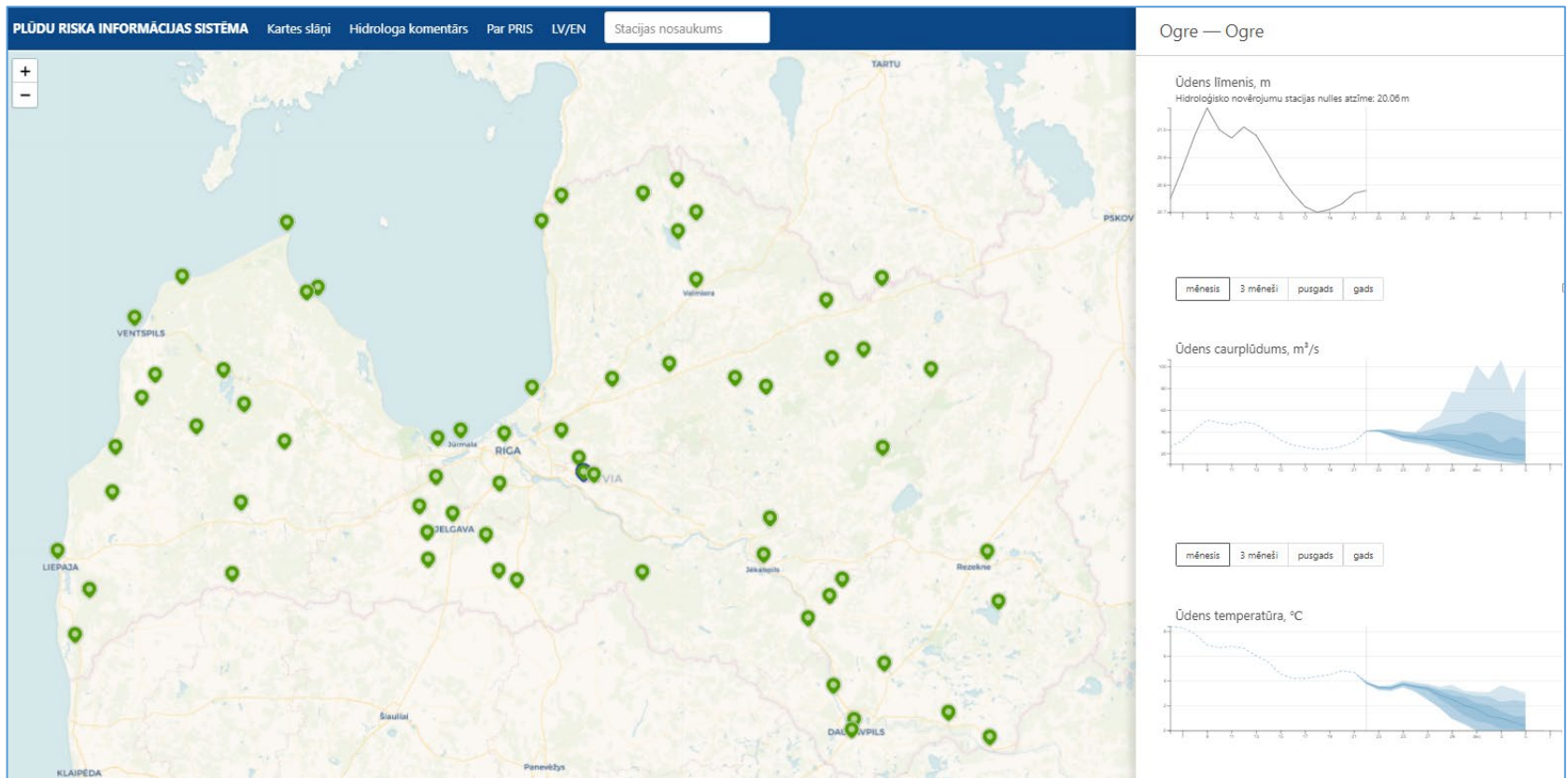
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Riga Technical University

23. 11. 2021

Existing Solution at Country Level

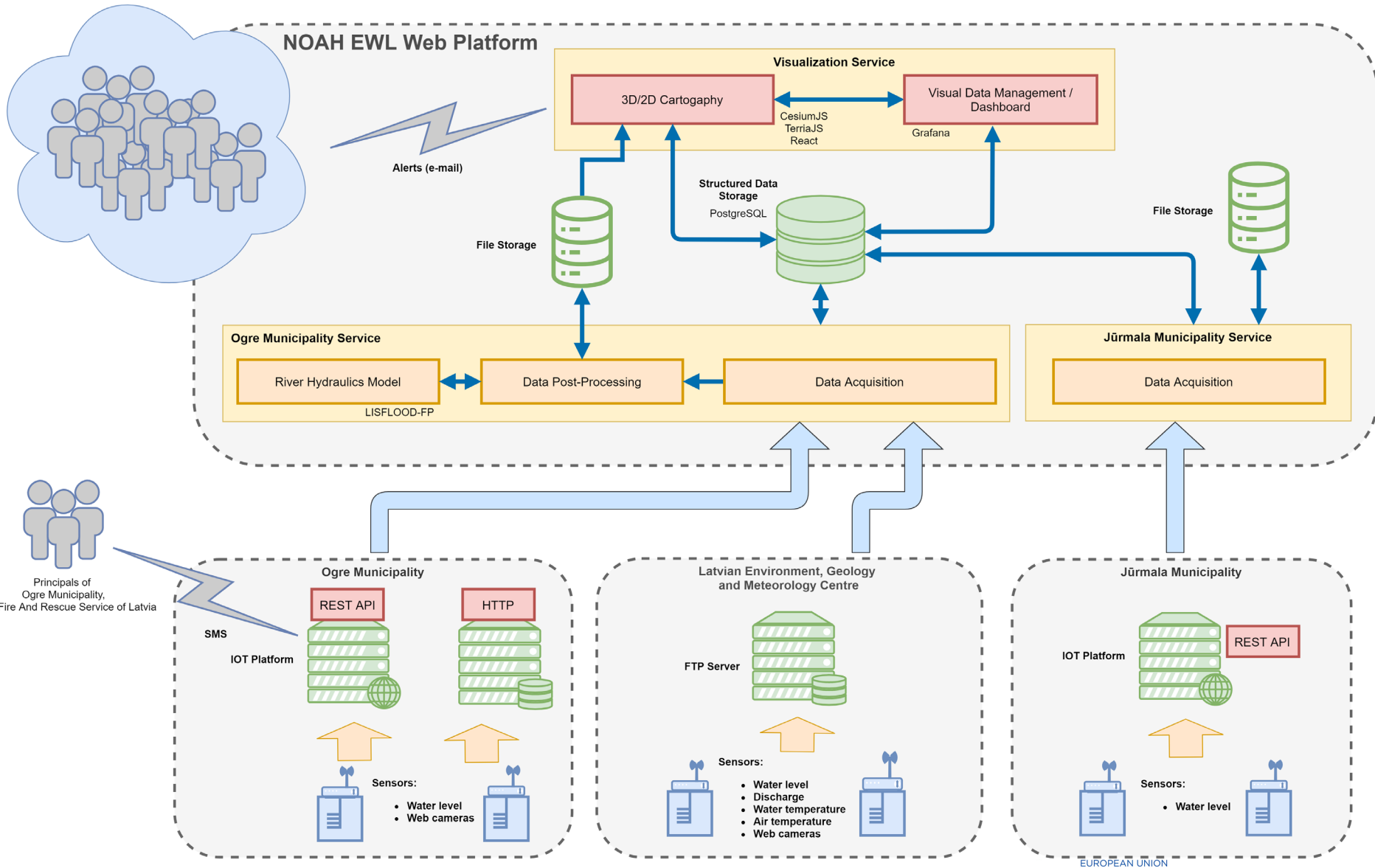
- *Flood Risk Information System* (PRIS) developed and maintained by Latvian Environment, Geology and Meteorology Centre (LVGMC)
- Focused on mid- and long-term flood risk forecasting
- PRIS web site: <https://hidro.meteo.lv>



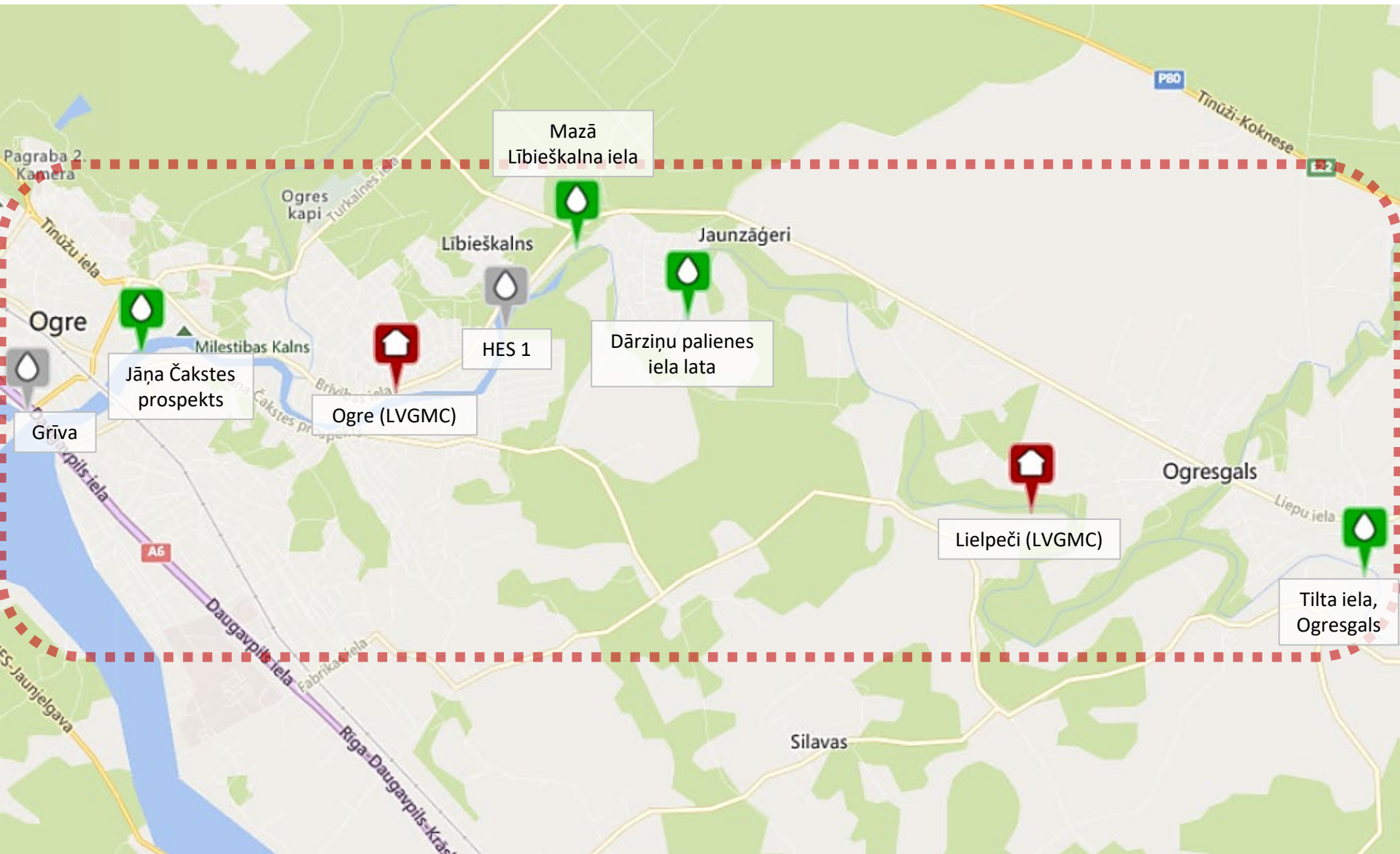
NOAH EWL Web Platform

- **Objective:** To develop an interactive 2D/3D Web platform representing an extreme weather layer by integrated monitoring, visualization, analysis and modelling of environment-dependent water resources information based on heterogeneous sensor data
- **Tasks:**
 - To implement 3D/2D interactive geospatial and sensor data exploratory visualization
 - To implement short-term spatio-temporal simulation and scenario analysis of potential flooding areas
 - To provide social support functionality by making available the information to a wider audience

Architecture of NOAH EWL Web Platform

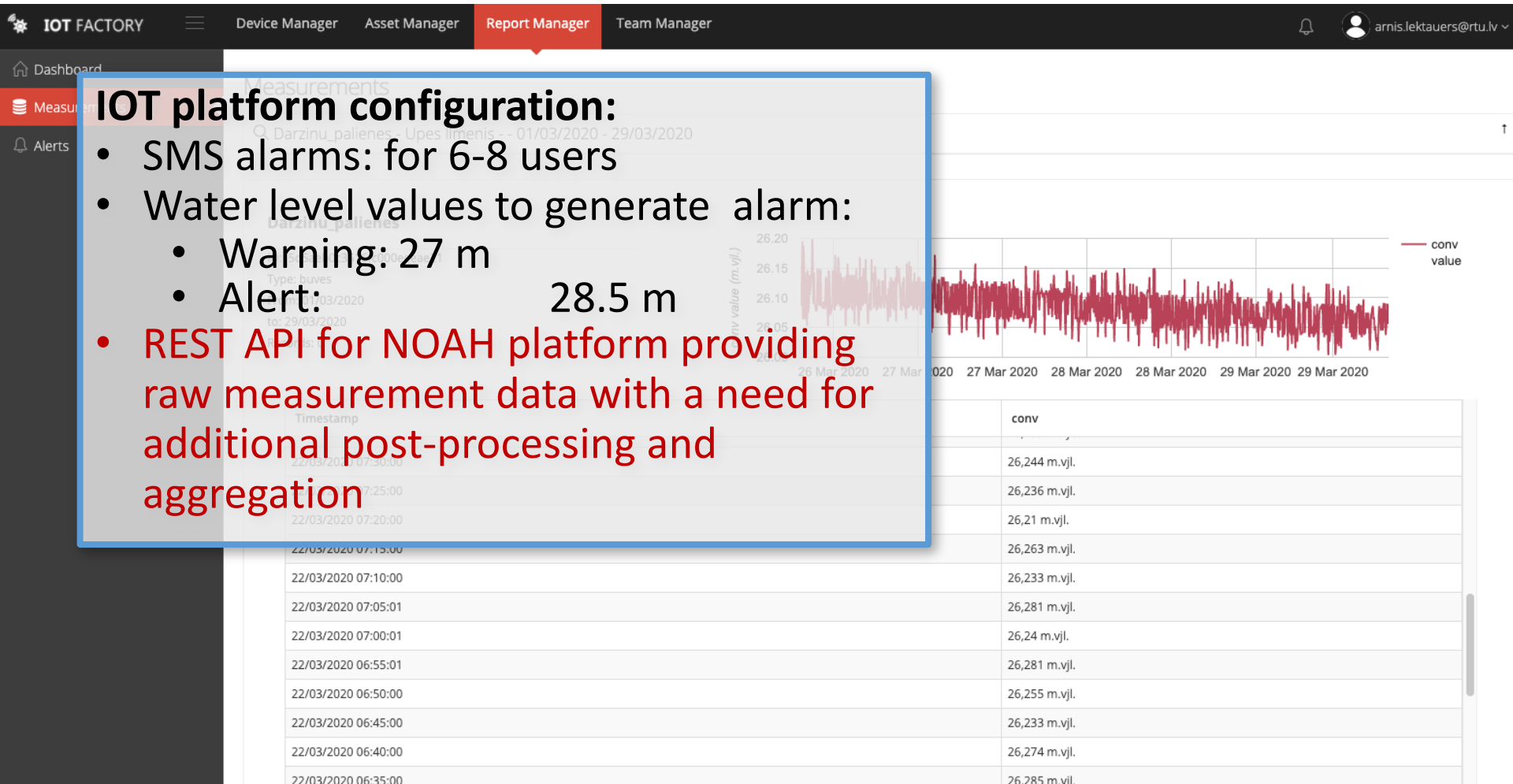


Ogre River Area Covered by the Project



Real-Time Sensor Data

Real-time water level data measurements from external sensor data provider *IOT Factory*



IOT platform configuration:

- SMS alarms: for 6-8 users
- Water level values to generate alarm:
 - Warning: 27 m
 - Alert: 28.5 m
- REST API for NOAH platform providing raw measurement data with a need for additional post-processing and aggregation

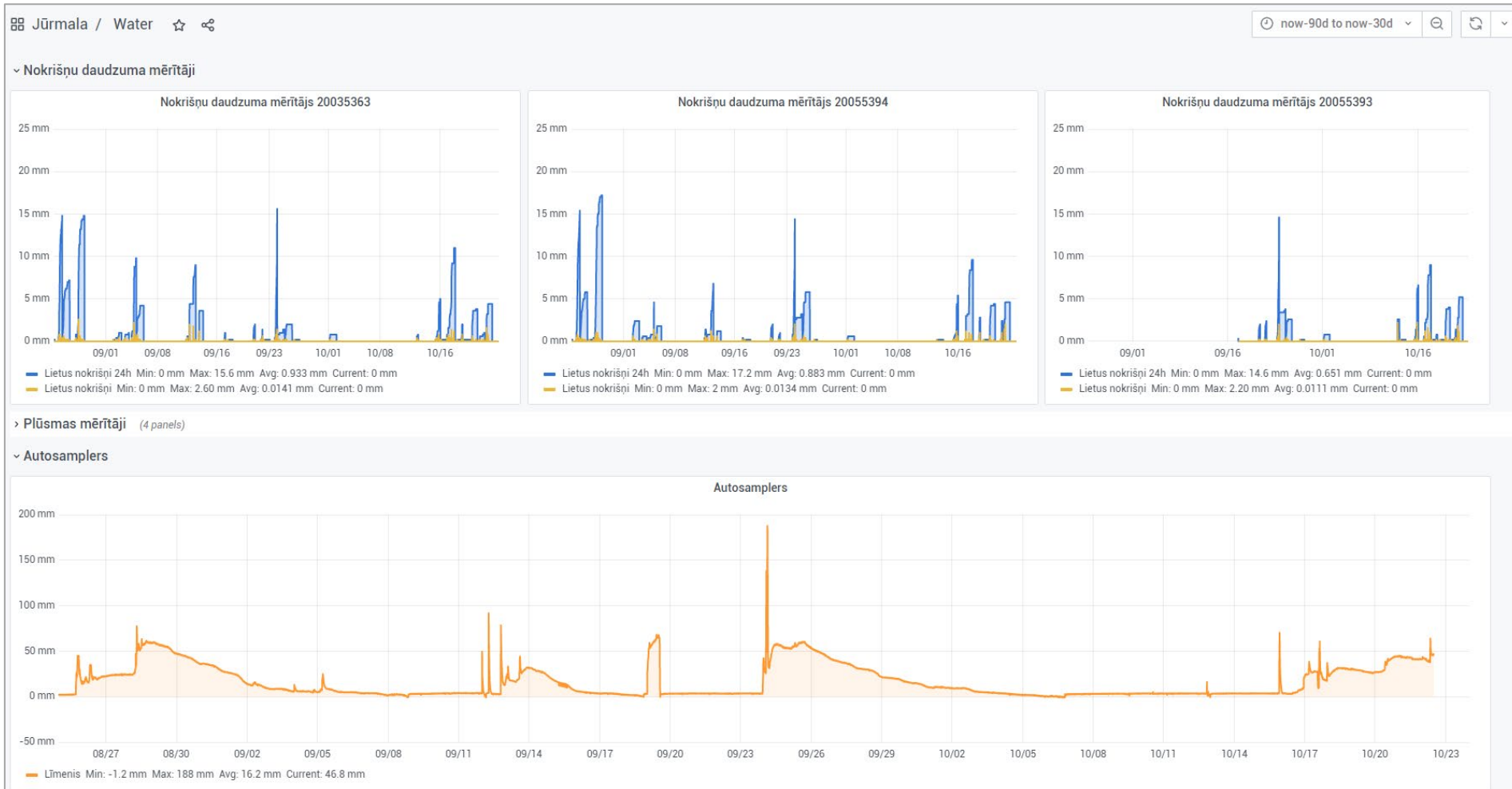
Ogre Municipality: Dashboard

- Monitoring of the dynamics of water level (relative / absolute), water discharge, water and air temperature changes
- Alerting support (e-mail, SMS, social networks)

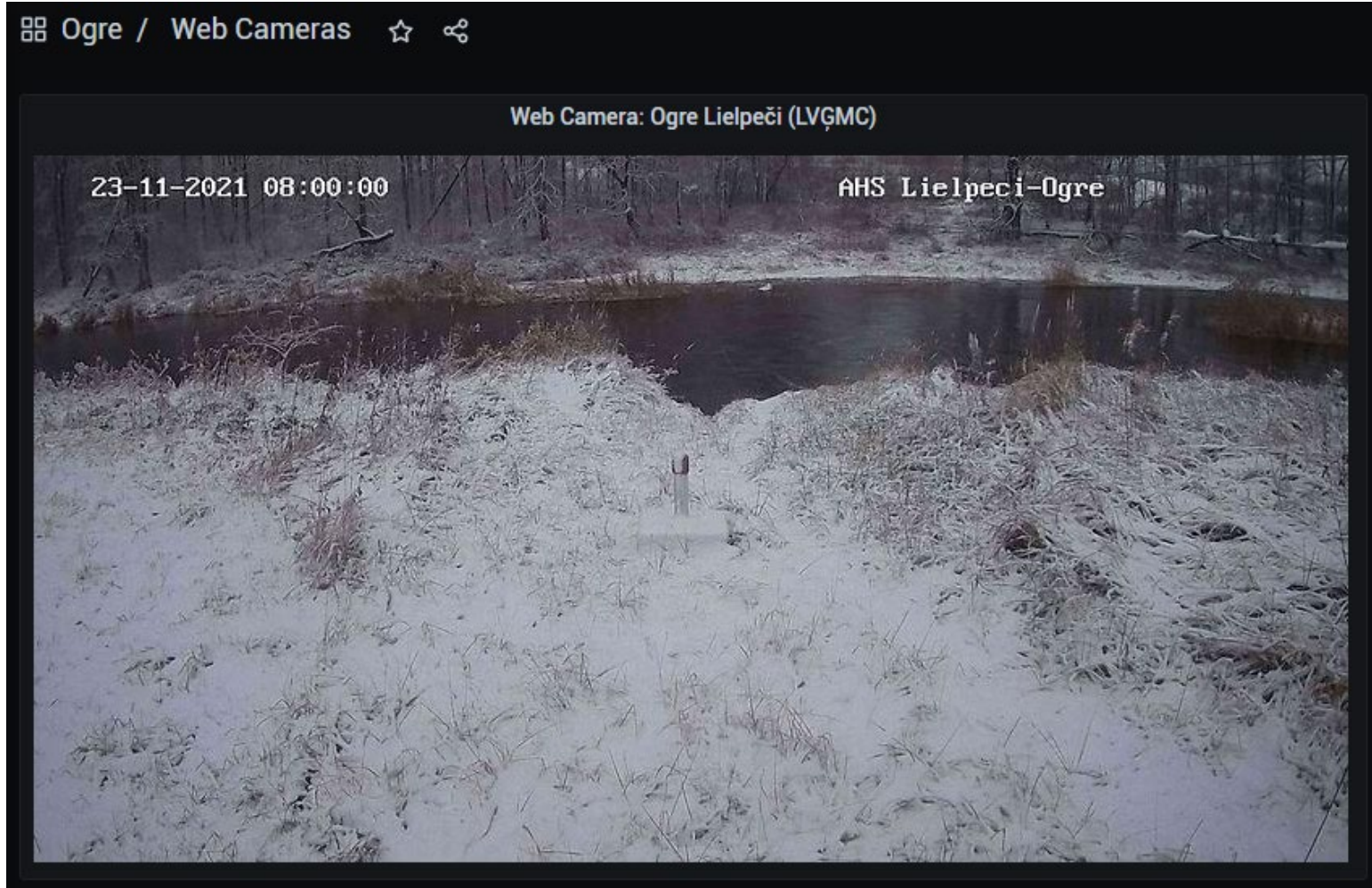


Jūrmala Municipality: Dashboard

- Monitoring of the data from local meteostation, waste water flow meters, automatic sampler with storm water level sensor



Ogre Municipality: Web Camera Data



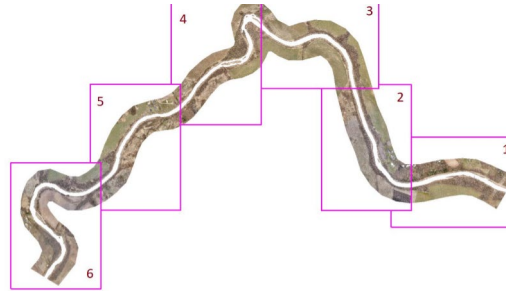
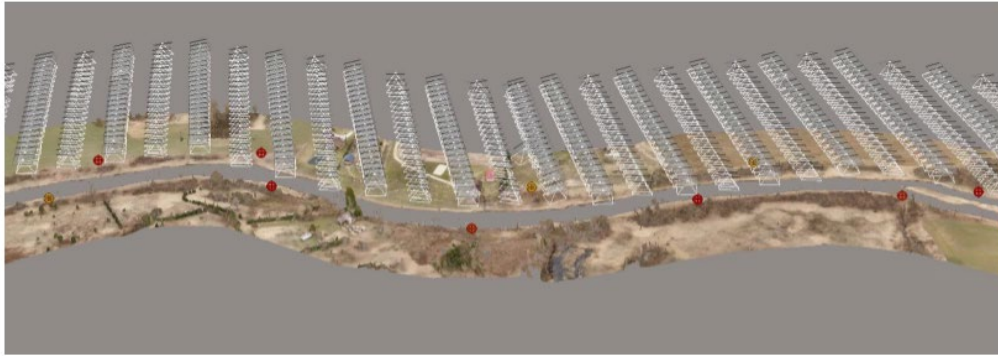
Ogre Municipality: Interactive 3D/2D Geospatial Visualization

- Support of high-performance 2D/3D multi-layered data visualization (3D Tiles, KML, GeoJSON, WMS etc.)



3D view of the new pedestrian bridge over the Ogre river

Digital Elevation Model (DEM)



Data formats:

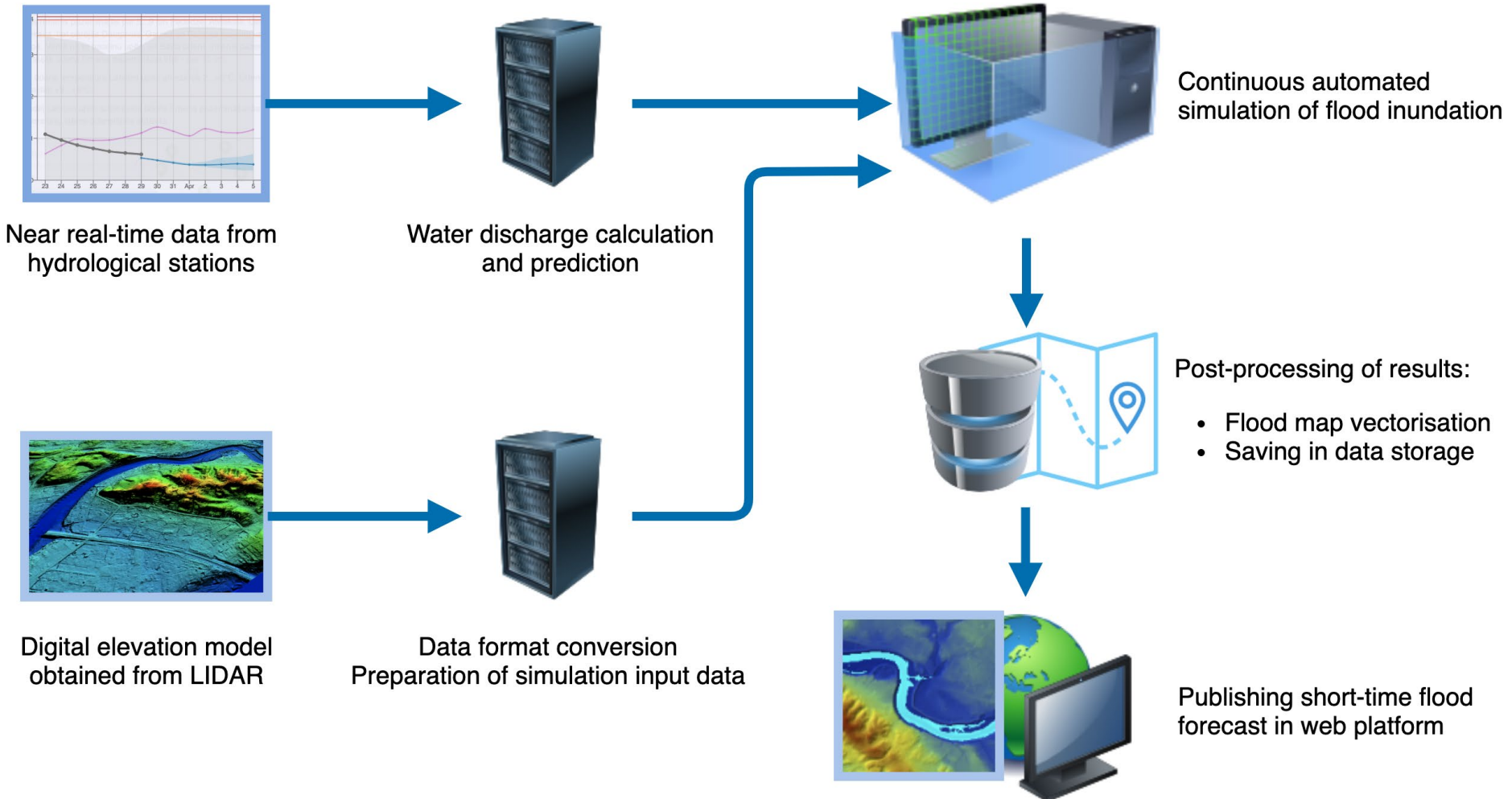
- Ortho photo - TIFF
- 3D model formats:
 - Point Cloud
 - 3MX
 - 3D Tiles

DEM for Ogre river:

- Length: >20 km
- Area: >2 000 000 m²
- Data size: >200 GB

Automated Floodplain Simulation

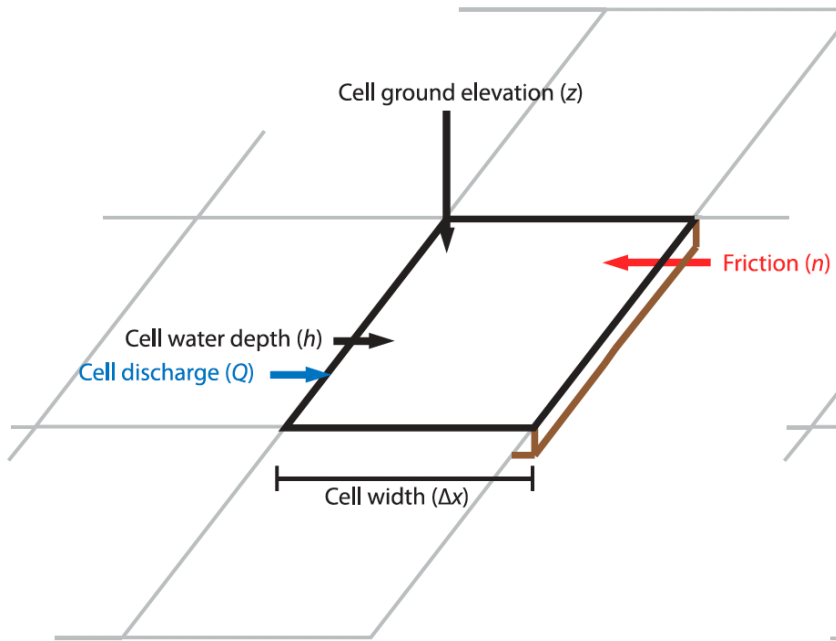
Short-term forecasting based on heterogeneous sensor data integration



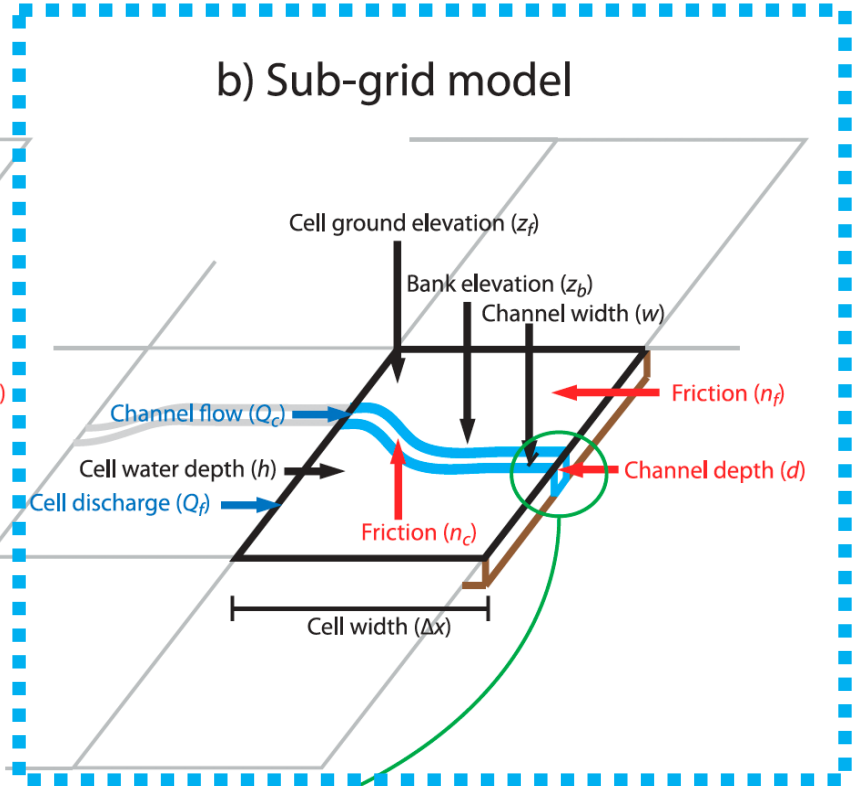
Simulation of River Hydraulics

LISFLOOD-FP

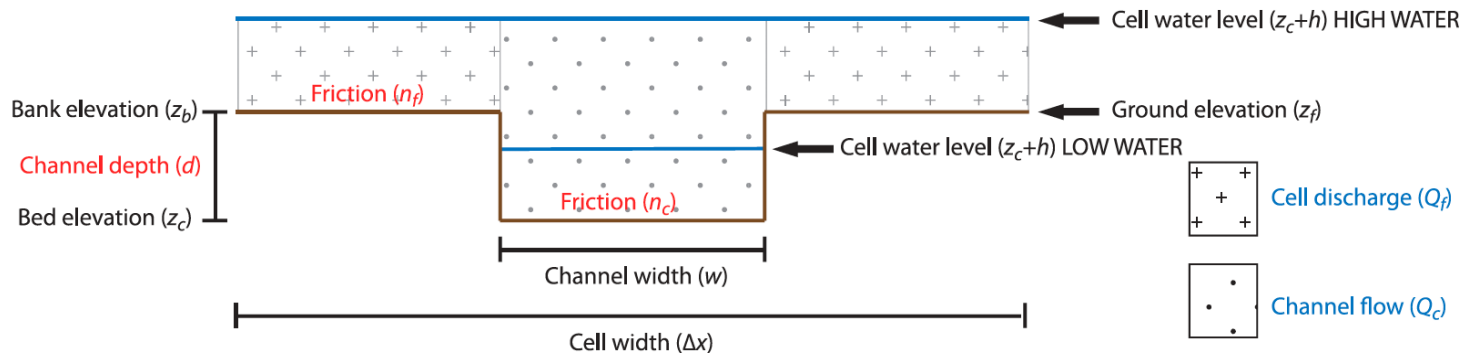
a) Base model



b) Sub-grid model

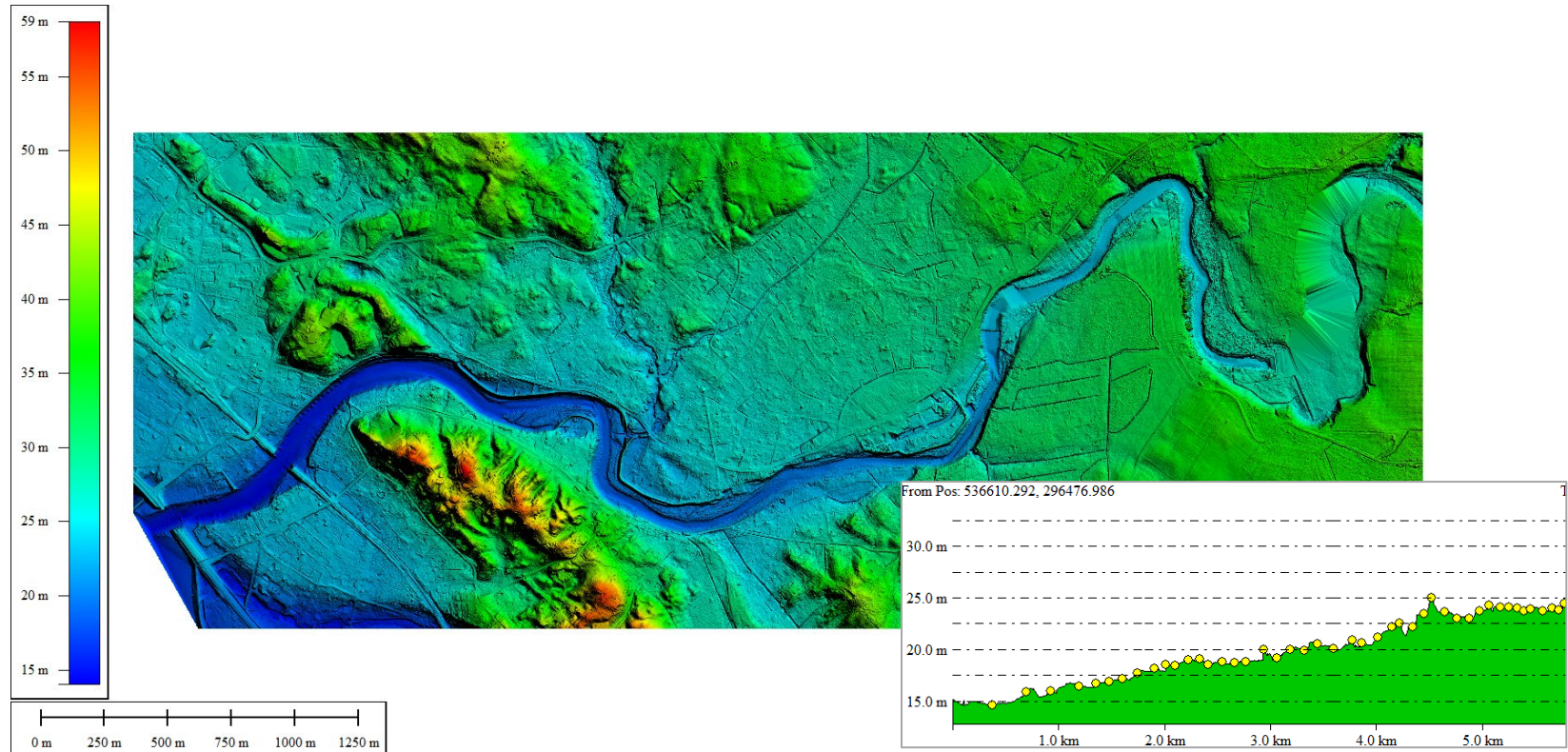


c) Sub-grid cross-section



Bathymetry DEM of Ogre River

- DEM integrating the ground elevation data with channel bathymetry information (river width, depth and shape):
 - Used as model input for LISFLOOD-FP



Floodplain Simulation

- Automated floodplain modelling (1x per hour) based on the sensor data measurements and short-term forecasts of water discharge and water level



The modelled floodplain area visualized on the top of the 3D map

Summary

- The proposed platform implements a generic concept of a Digital Twin with an intent to blend heterogeneous sensor and crowdsourcing data for integrated monitoring, visualization, analysis and modelling environment-dependent water resources information from sensor and social data streams
- The main distinctive functions of the NOAH web platform:
 - 3D/2D interactive data visualization and exploratory scenario analysis
 - Automated short-term simulation and mapping of potential flooding areas
 - Social support – providing the information to a wider audience

<http://noah.rtu.lv>