Estonia Latvia Russia
ENPI cross border cooperation programme
part-financed by the European Union
united by borders

Flood Simulation Geo-Information Platform

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INFROM Project

"Integrated Intelligent Platform for Monitoring the Cross-Border Natural-Technological Systems"

ELRI-184 project of the Estonia-Latvia-Russia cross border cooperation Programme within European Neighbourhood and Partnership instrument 2007-2013

Project Partners

1. Riga Technical University, Latvia
2. Institution of the Russian Academy of Sciences St.Petersburg Institute for Informatics and Automation of RAS, Russia

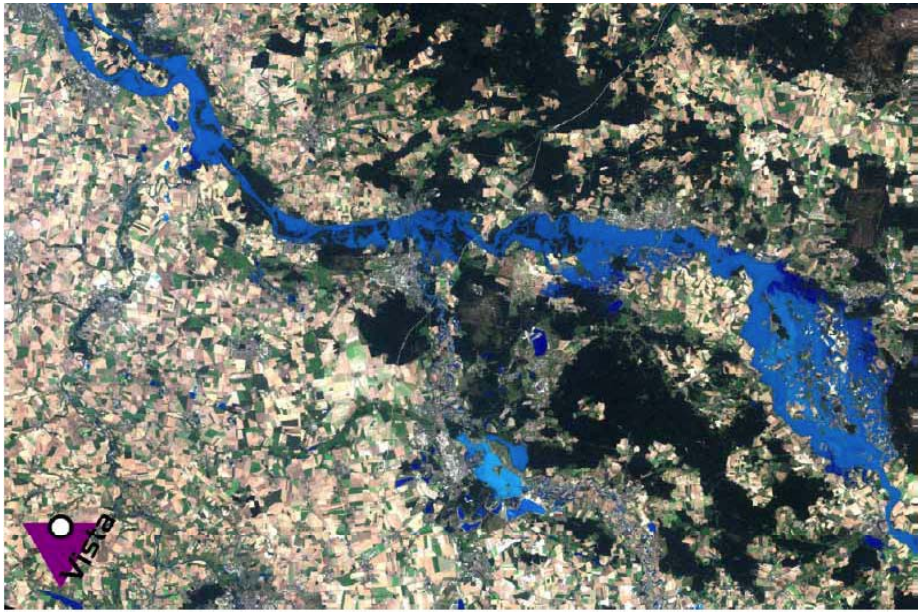
Project Adresses

Monitoring and control of cross-border natural-technological systems in normal and emergency situations by using data from both ground-based and space facilities:

- Technology development
- Demonstration of application possibilities

Existing Methodologies and Tools

1. Satellite monitoring

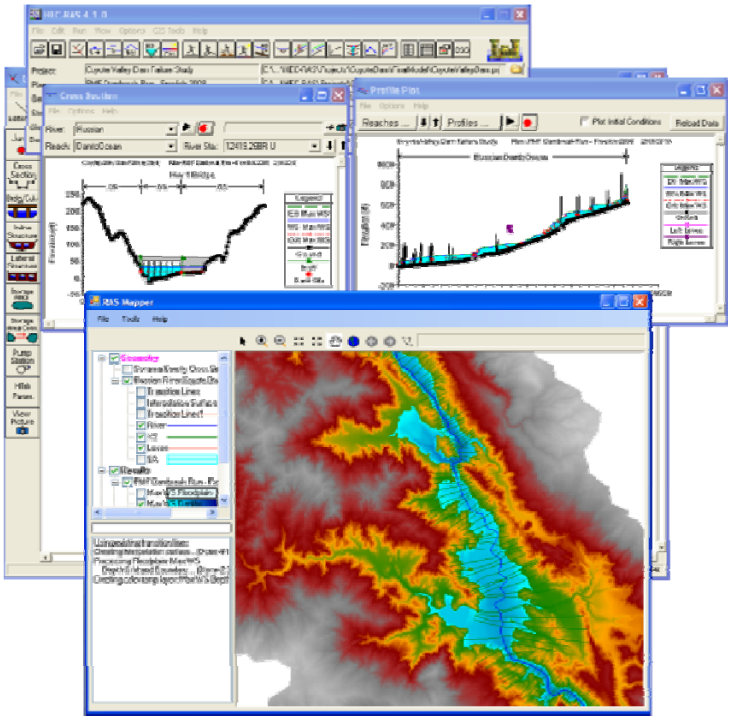


Tasks solved:

1. statement of flooding fact
2. assessment of already caused damage
3. subjective forecasts by experts

Existing Methodologies and Tools

2. Long-term forecasting



Tasks solved:

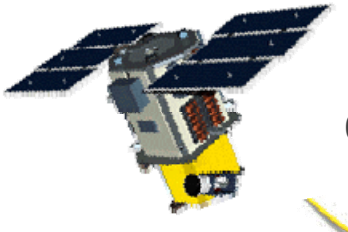
- modeling based on weather forecasts models, snow cover, riverbed profiles, soil types, etc.

- greater complexity, low reliability of initial data

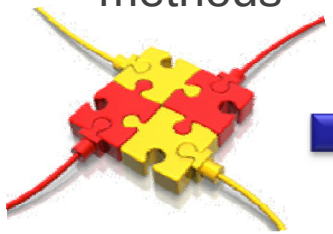
The Basic Idea

Short-term forecasting based on integration of ground-space data

space initial data



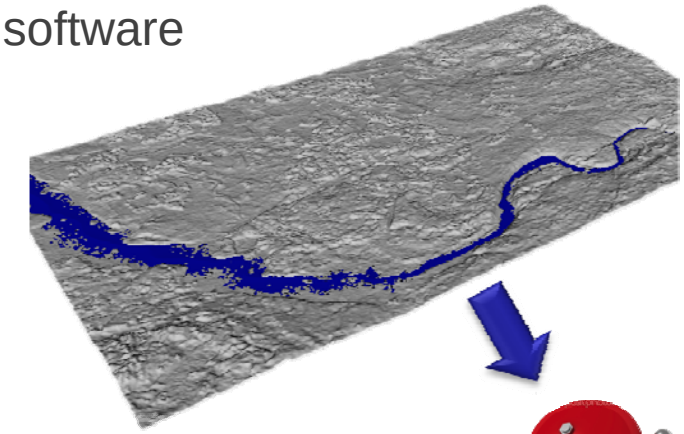
data fusion methods



ground-based initial data

forecasting using adapted hydrological models and developed technique

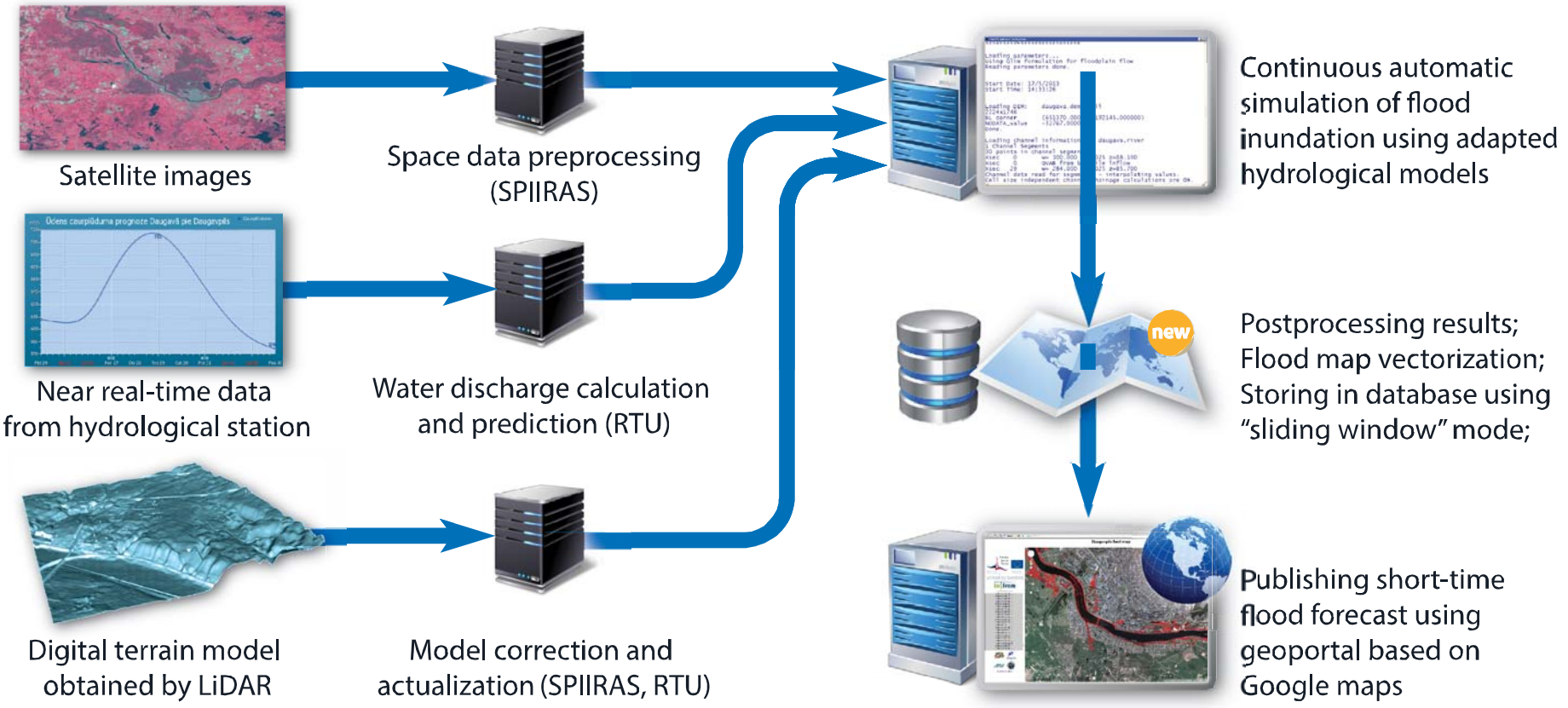
technique for images processing with Scanex software



technology for targeted alert of stakeholders

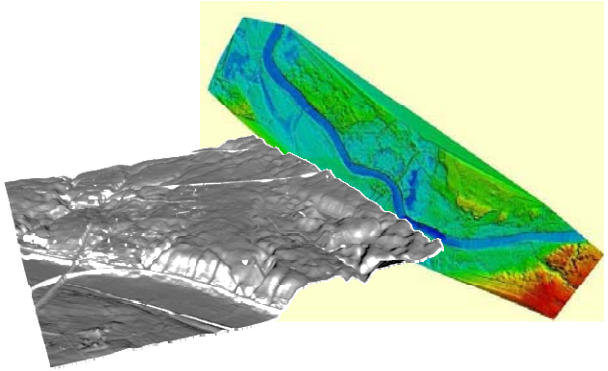
Simulation Cycle

Short-term forecasting based on the heterogeneous data integration



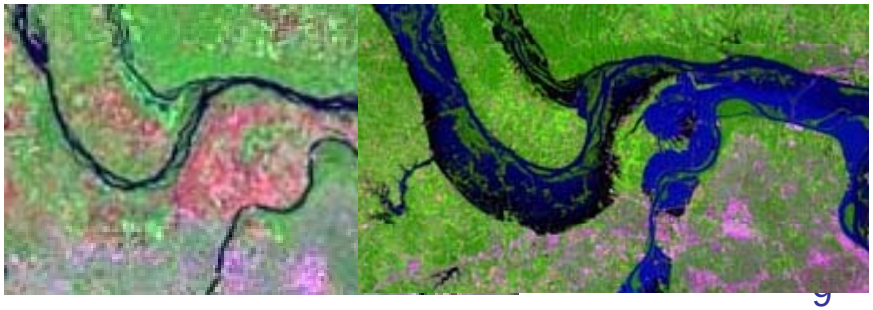
Initial Space Data

1. Digital elevation model based on Pleiades and TerraSAR-X satellites



2. Satellite images of territory before the flood for refining current state of the riverbed

3. Satellite images received during flood
for refining digital elevation model



Initial Ground-Based Data

4. Statistical data:
   hydrological characteristics
   of the river channel
   (Manning's number,
   flow rate coefficient)

5. Dynamic data:
   the river flow rate
   based on automatic measuring the
   water level by hydrological station
   (data available in real-time)

Hydrological Model Based Flood Forecasting

Software complex includes **LISFLOOD** - hydrological model developed by Hydrology Group of University of Bristol. LISFLOOD-FP has been used as a research tool within the pre-operational European Flood Alert System being developed at the EU Joint Research Centre.

Feature: a minimum of input data to obtain an acceptable level of accuracy of the forecast.

Simulation results: maps of flooding at specified times, indicating the depth of flooding.

Feasible results are achieved with a term of the forecast from 1 hour to 5 days.

The Problem of Flood around Daugavpils

DELFI

Flood damage compensation cost nearly 1.3 million LVL to local governments 30.06.2013.

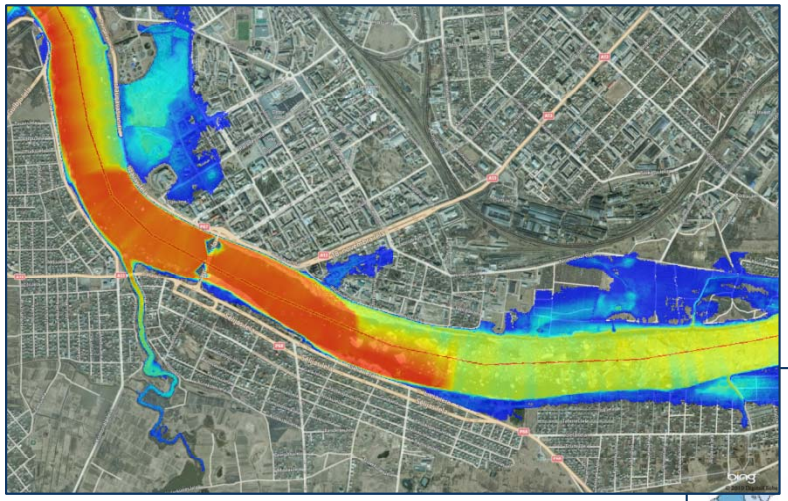
To compensate the spring flood damage 1,281,506 LVL is allocated to the local governments from the extraordinary expenses budget.

The greatest contribution -

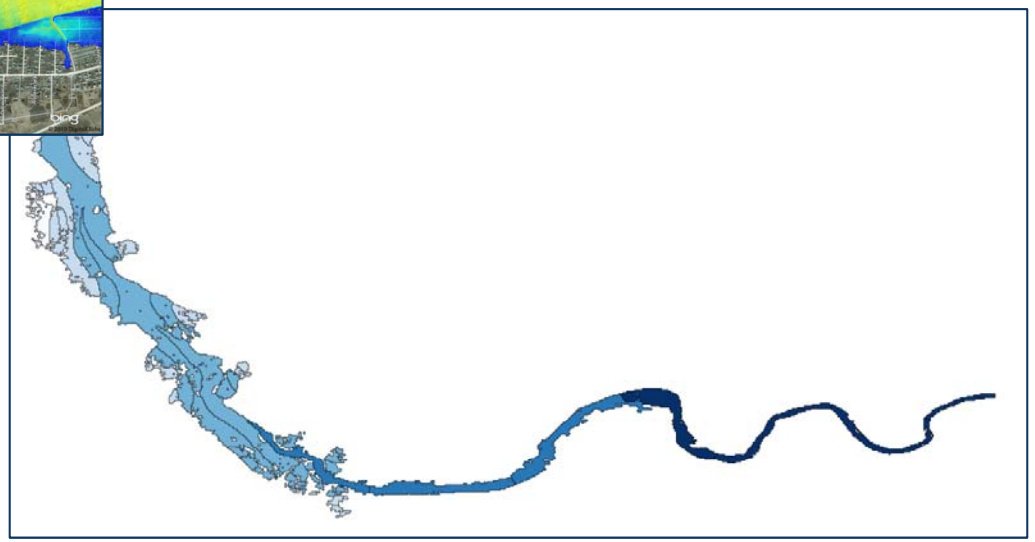
198 433 LVL - is designed to Daugavpils.

Processing Simulation Results

Raster maps with water depths are created as a result of simulation



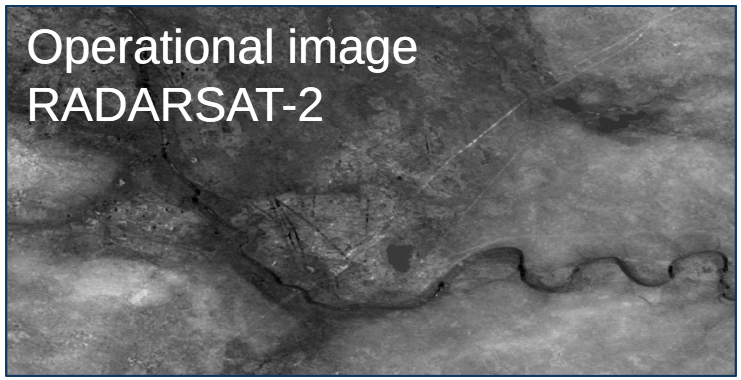
Vectorization with Scanex Image Processor

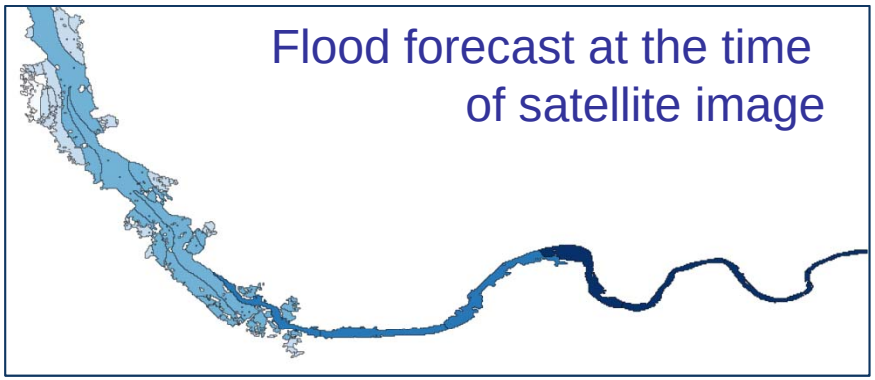


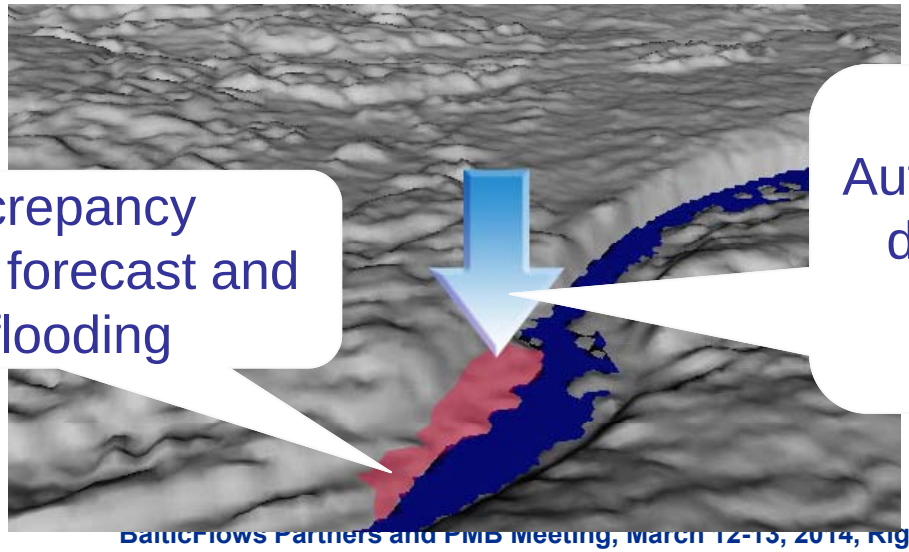
GIS tools are used for automatic format conversion

Input Data Correction

Comparison of the forecast and the actual situation



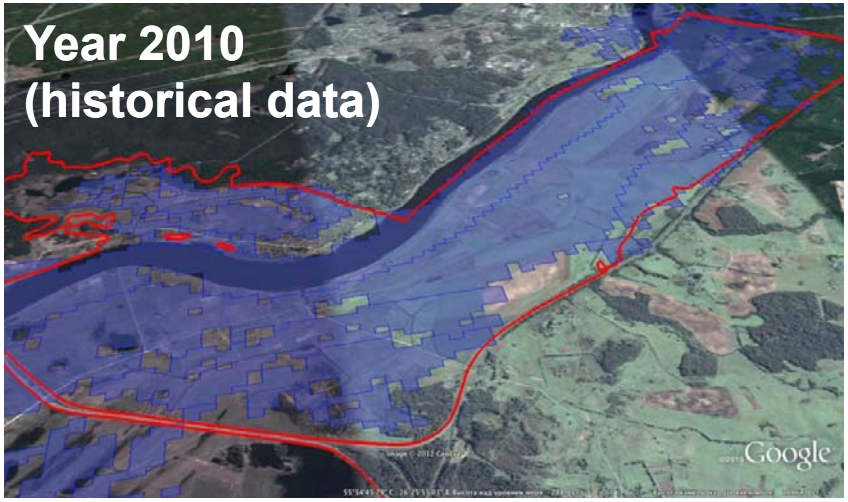


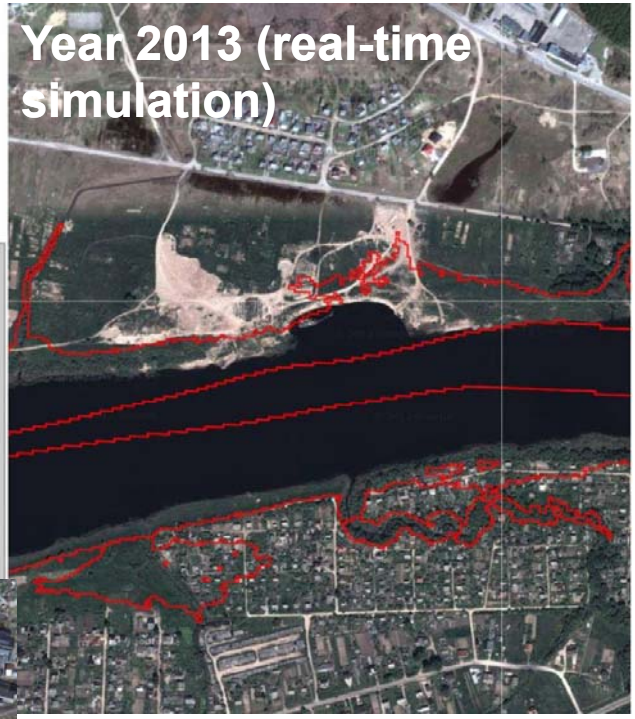


The discrepancy between the forecast and actual flooding

Automatic adjustment of a digital elevation model (lower ground level)

Flood Simulation around Daugavpils





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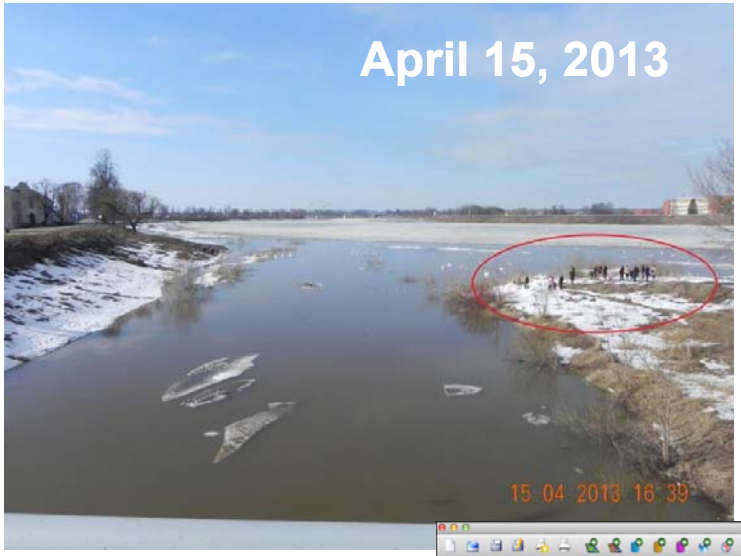
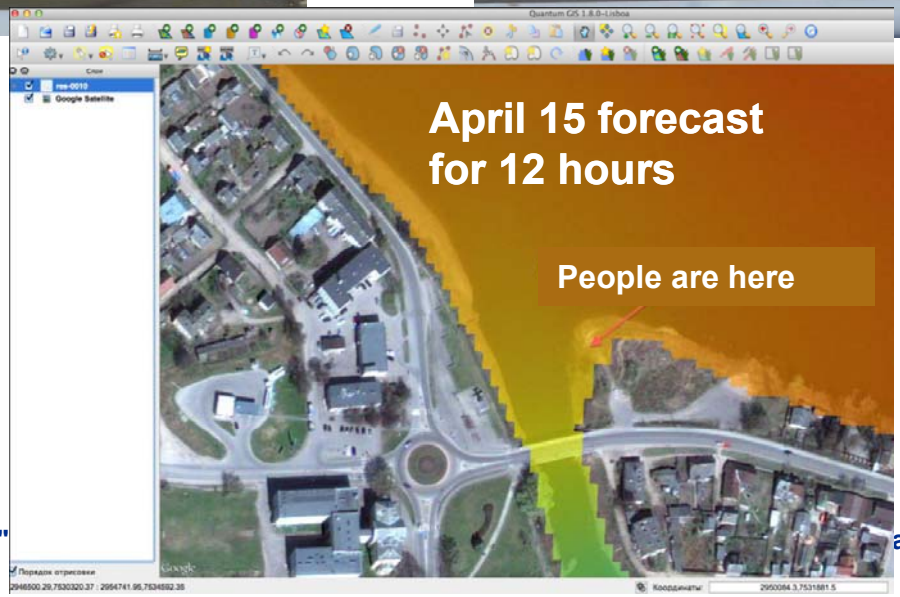
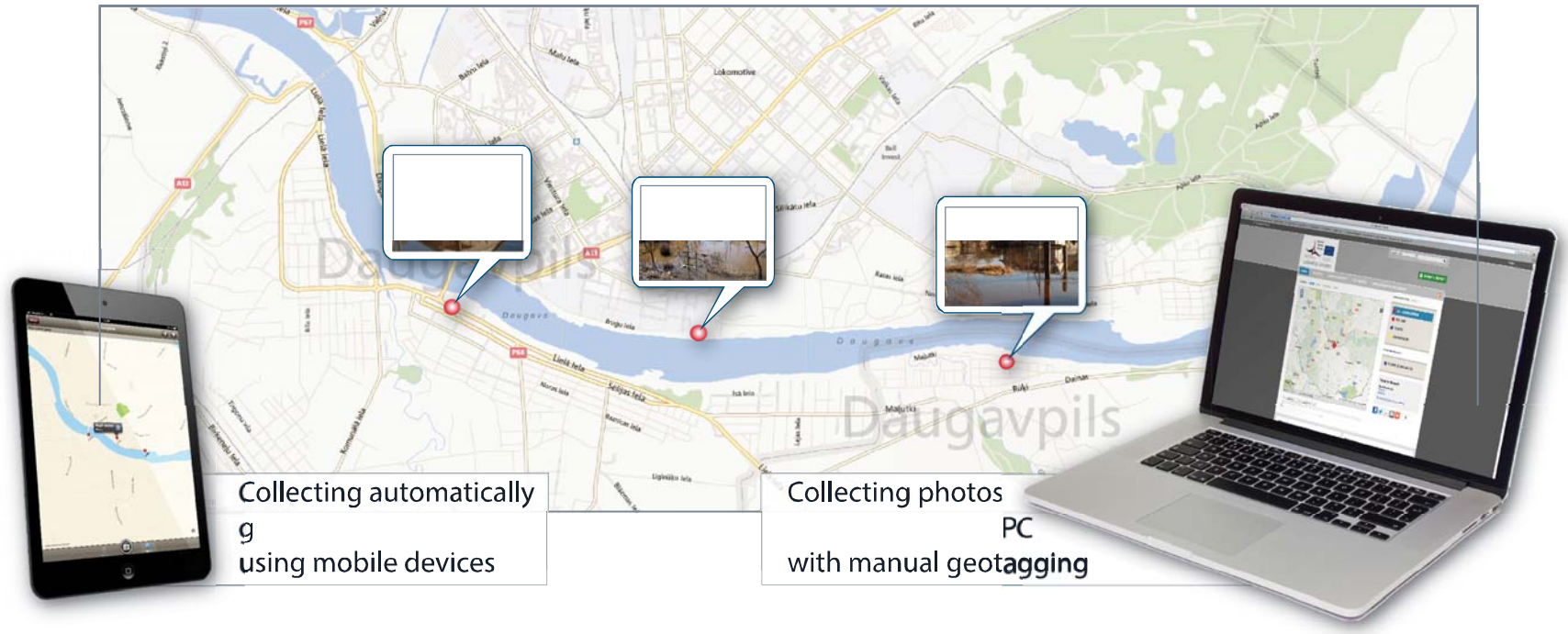
Flood Simulation around Daugavpils



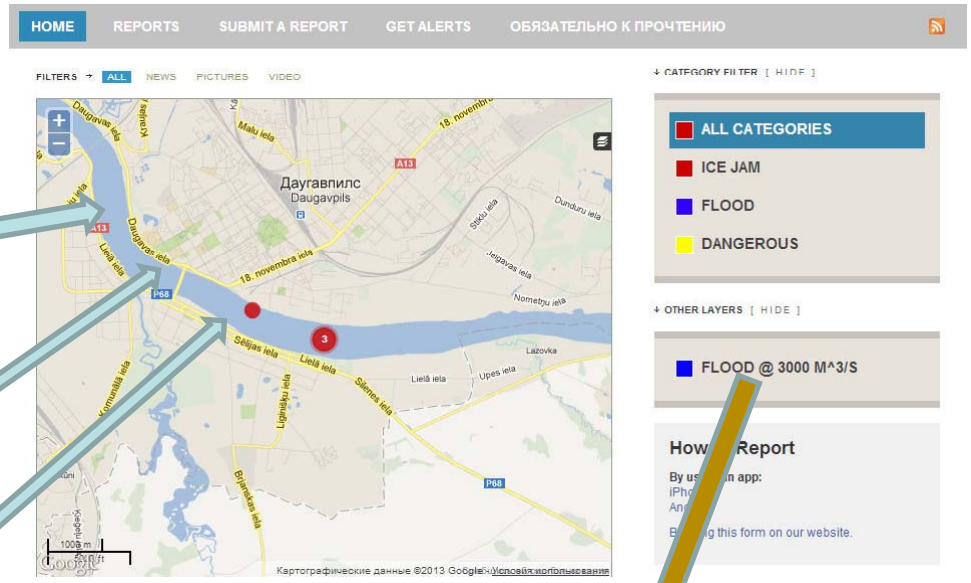


Crowdsourcing based validation

Involving citizens into model validation process using crowdsourcing technologies



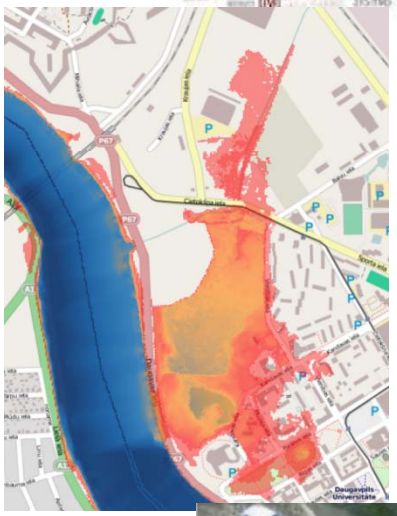
Crowdsourcing (User Data Application)



Application of Operational Flood Forecasting Results

- **Preventive activity planning**

- **Simulation of catastrophic event: levee collapse**



- **Decision support system: organization of evacuation**