FLOOD AND COASTAL DEFENCE AND INTEGRATED WATER MANAGEMENT FOR ST.PETERSBURG

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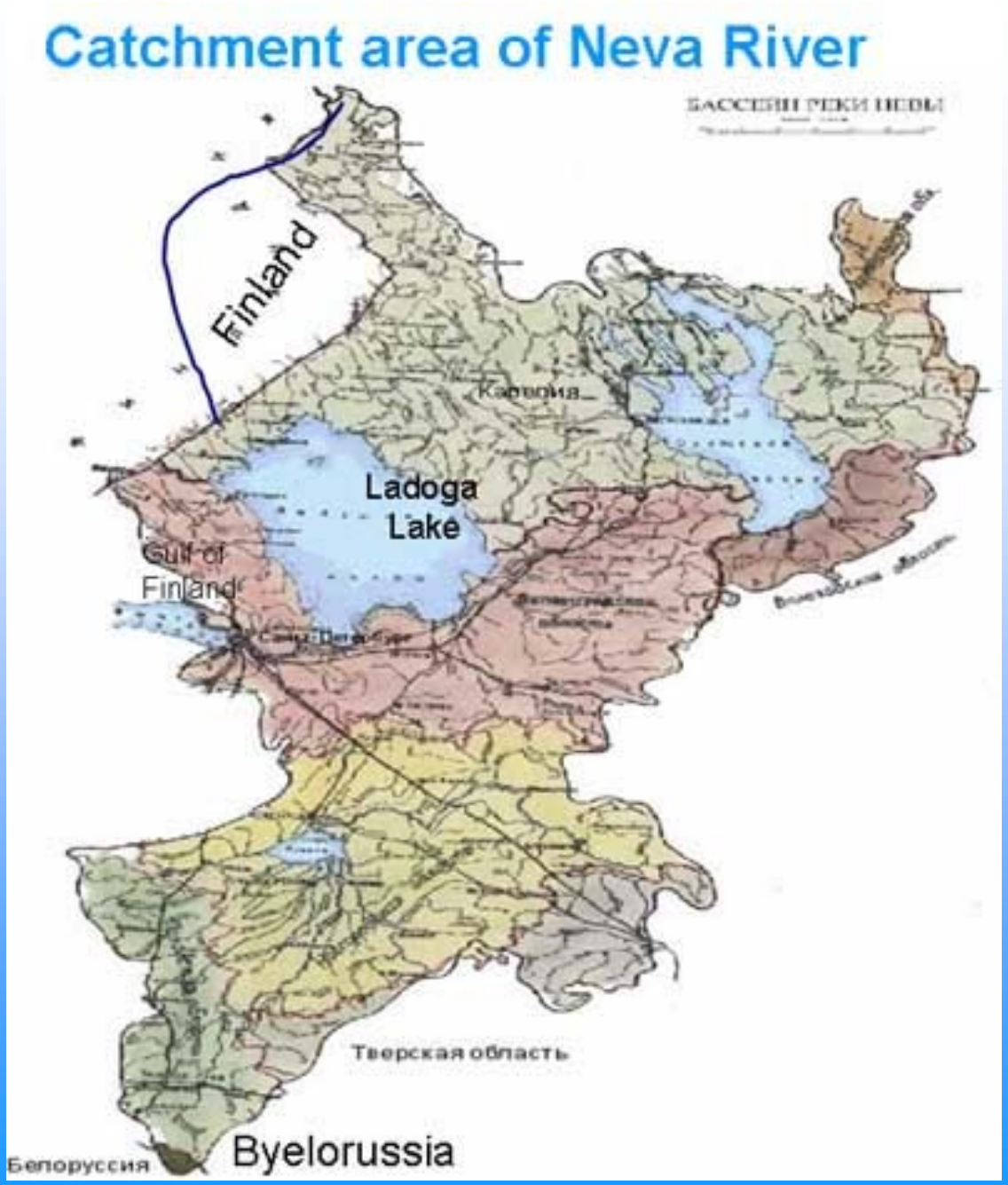
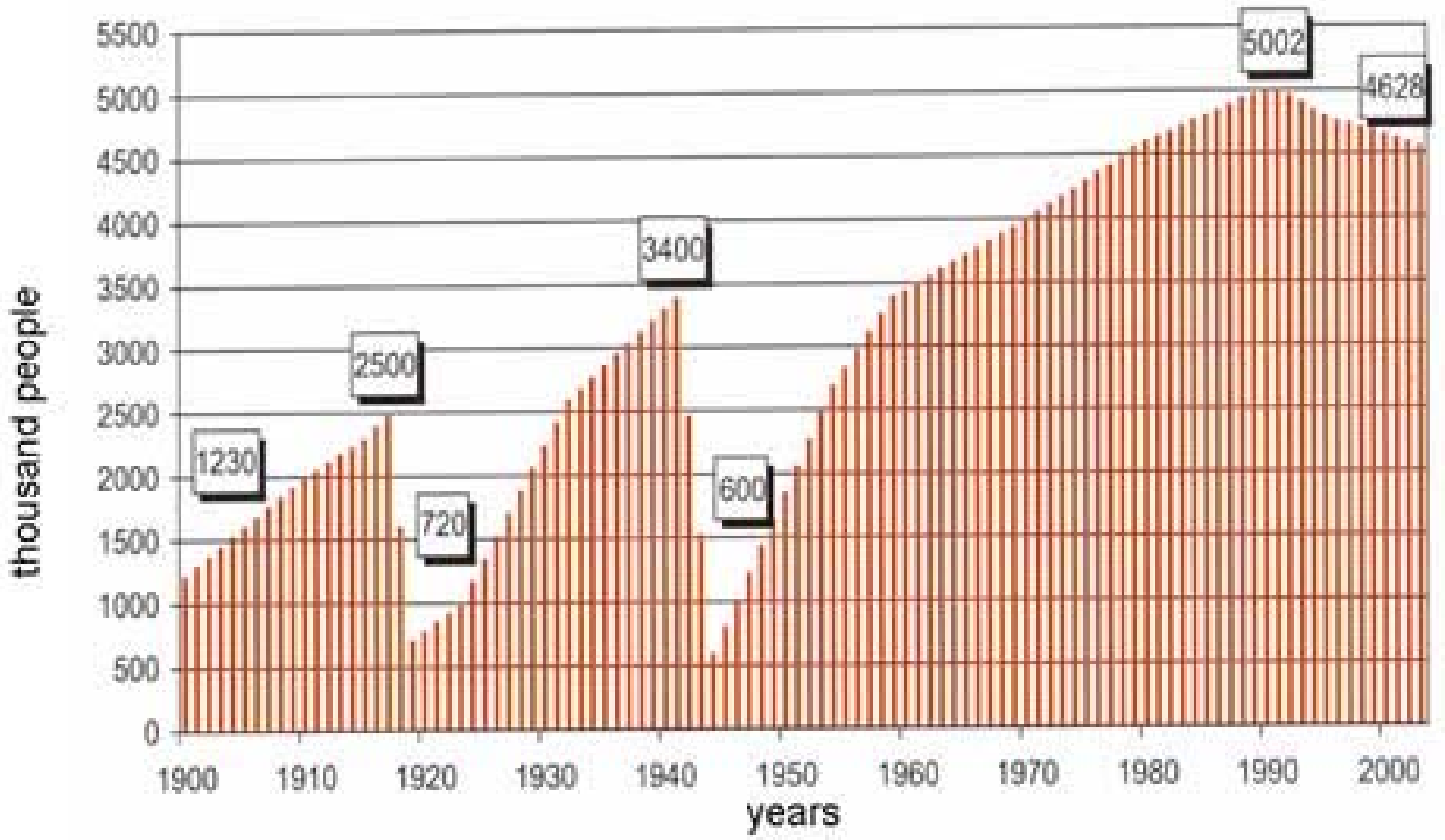
Head of Research and Environmental Department

of St.Petersburg City Government

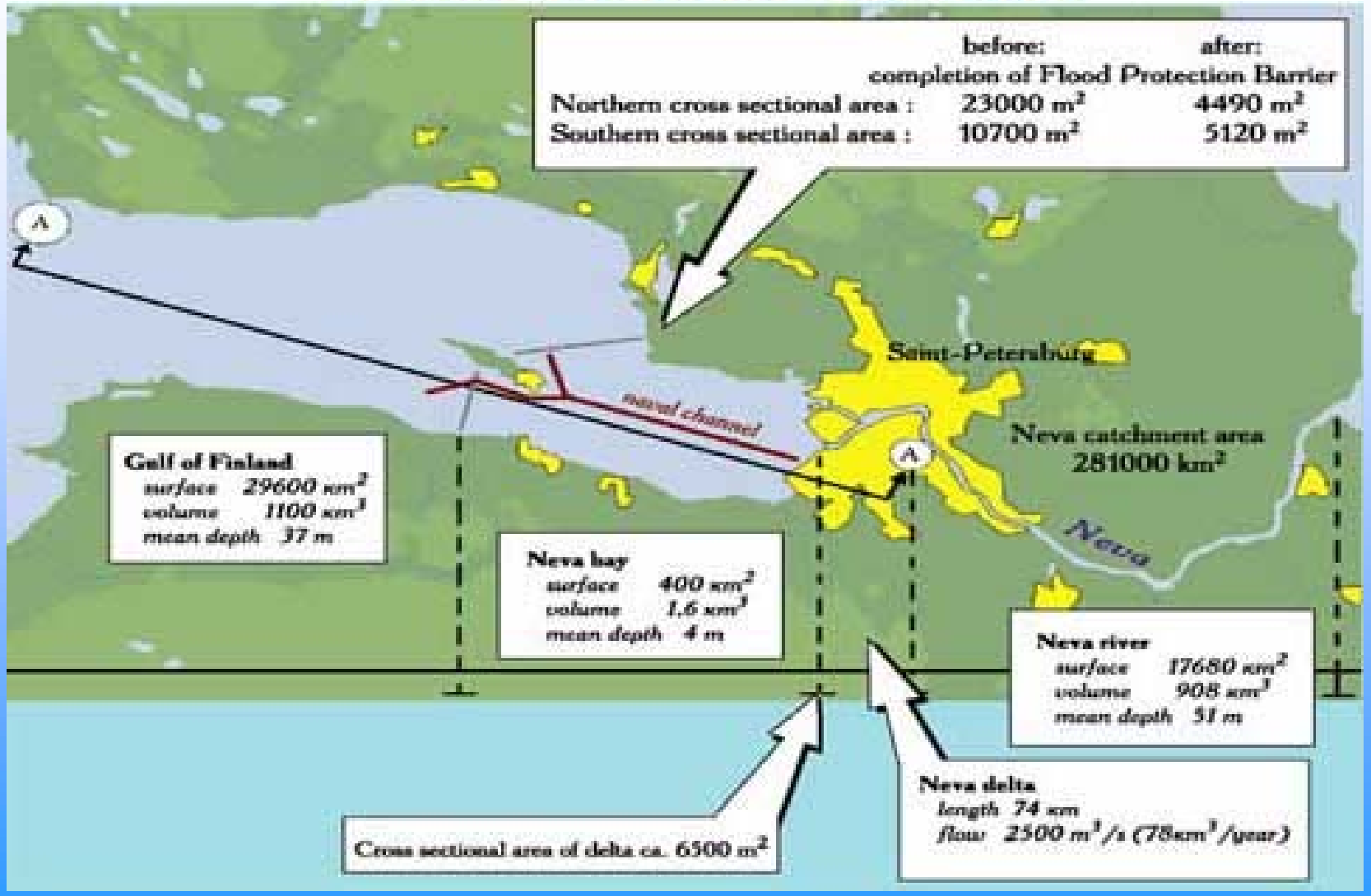


St. Petersburg is situated at the meeting point of the Neva River and the Baltic Sea, which has a strategic value for its economic and social development. At the moment the various economic and social uses of the water resources have a negative influence on water environment and are potential sources of an ecological risk.

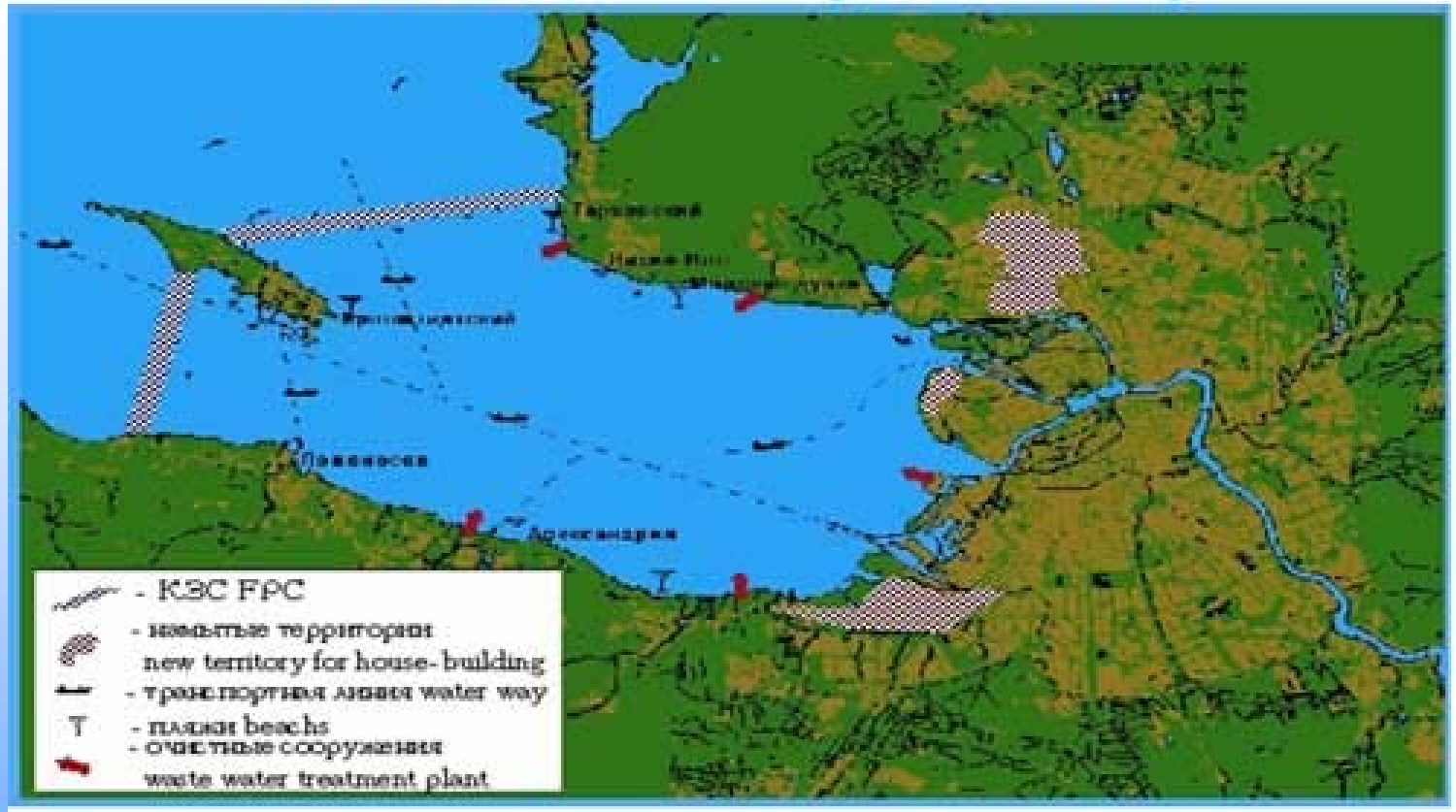
Dynamic of population of St. Petersburg for 100 years



Area of integrated water management for the Saint-Petersburg region



Multifunctional using of Neva bay



1. Waste water influence
2. Drinking
3. Commercial and recreation fishing
4. Navigation traffic
5. Along-coast construction of housing and infrastructure
6. Recreation
7. Drainage and sand-extraction
8. Dumping
9. Hydrotechnical construction, rafting
10. Agricultural activity
11. Impact of atmosphere pollution

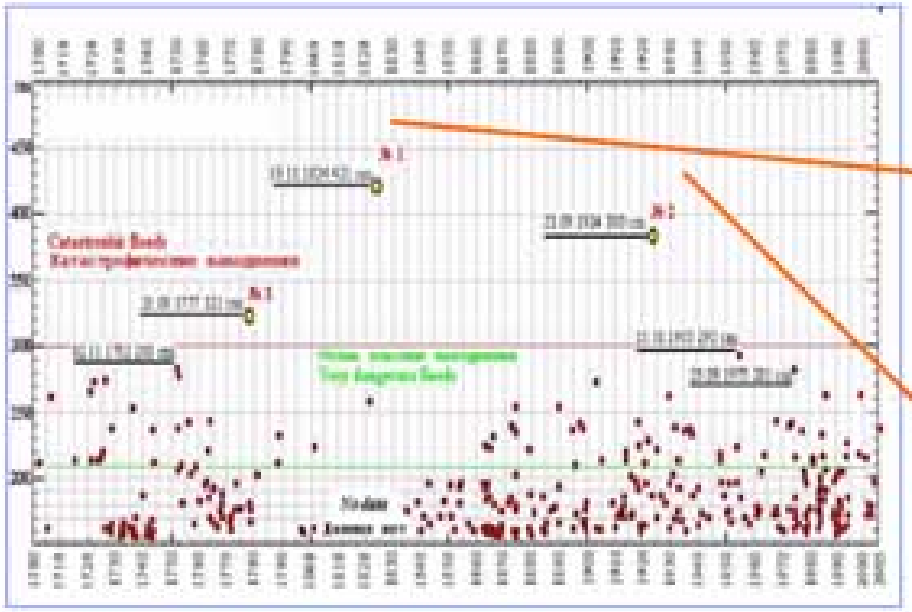
Impacts on recreation

The resort area on northern coast of the Gulf of Finland after storm

Flooded areas of St. Petersburg

Catastrophic Floods:

7 (19) November 1824 (421 cm) and
23 September 1924 (380 cm)



Vasilievskii Isl. Next day after flood.

Broken wooden pavement on Nevskii Pr.

“Morzaschita” Department carries out following functions

(According to the Decree of the Government of Saint-Petersburg dated April 6, 2004 №531 (with changes on February 16, 2005)):

- development and realization of state policy in area of scientific support, ecological management, including integrated water management, and protection of coastal areas from dangerous natural disasters, design, construction of the Barrier, supervision of the Barrier, operation of the Barrier, construction and technical supervision of water resources objects;
- activity coordination of another executive government bodies of St. Petersburg in this area;
- development, implementation and operation of Geographic informational system for flood defense in St. Petersburg;
- realization of another tasks in the area of construction and flood defense in St. Petersburg region in accordance with modern legislation.

Integrated Water Management in St. Petersburg

- a system scientific approach of water management, that aims at balancing the various (often conflicting) users of the water systems
- needed for sustainable development and rational use of water system
- development of other than safety functions of FPB

Scheme of monitoring stations

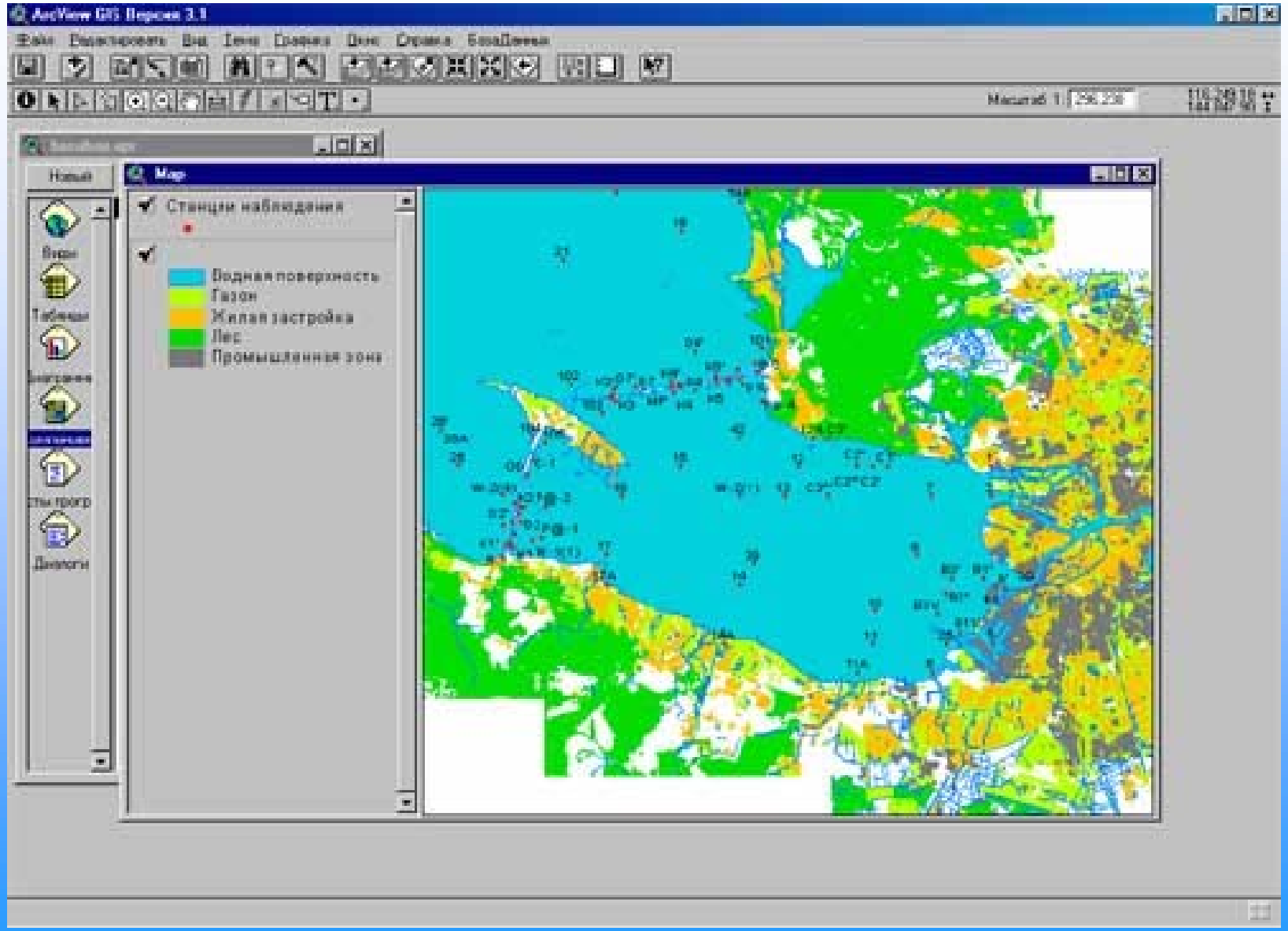


Схема функционирования базы данных

Scheme of Database

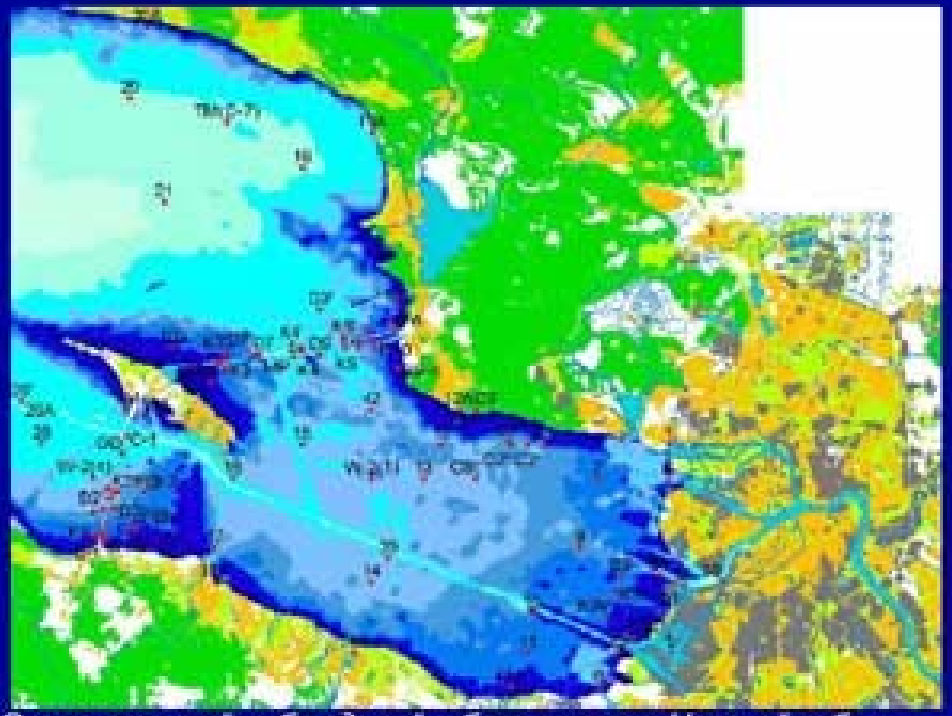


Схема станций наблюдений и батиметрии Невской губы

The Batimetry of Neva Bay

Зона затопления при максимальном наводнении в пос. Комарово Курортного района в Санкт-Петербурге

The flood zone of Komorovo

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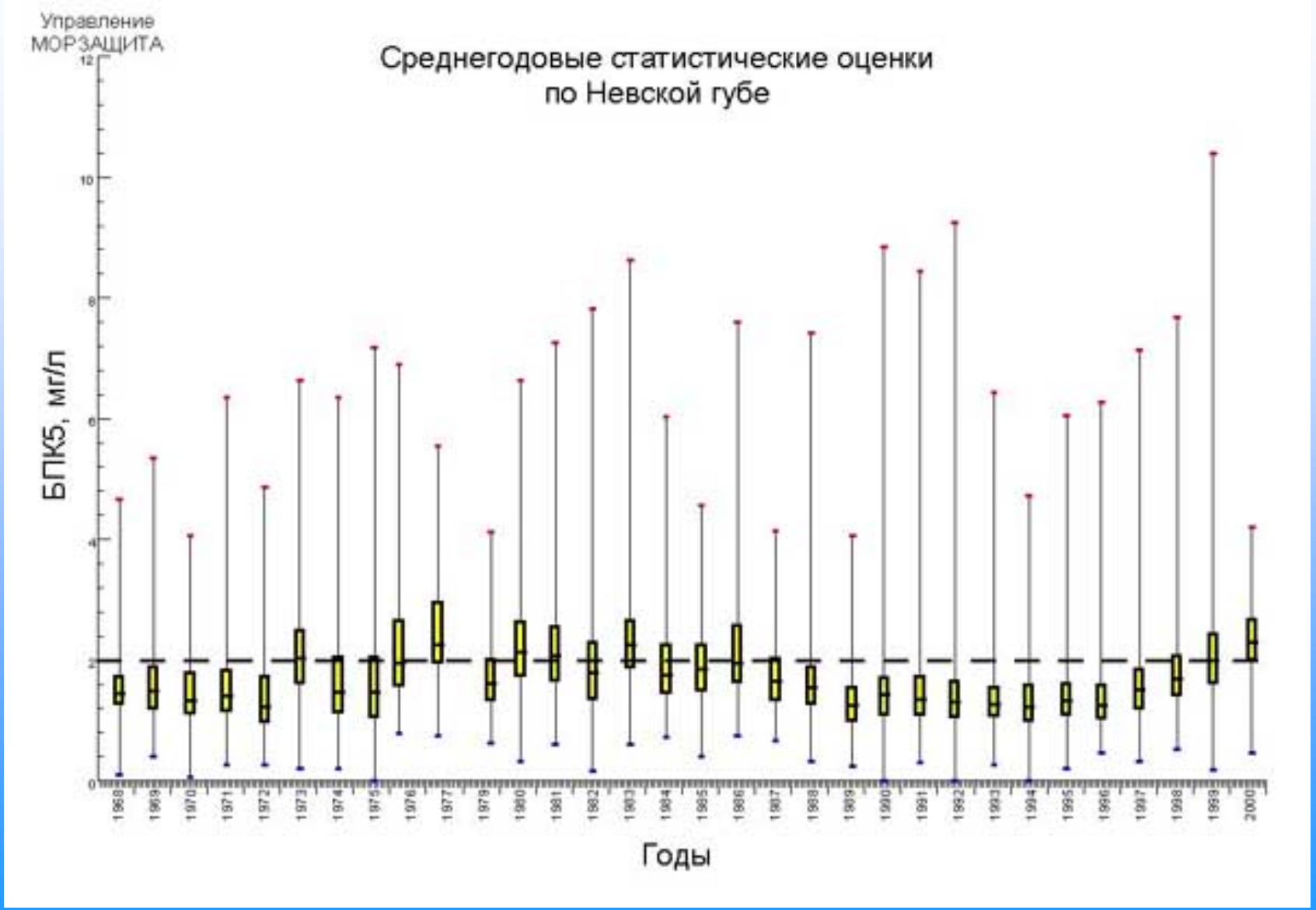
Variability of main water parameters of BOD_5

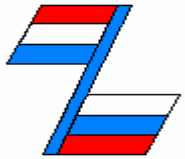


«Morzaschita»

Department of St.-Petersburg

City Administration

St.-Petersburg



WL | Delft Hydraulics

The Netherlands

Ministry of Transport, Public Works and Water Management

A Flood Warning &Assessment GIS for St. Petersburg

Project development: 1998-1999

Water level extrimal rise during floods

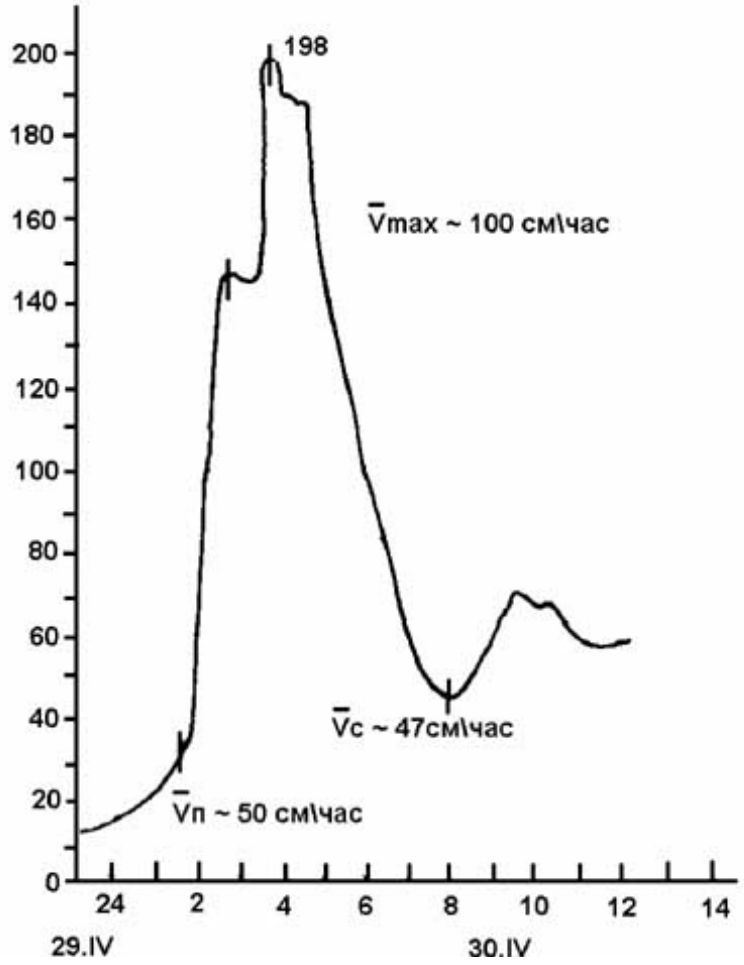


Diagram of water level change during the flood of April 30, 1914 according to Gornyi Institute mark. Average rate of rise is 50 cm/h, maximal 100 cm/h average rate of fall 47 cm/h.

Diagram of repeatability of floods for different flood water levels

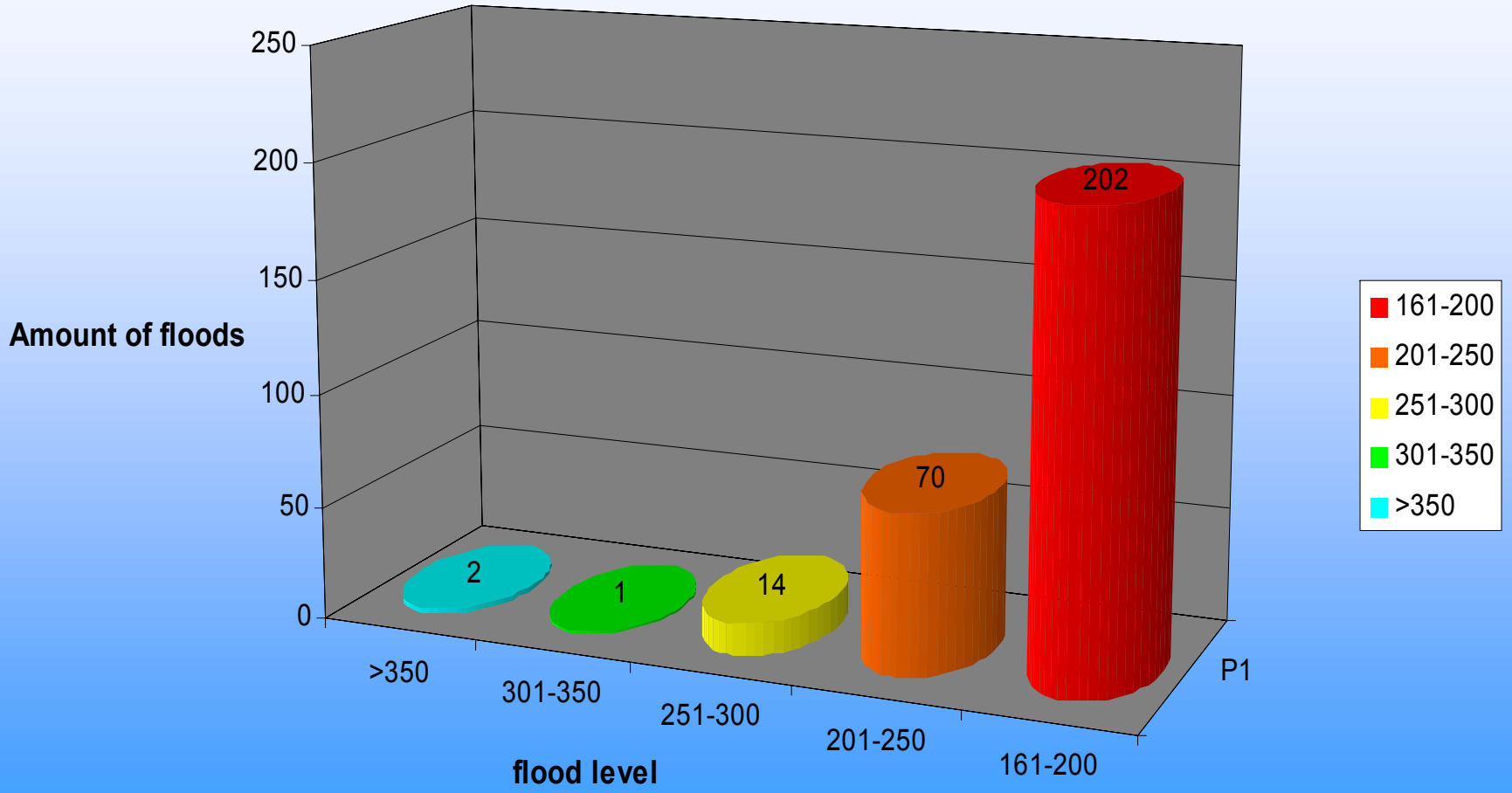
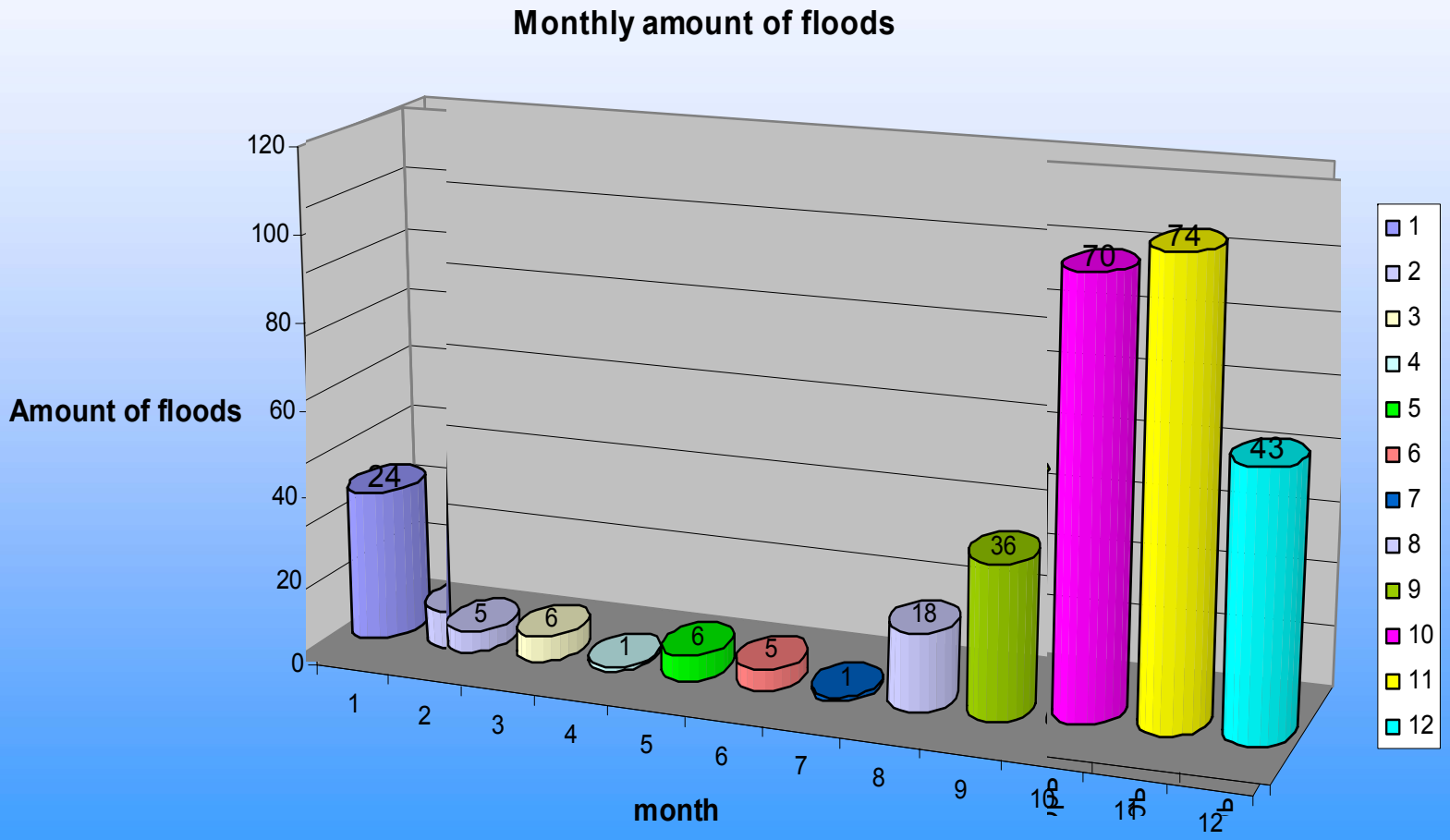
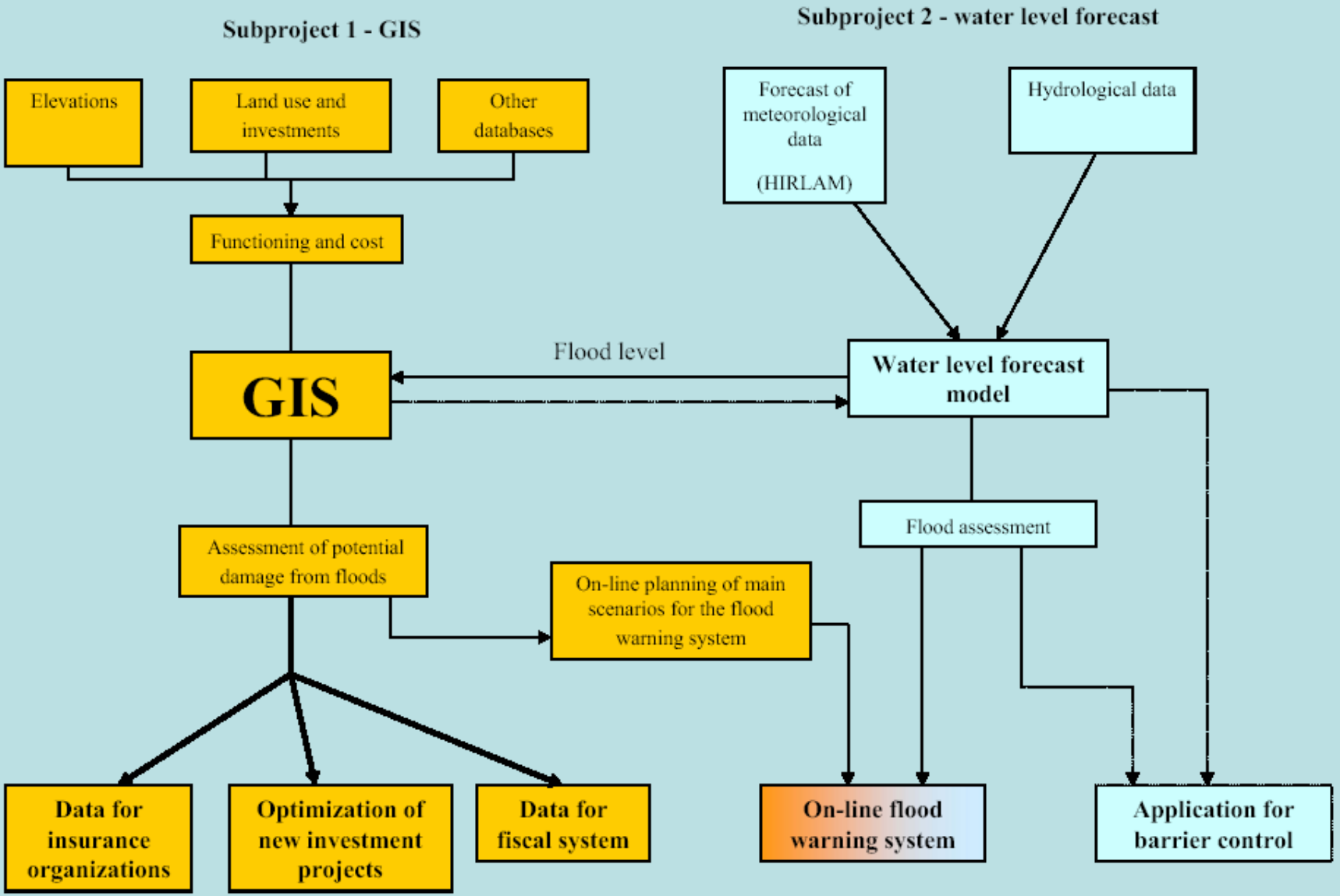


Diagram of repeatability of floods with breakdown by months



Flood warning and damage assessment



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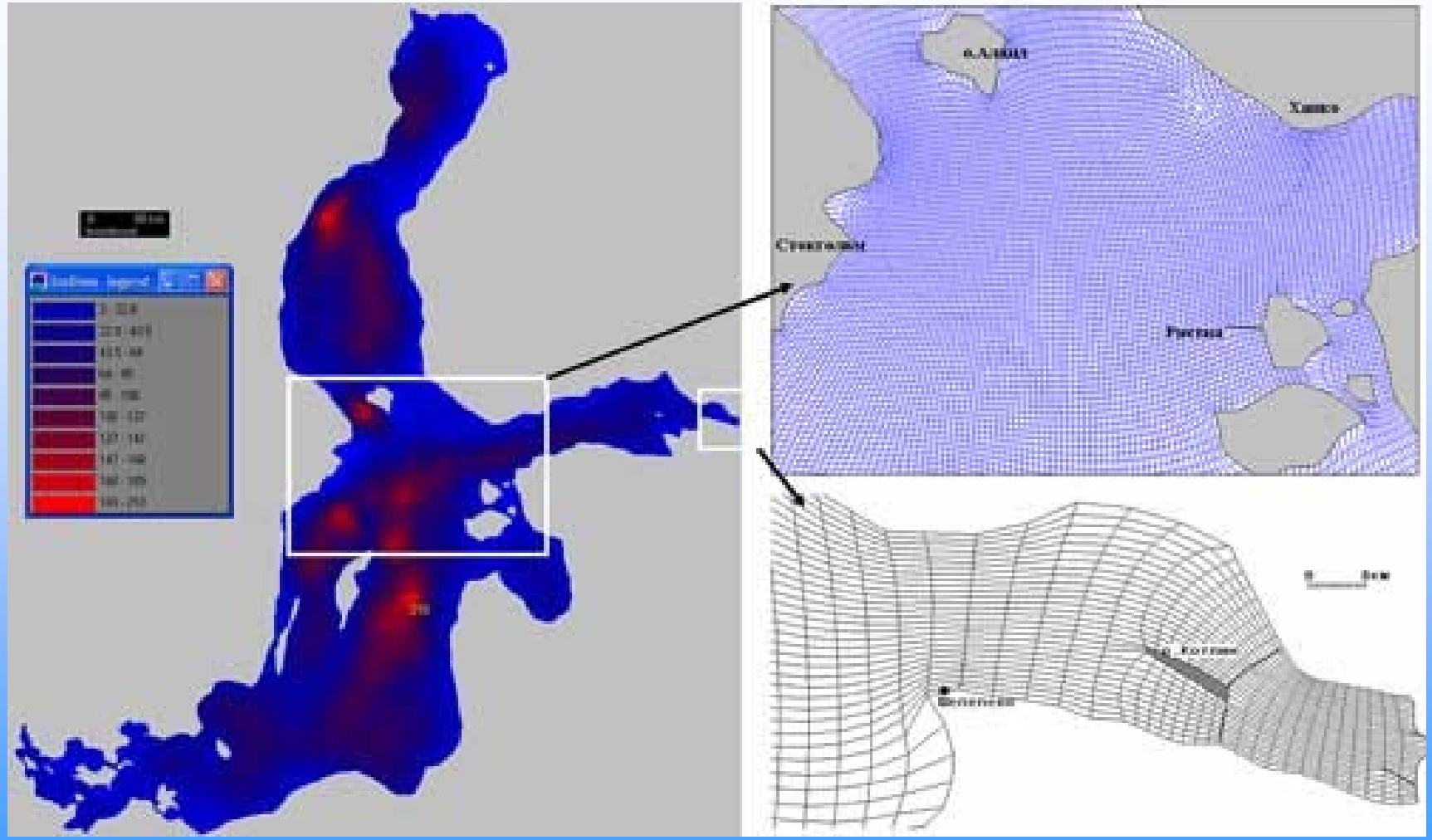
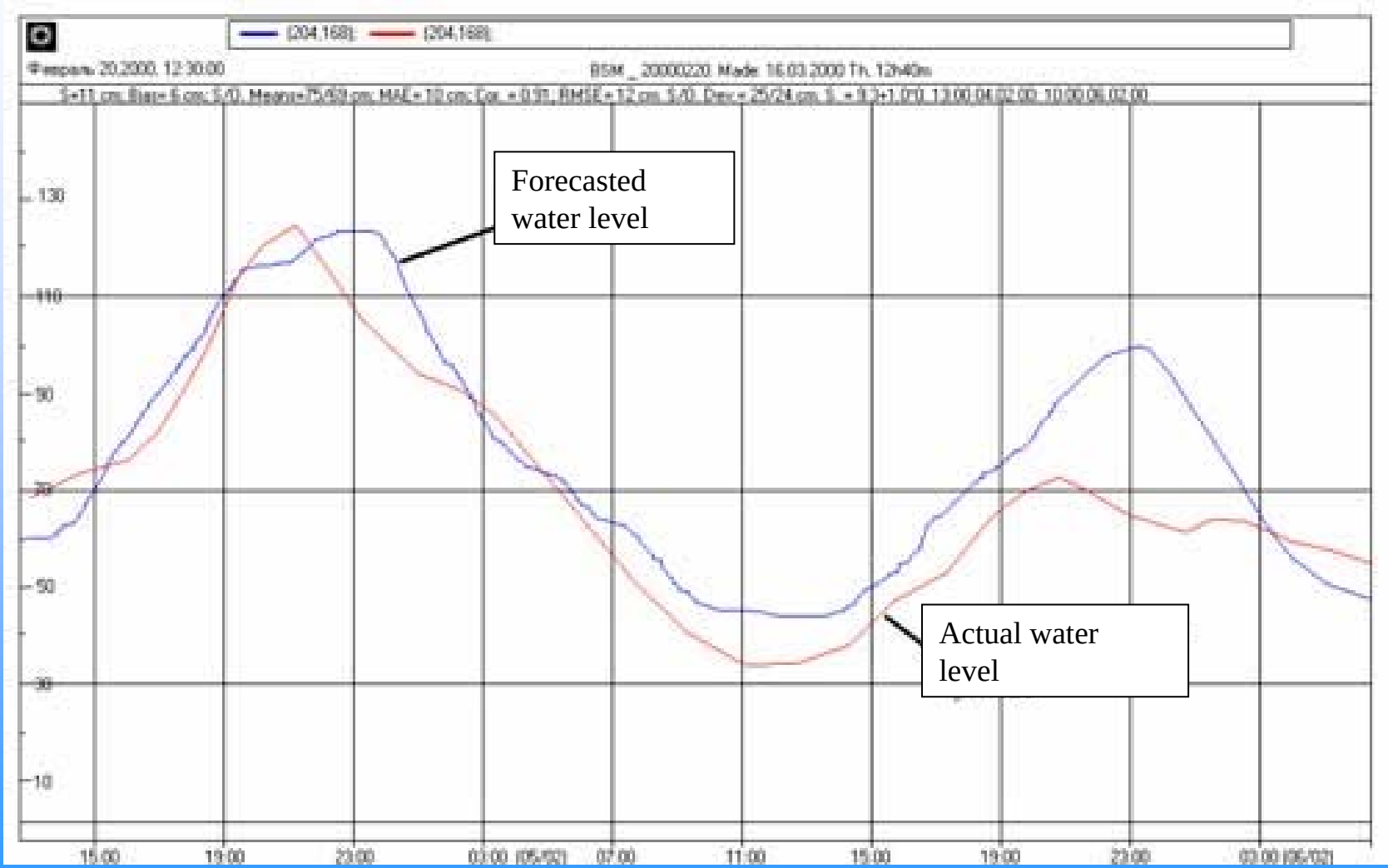
Baltic Sea model BSM5 (shallow water equations) developed at MORZASCHITA

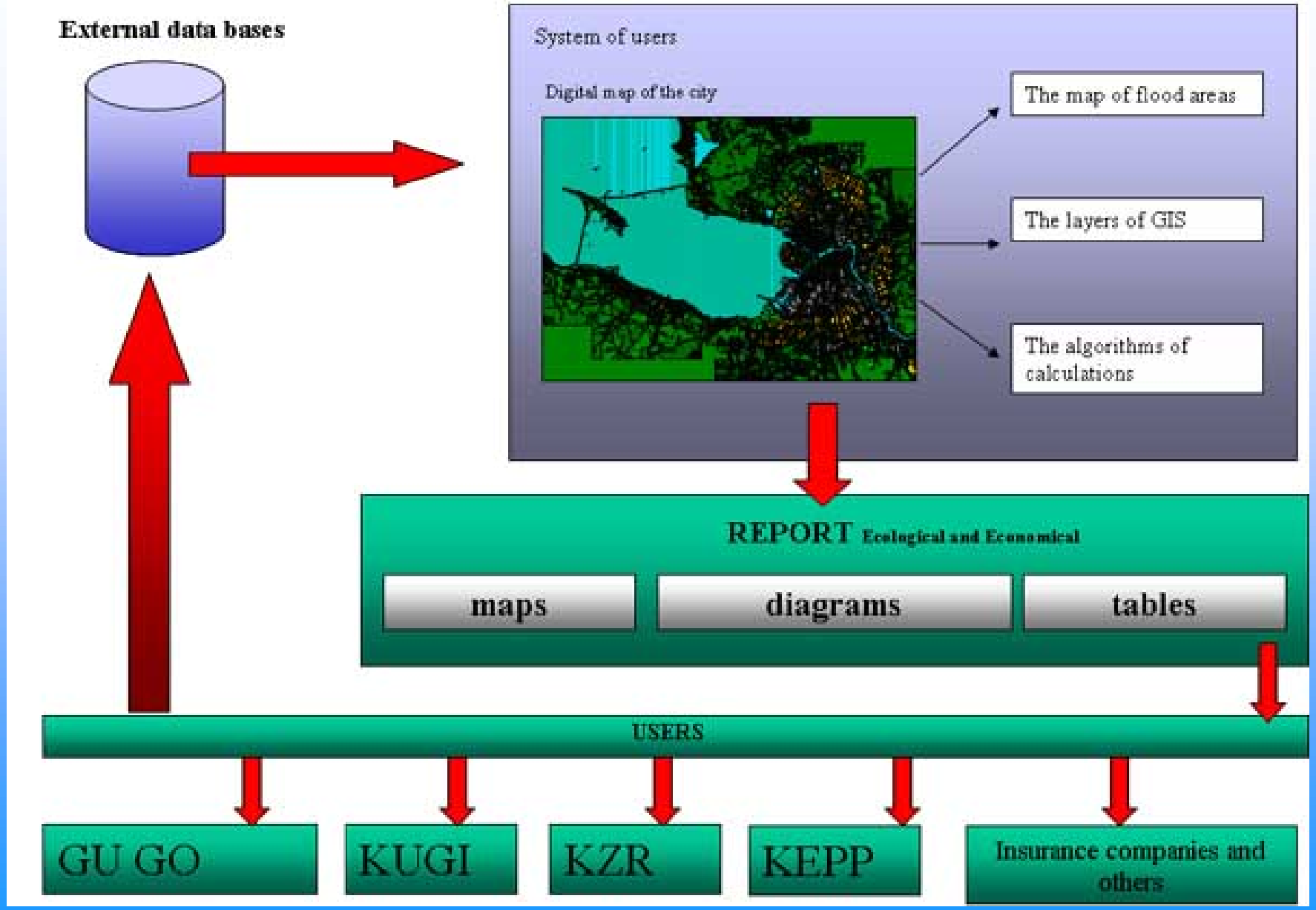


Mean grid size is 7400 m, minimum is 400 m (Neva Bay). The Barrier is approximated with dams with 4 openings keeping total open cross section area 14900 m^2

Comparison of actual and forecasted water levels

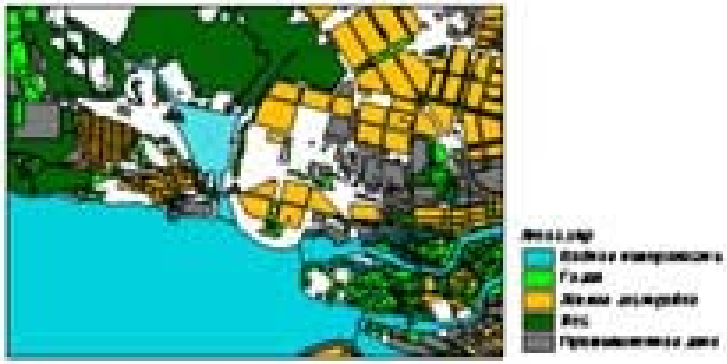


GIS structure



Main layers of the GIS

Types of areas



Buildings

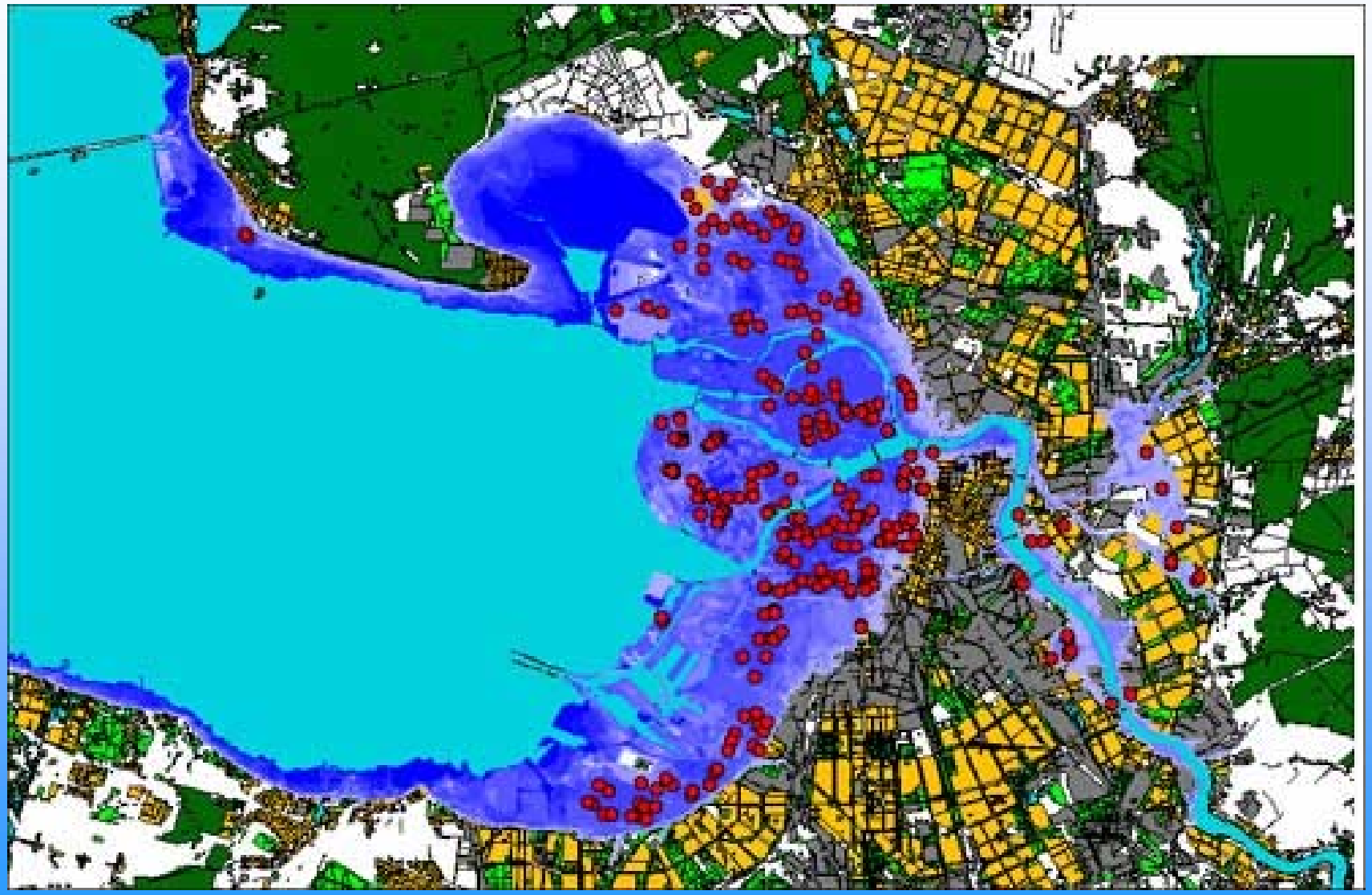
District

Streets

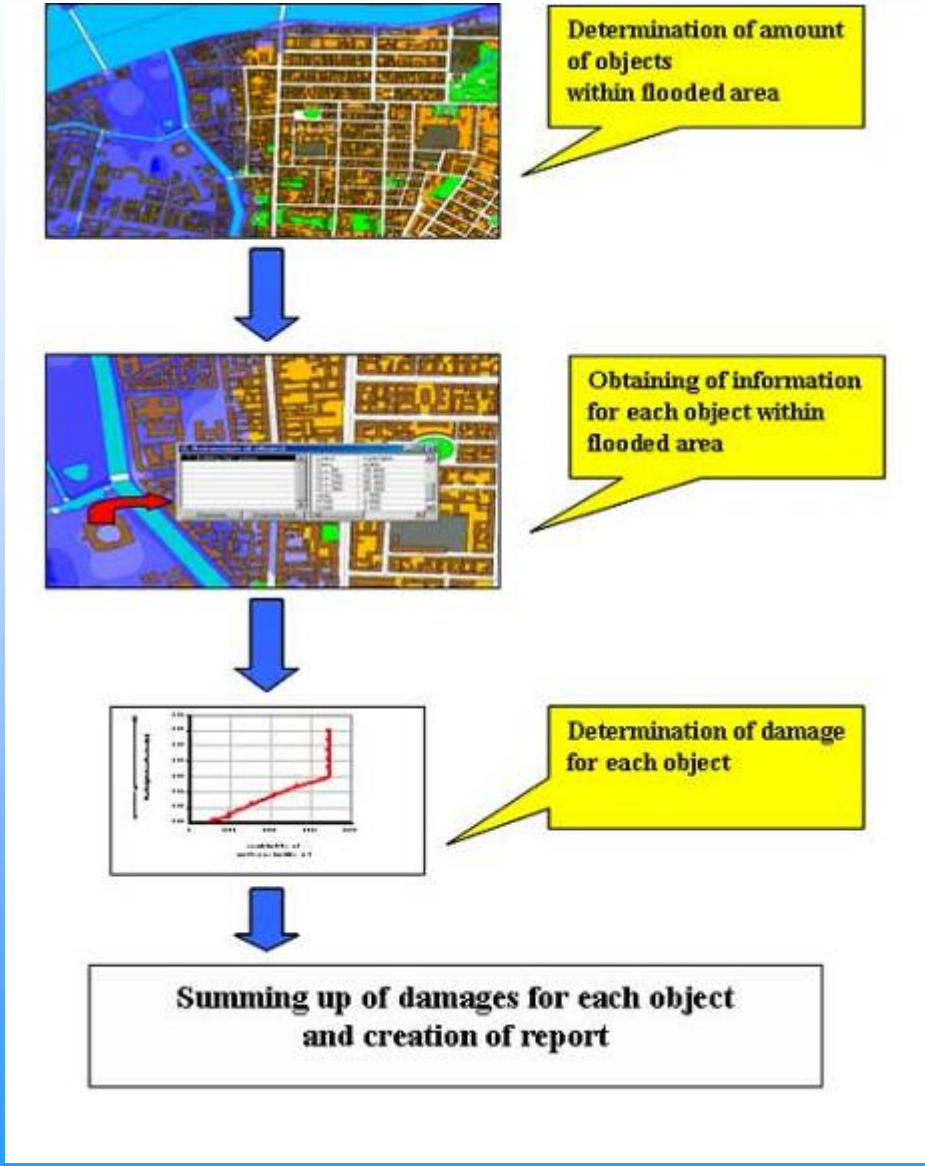
Engineering communications

Factories

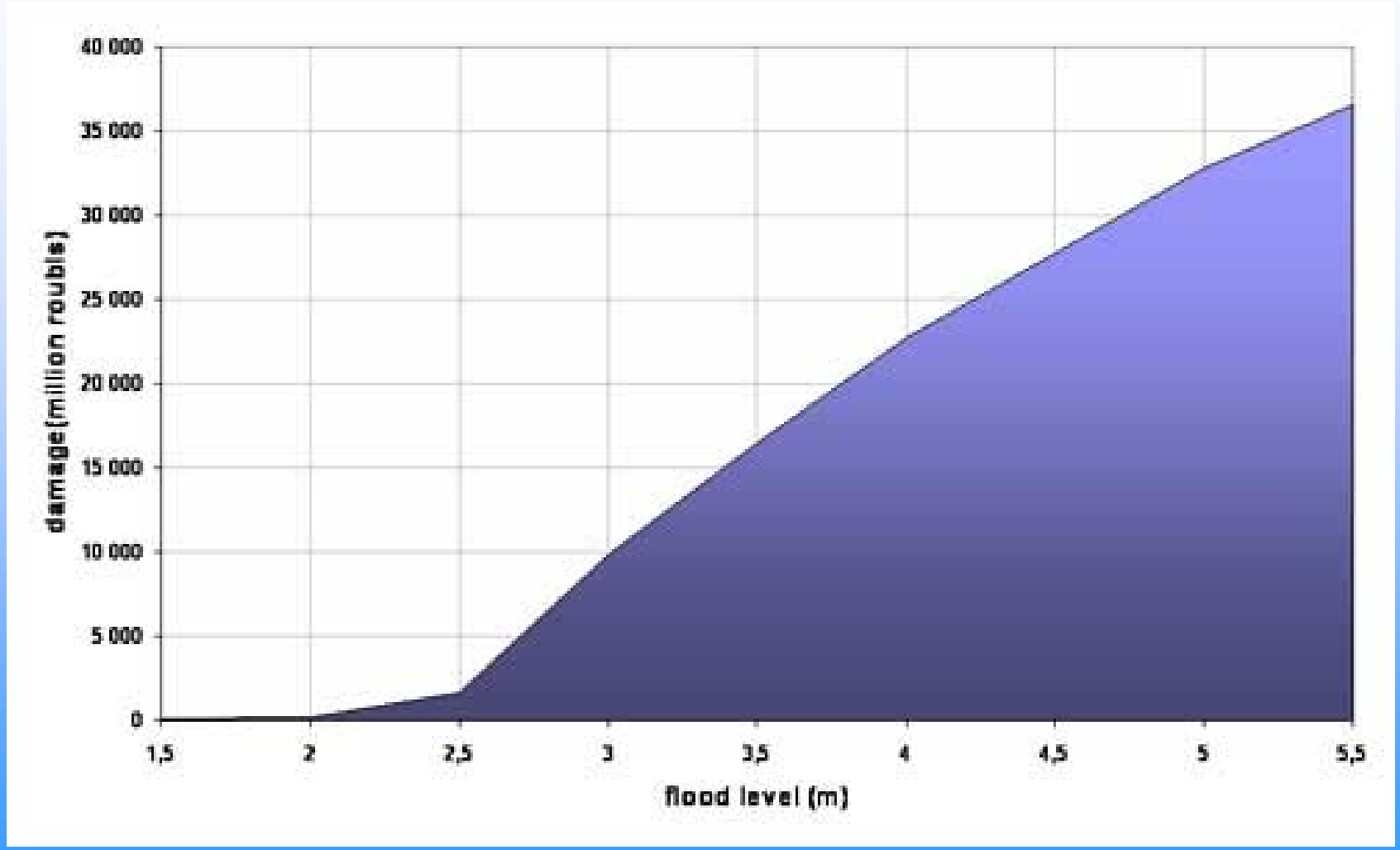
Colleges and schools within the maximum flooding area



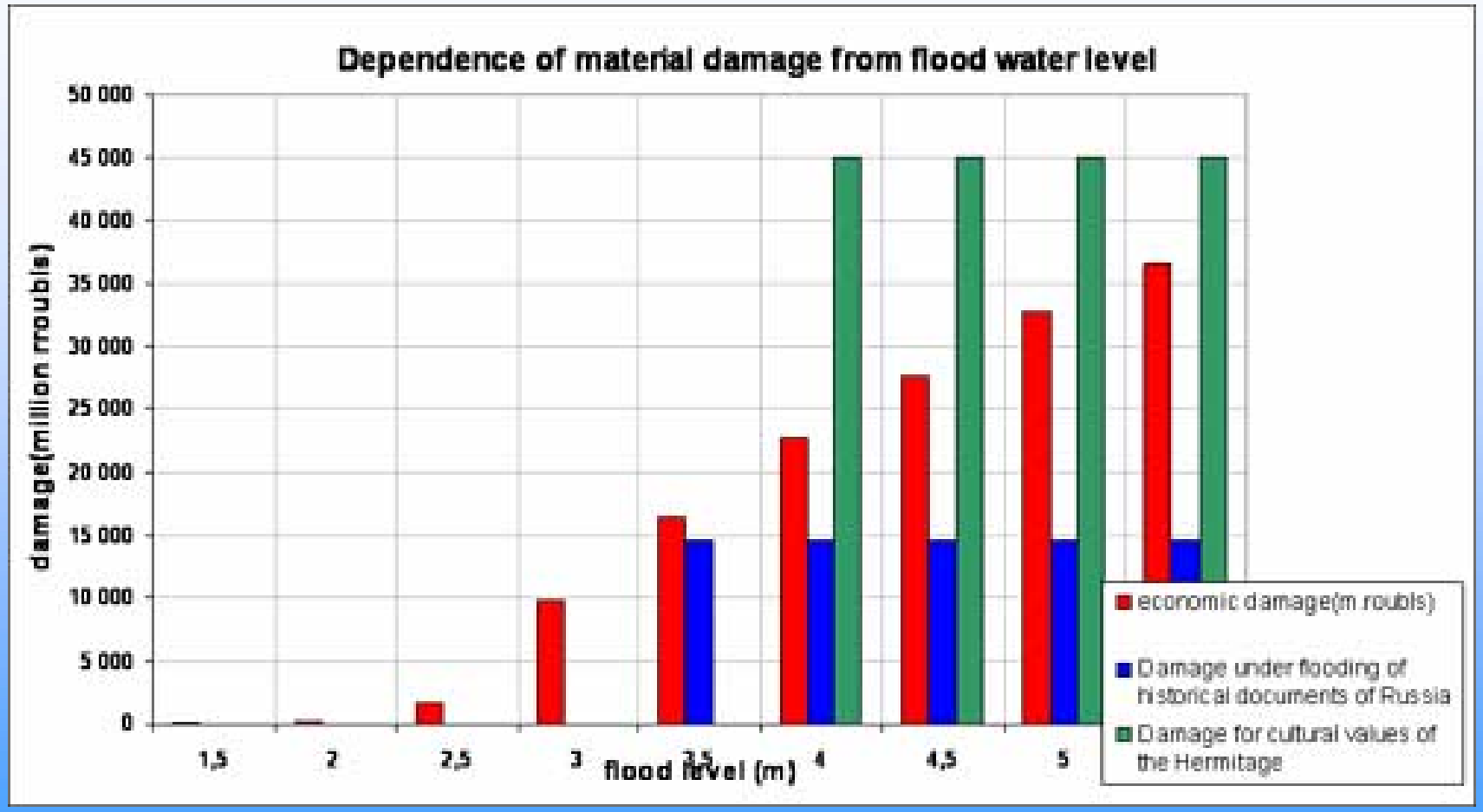
Algorythm of economic damage calculation in the GIS



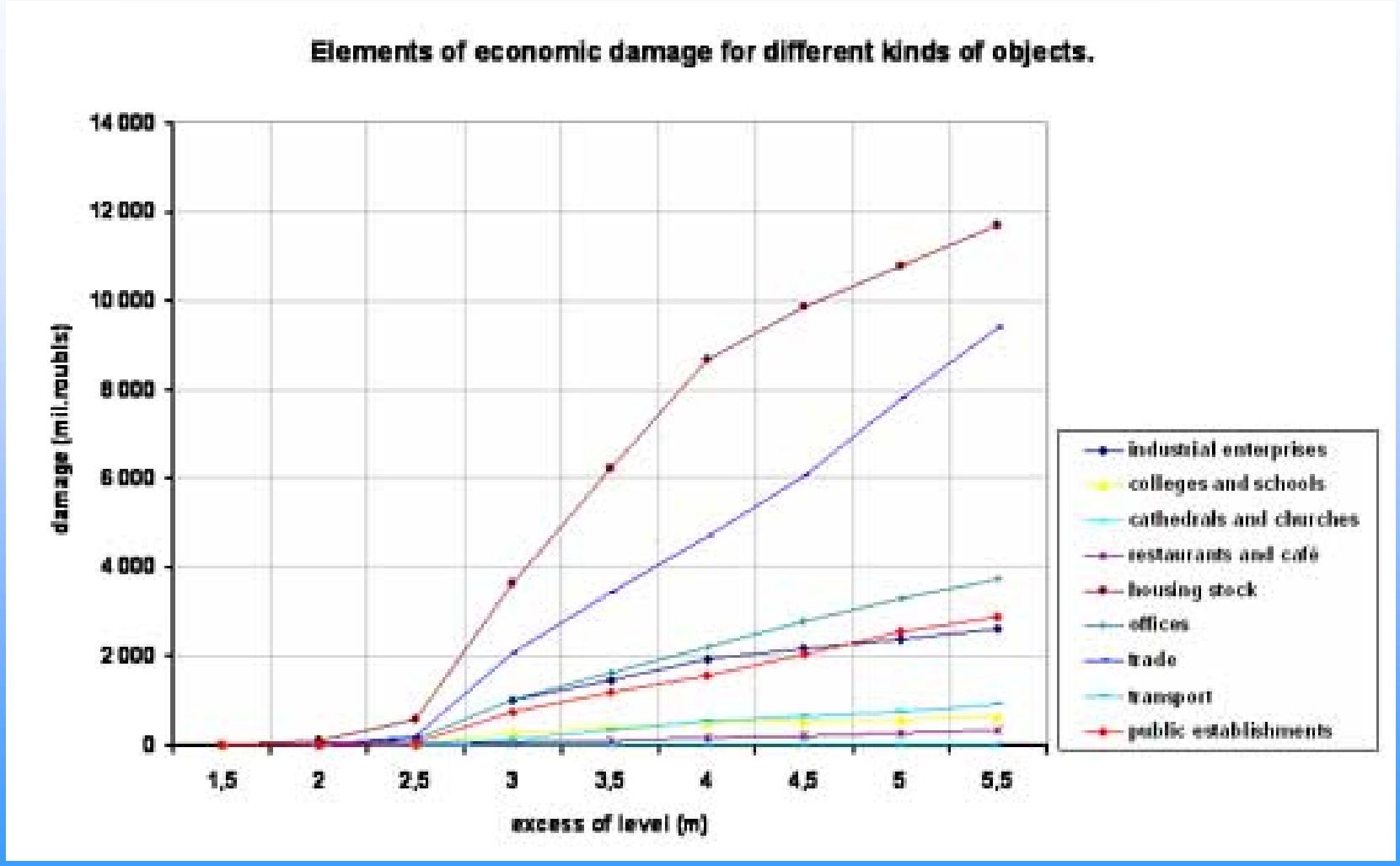
Economical damage depending on flood water level



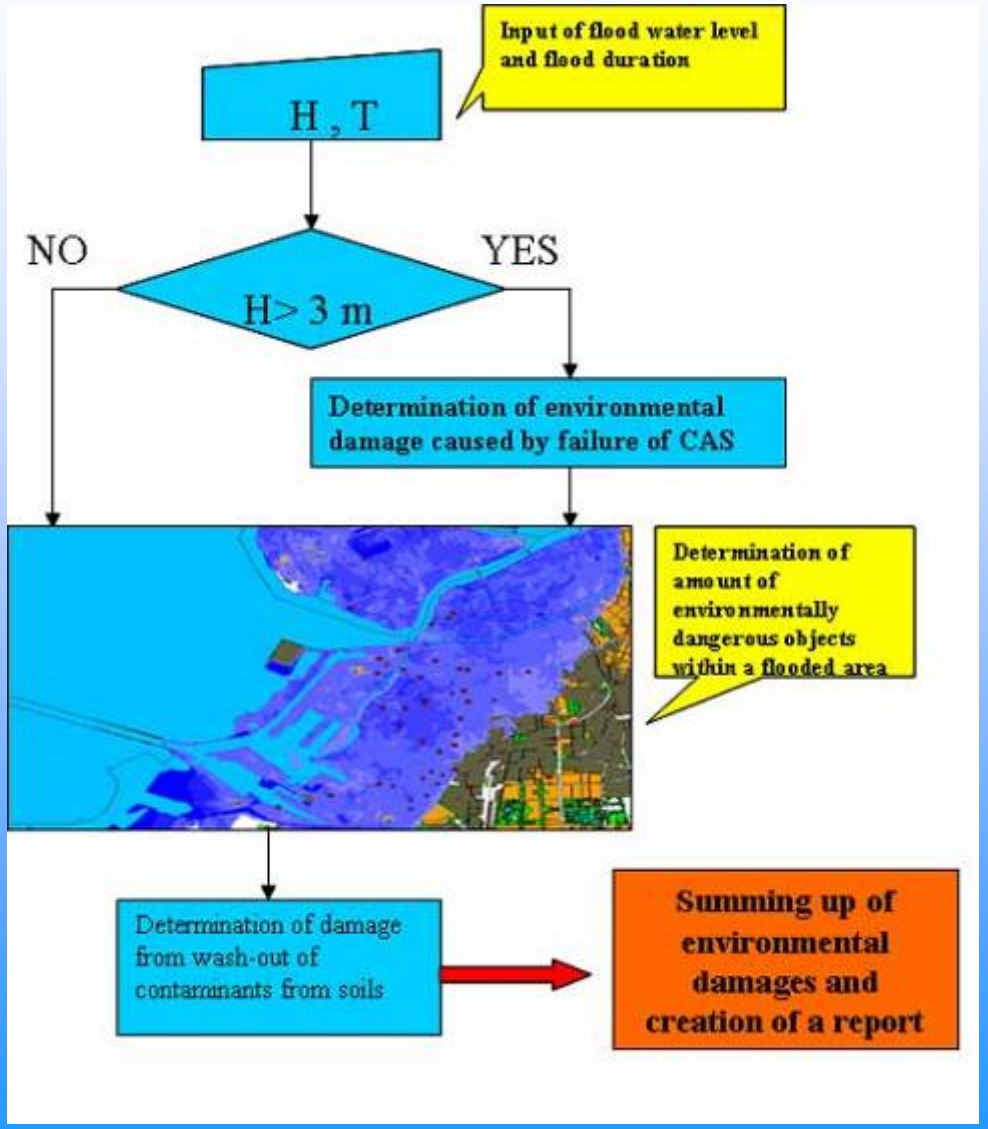
Dependence of material damage from flood water level



Elements of economic damage for different kinds of objects



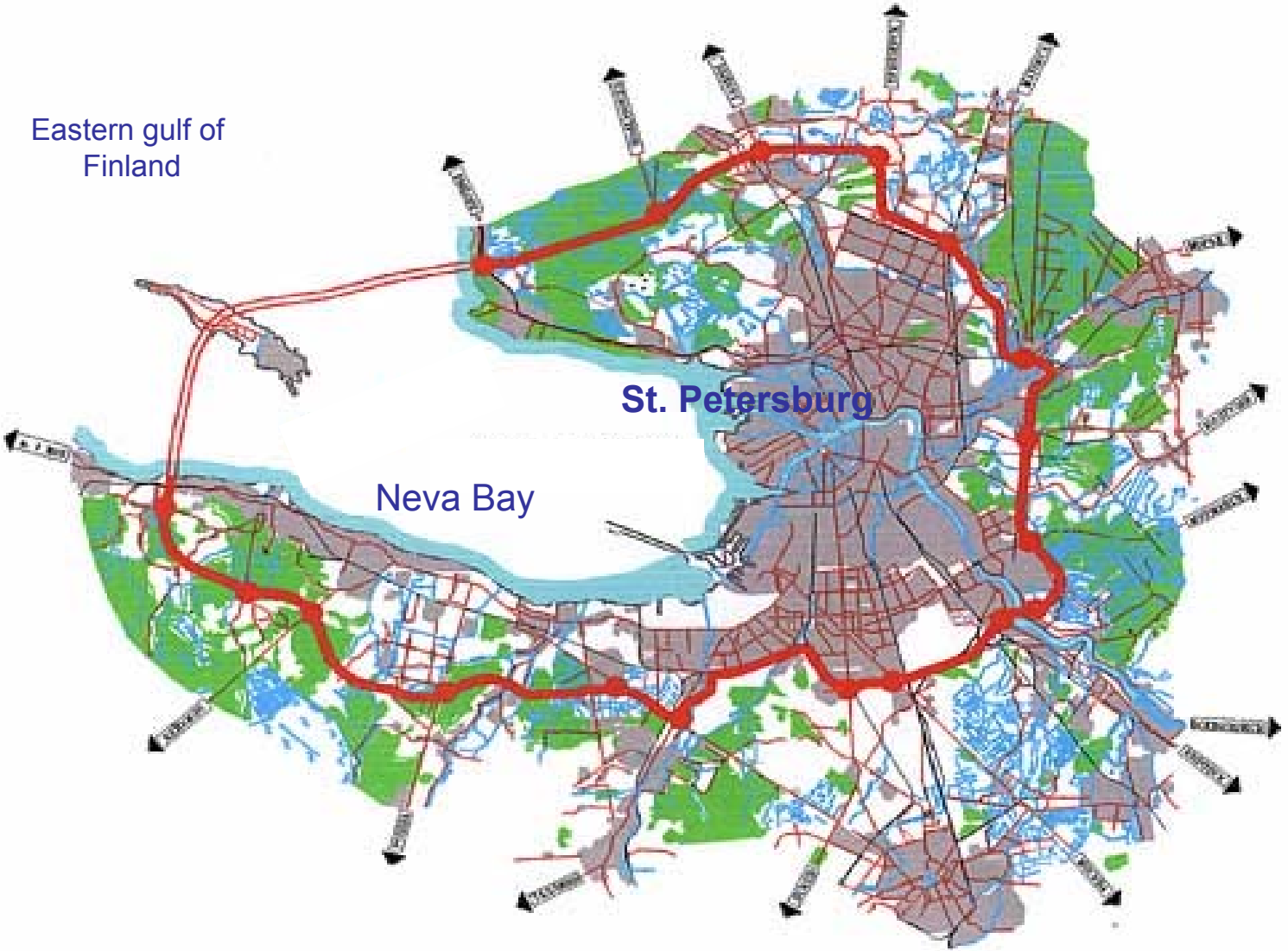
Algorythm of environmental damage calculation in the GIS



Multifunctional use of the Flood Protection Barrier for St. Petersburg

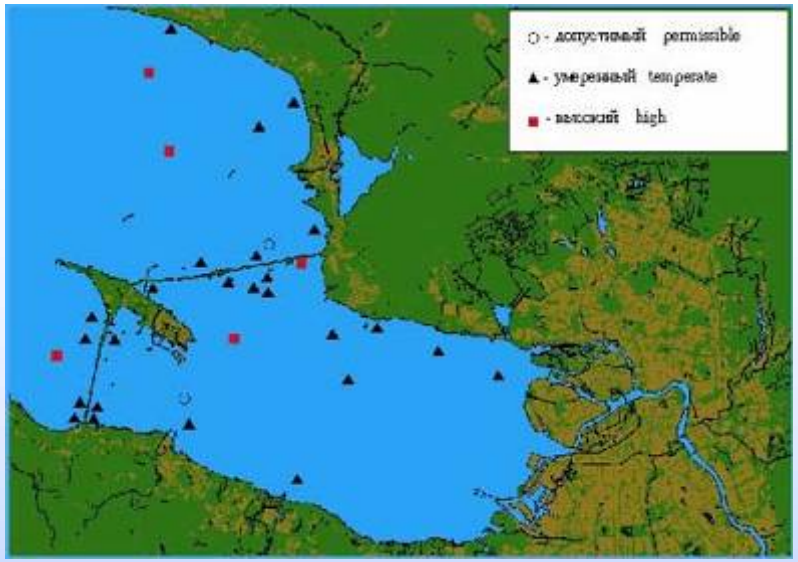
- Protecting St. Petersburg from floods
- Providing St. Petersburg ring road through FPB
- Providing management of water flows in the Neva Bay for ecological condition improvement by means of FPB water gates manoeuvring. Minimising pollution damage
- Navigation and vessels passage
- Recreation, fishing, tourism

Ring road around of Saint-Petersburg

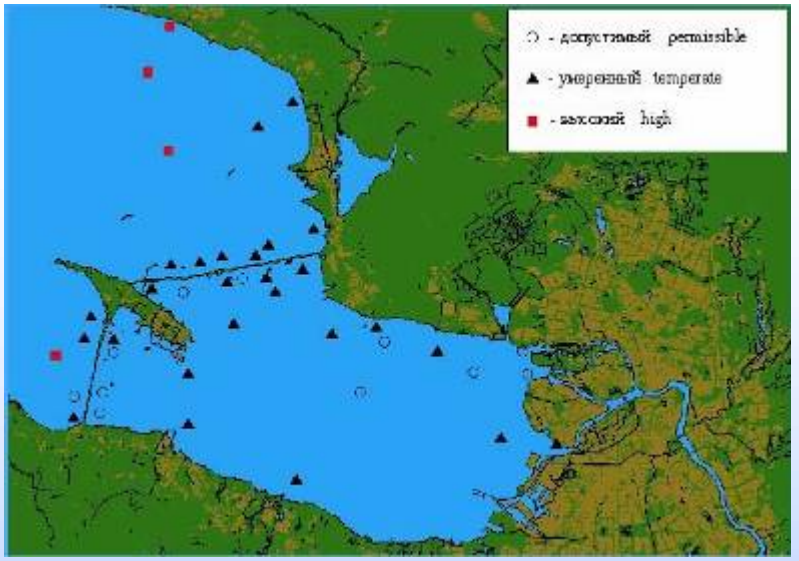


The procedures of the experiment on studying the influence of FPB water gates maneuvering on the ecological condition improvement

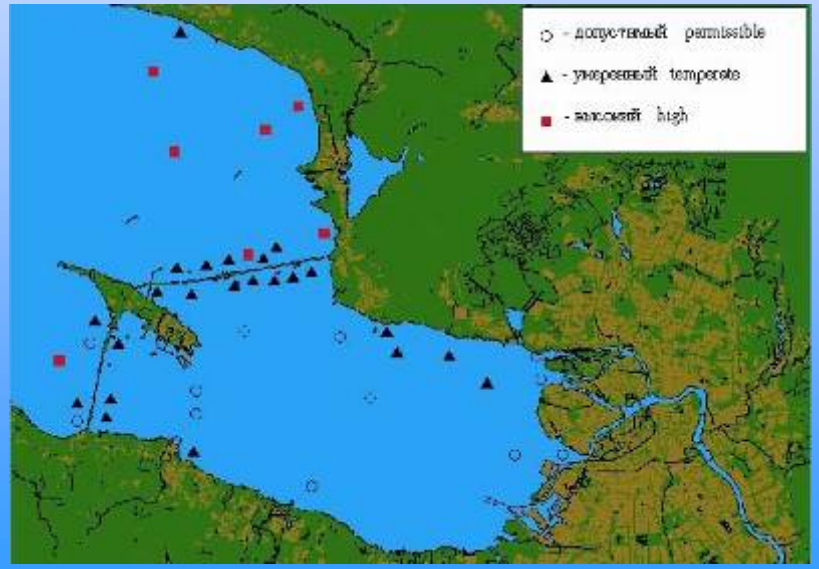
Water exchange gates



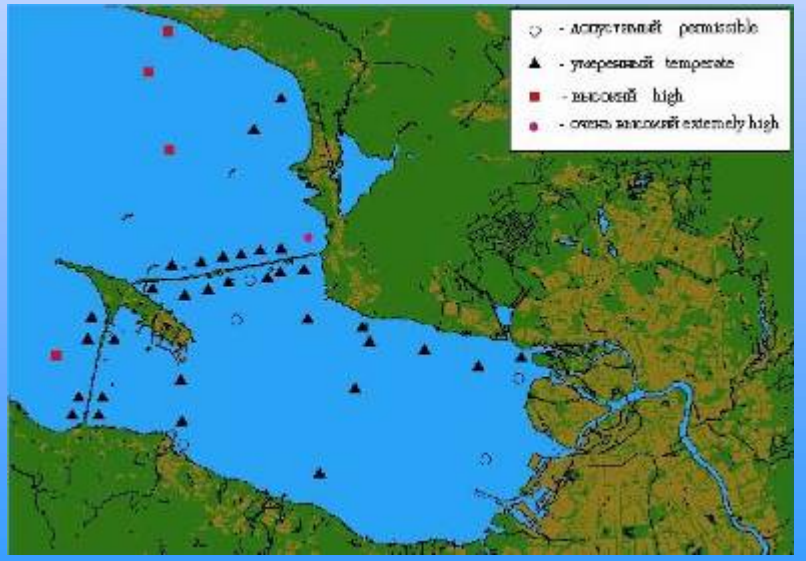
Level of pollution. 14-15.10.92



Level of pollution. 22-23.10.92



Level of pollution. 28-30.10.92



Level of population. 05-06.11.92

Long-term Observations of the NWHMS on water levels in the Eastern Gulf of Finland

Socio-economic and cultural impacts

- No economic losses incurring from flooding
- Improved situation for making investments in the City territory
- Possibility to create recreational facilities on the reclaimed areas
- Protection of the cultural heritage of the City

Integrated Water Management in St.Petersburg (IWM) is:

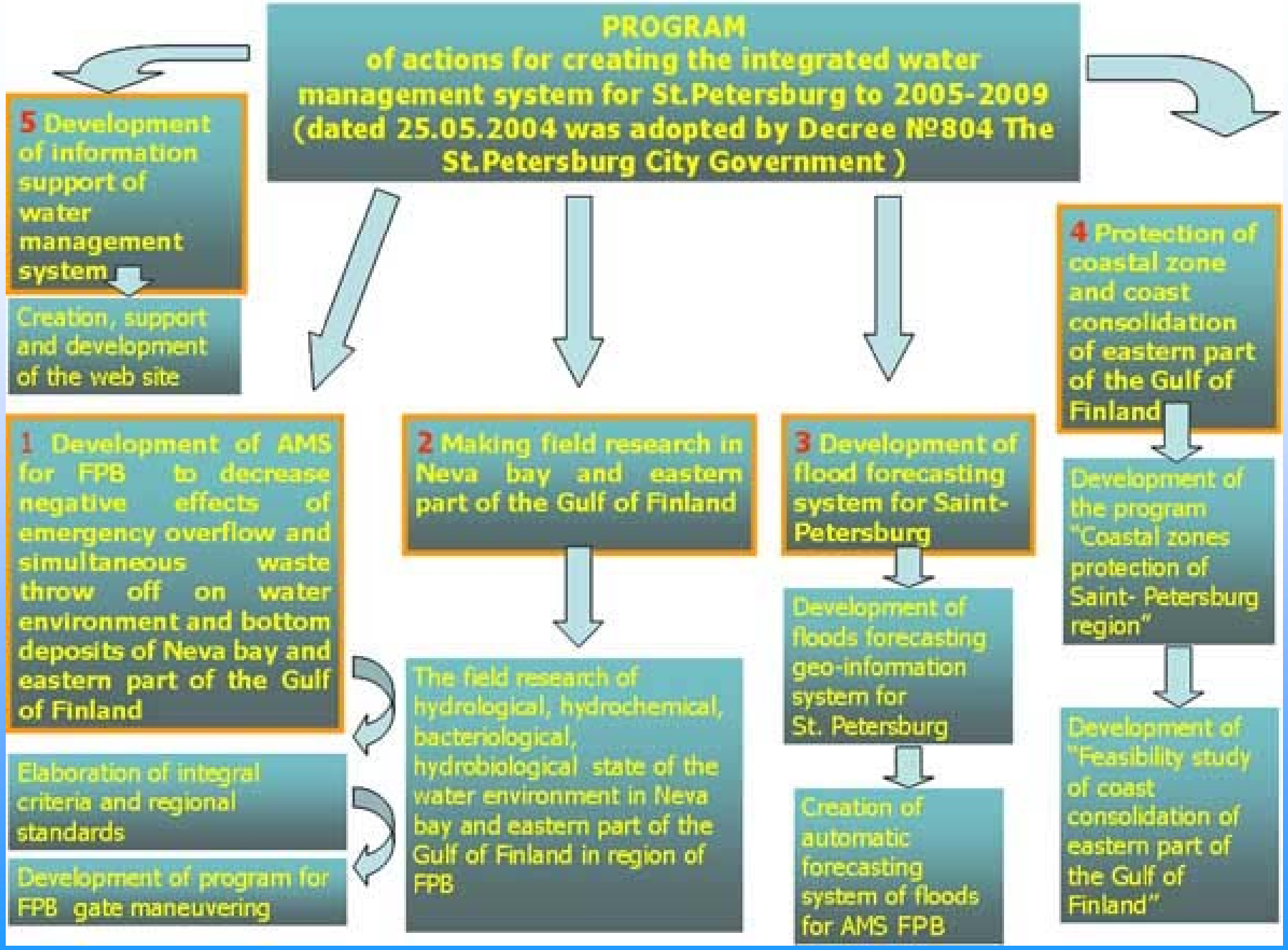
- a system scientific approach of water management, that aims at balancing the various (often conflicting) users of the water systems
- needed for sustainable development and rational use of water system
- development of other than safety functions of FPB

Recent IWM developments:

- **2004: The City Government has appointed Morzaschita as an organization for realization of the Program of actions to create the IWM system in St.Petersburg for 2005-2009**

  (Decree of the St.Petersburg City Government dated 25.05.2004 № 804)

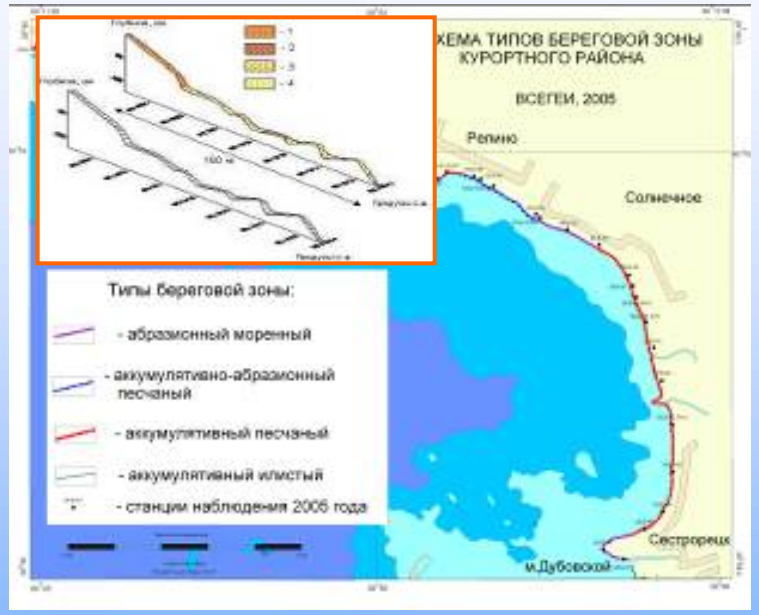
- **12 main organizations participate in this Program**


PROGRAM
of actions for creating the integrated water management system for St.Petersburg to 2005-2009 (dated 25.05.2004 was adopted by Decree №804 The St.Petersburg City Government)
5 Development of information support of water management system
Creation, support and development of the web site
1 Development of AMS for FPB to decrease negative effects of emergency overflow and simultaneous waste throw off on water environment and bottom deposits of Neva bay and eastern part of the Gulf of Finland
Elaboration of integral criteria and regional standards
Development of program for FPB gate maneuvering
2 Making field research in Neva bay and eastern part of the Gulf of Finland
The field research of hydrological, hydrochemical, bacteriological, hydrobiological state of the water environment in Neva bay and eastern part of the Gulf of Finland in region of FPB
3 Development of flood forecasting system for Saint-Petersburg
Development of floods forecasting geo-information system for St. Petersburg
Creation of automatic forecasting system of floods for AMS FPB
4 Protection of coastal zone and coast consolidation of eastern part of the Gulf of Finland
Development of the program "Coastal zones protection of Saint- Petersburg region"
Development of "Feasibility study of coast consolidation of eastern part of the Gulf of Finland"

Protection of coastal zones and coast consolidation of eastern part of the Gulf of Finland

In 2005 the following works have been done:

- The weak spots along coast of eastern part of the Gulf of Finland have been determined.
- Typification of the Kurortniy district coastal zones by directivity of lithodynamic processes has been made.
- The complex bottom researches of eastern part of the Gulf of Finland have been made.



2003 2005

“Operational management of the St.Petersburg Flood Protection Barrier ” Workshop, 19-20 May

Participants from Russia, the Netherlands, the United Kingdom, Italy, Sweden

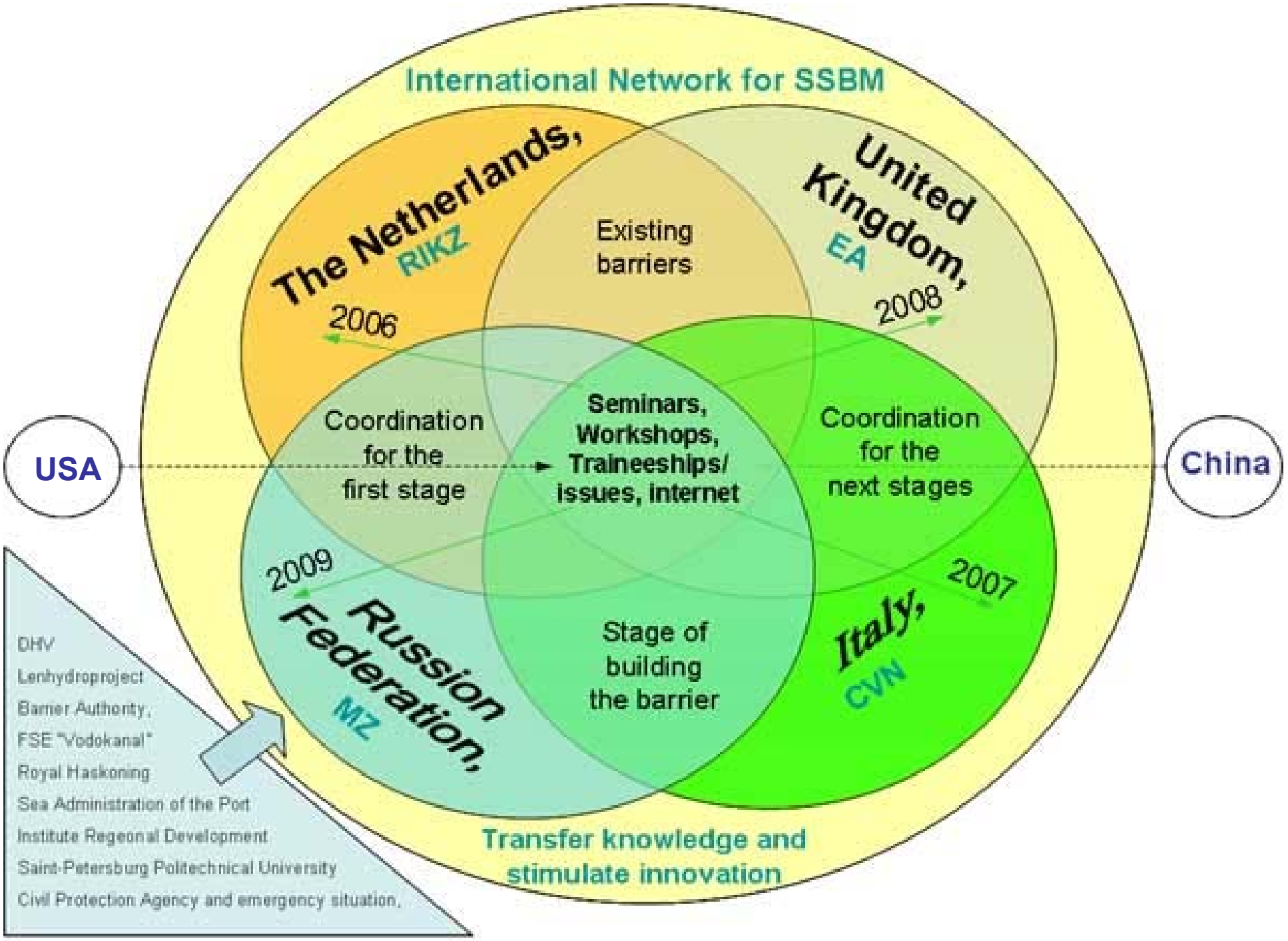
Main subjects:

- Experiences with operation of existing barriers in Europe
- Various stakeholders issues
- Flood forecasting; prediction methods, measurements, monitoring
- Legal issues; Flood warning requirements for St. Petersburg

The Hague, 26 October 2005
4th session of WATERGROUP

Main conclusions of Protocol:

- Building of International network for Flood Protection Barrier managers
- The Netherlands (RIKZ) and St.Petersburg (Morzaschita) will play an initiating role to build such a network


International Network for SSBM
The Netherlands,
RIKZ
2006
United Kingdom,
EA
2008
Existing barriers
USA
Coordination for the first stage
Seminars, Workshops, Traineeships/ issues, internet
Coordination for the next stages
China
2009
Russion Federation,
MZ
Stage of building the barrier
2007
Italy,
CVN
Transfer knowledge and stimulate innovation
DHV
Lenhydroproject
Barrier Authority,
FSE "Vodokanal"
Royal Haskoning
Sea Administration of the Port
Institute Regeonal Development
Saint-Petersburg Politechnical University
Civil Protection Agency and emergency situation,

Thank you for your attention

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