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WMO OMM

WORLD METEOROLOGICAL ORGANIZATION
WEATHER, CLIMATE AND WATER

WMO RA VI Hydrology Forum

Warsaw, Poland, 24 – 26 September 2014

ADMINISTRAȚIA NAȚIONALĂ "APELE ROMÂNE" INSTITUTUL NAȚIONAL DE HIDROLOGIE ȘI GOSPODĂRIREA APELOR INHGA

Needs in harmonization of monitoring network and of hydrological data processing on the trans-border rivers

Jointly for our common future

Mary-Jeanne Adler, PhD,
Hydrological Adviser INHGA, Bucharest

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A transnational river requires transnational cooperation …

- All Danube countries worked on improvements:
  - Hydro-meteorological Data Collection
  - Data Processing
  - Harmonization of methodologies
  - Mapping methods - Elevation systems
  - Metadata and Geodata base
  - Portal for data dissemination
  - Common procedures for establishing thresholds and warnings
  - Data for water policy implementation

Motivation for DANUBE FLOODRISK Project,
Danube WATER and EAST AVERT

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1. DATA COLLECTION

- **collecting data with similar instruments to get comparable data precision**
- **redundant data collection – back-up system at the first level (two types of sensors, or better, 2 automate stations**
- **sampling interval depending on the thresholds water level getting the picks – flexibility of data logger in programming**
- **Facility to introduce the control water level observation in the data logger, for eventual data series correction**

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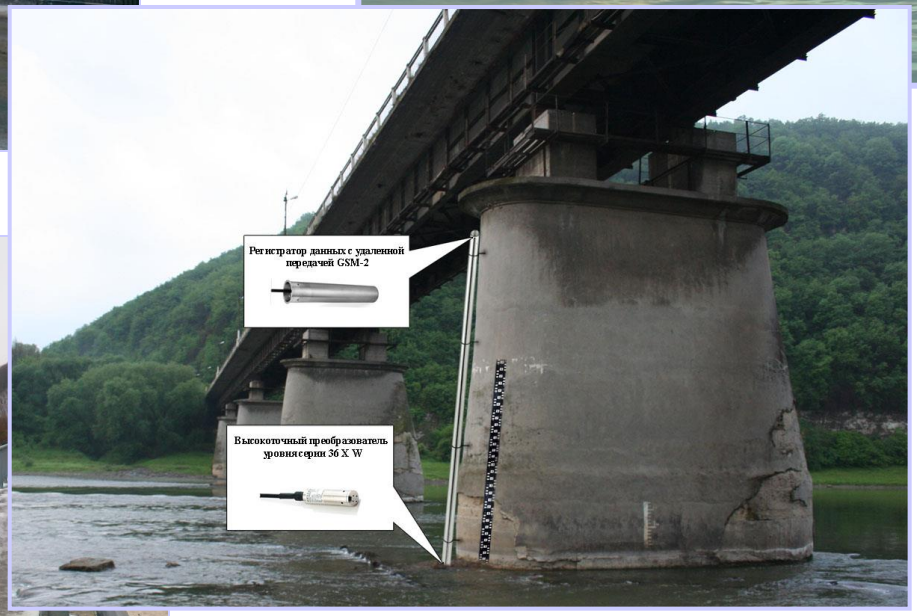
Pilot basin Prut - MODERNIZATION OF THE MONTORING SYSTEM - back-up for water level registration

- ***Under the project it is foreseen automatization of 27 observation points in the basins of the rivers Prut and Siret, including :***
- ***20 stations to measure water levels,***
- ***5 hydrometric crossings,***
- ***19 measuring device of rainfall that will be installed at the hydrometric stations as well as separate stations;***

- ***Modernization of 7 control centers for the collection, analysis and transmission of information (3 UA, 1 MO, 3 RO);***

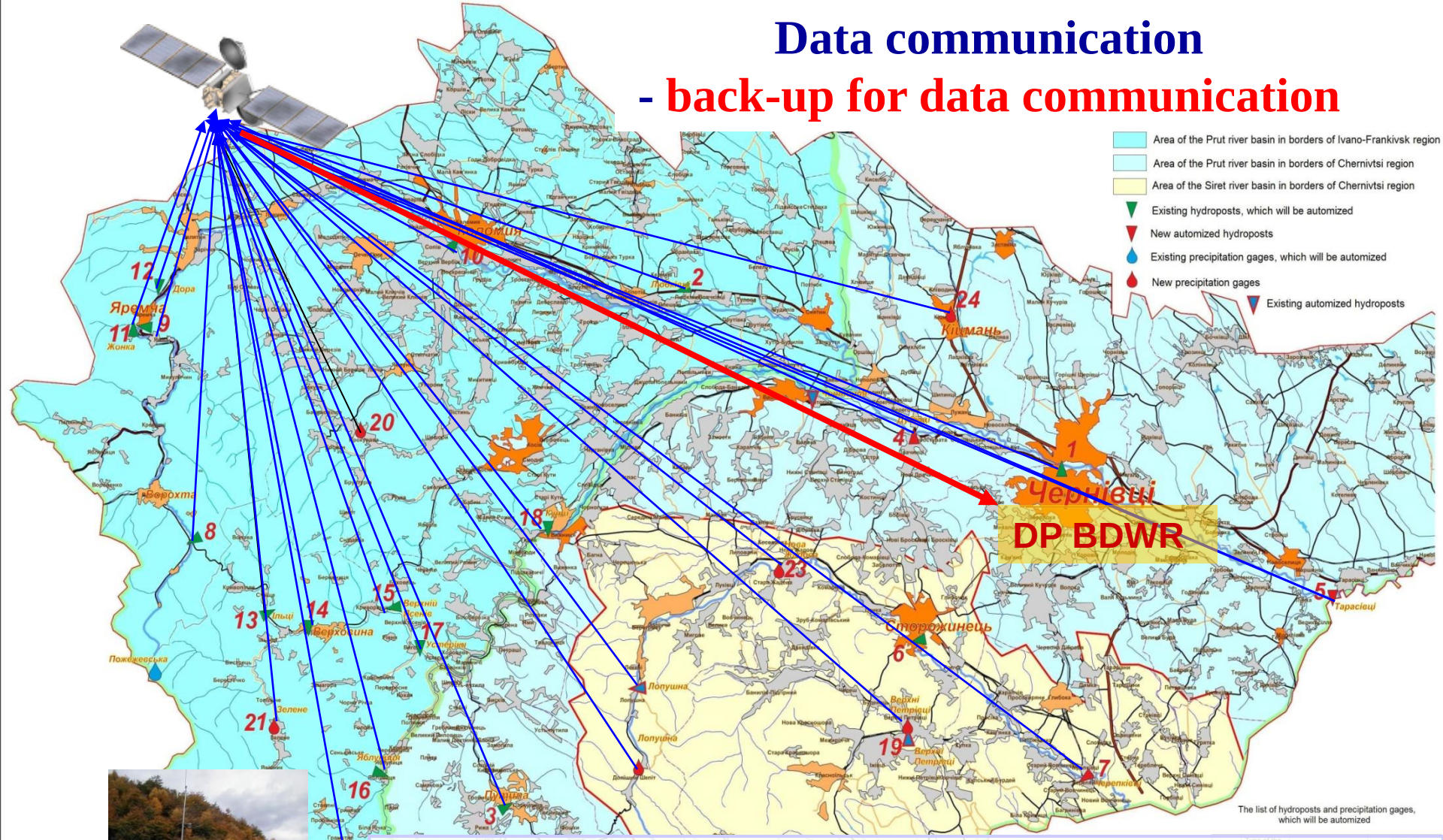
- *Water level sensors and stages should be in security during floods*
- *In the cross section will be provided discharge measurements*



Discharge measurements

- Attention to instruments, and correct methods for measurements, to get similar precision along the river,
- Common field campaigns, considering travel time, to verify the maximum and minimum discharges are correct determined by different instruments and different methods of calculation (ADCP, propeller, magnetic sensors registering, ultrason senzors)

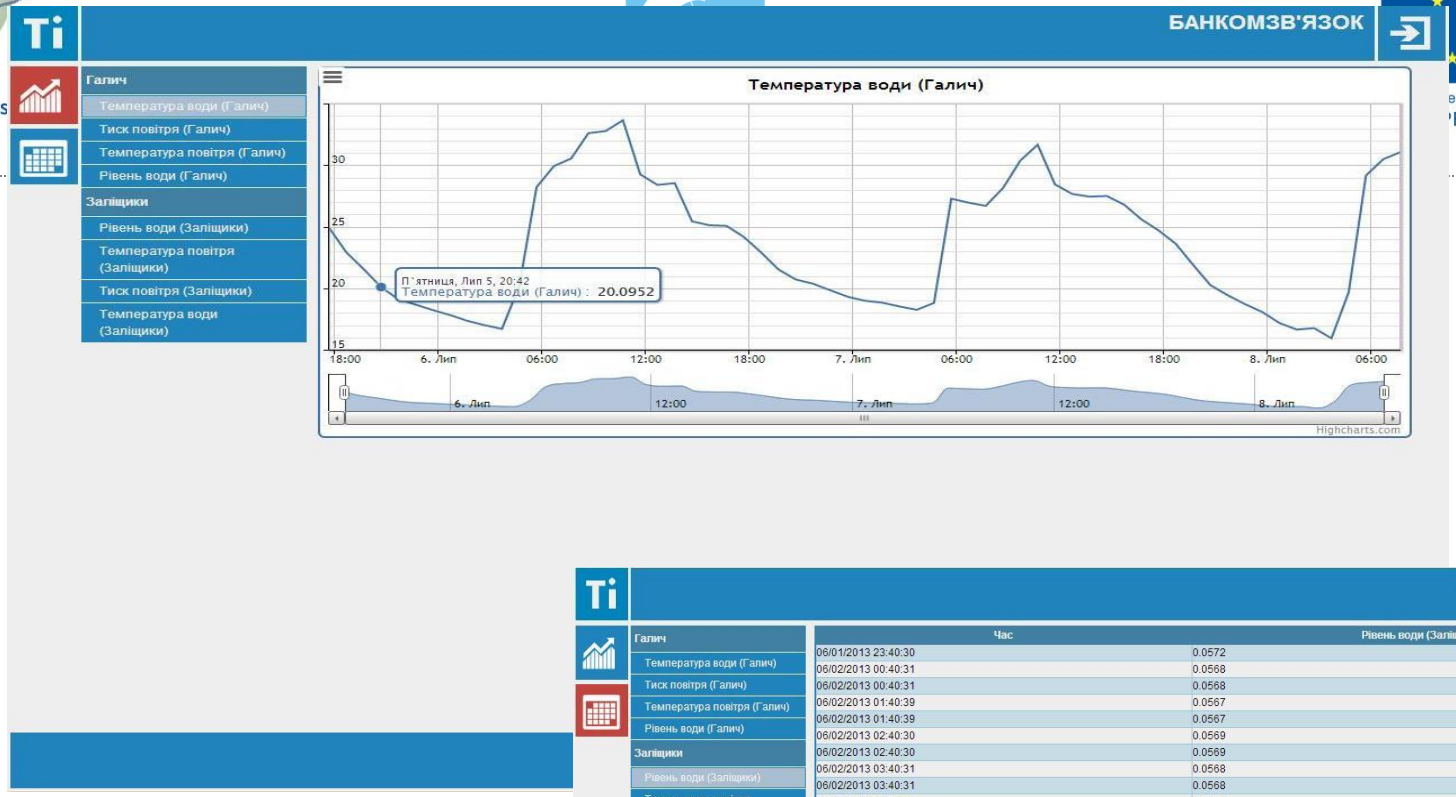
Data communication
- back-up for data communication



Reliability data will be provided through the use of mobile (modem channel with two cards of different operators) and satellite communications.


BORDER INFORMATION SHARING DIAGRAM
(Киев) Kyiv
L'viv
Ternopil'
Hmel'nytskyi
Vinnytsya
Украина
Ivano-Frankivsk
Data portal
Dnister-Prut BDWR
Молдова
(Кишинев) Chisinau
Odesa
LINEP
Румыния
(Бухарест) Bucuresti

Data collection and processing



Час	Рівень води (Заліщики)
06/01/2013 23:40:30	0.0572
06/02/2013 00:40:31	0.0568
06/02/2013 00:40:31	0.0568
06/02/2013 01:40:39	0.0567
06/02/2013 01:40:39	0.0567
06/02/2013 02:40:30	0.0569
06/02/2013 02:40:30	0.0569
06/02/2013 03:40:31	0.0568
06/02/2013 03:40:31	0.0568
06/02/2013 04:40:41	0.0568
06/02/2013 04:40:41	0.0568
06/02/2013 05:40:30	0.057
06/02/2013 05:40:30	0.057
06/02/2013 06:40:37	0.0571
06/02/2013 06:40:37	0.0571
06/02/2013 07:40:35	0.0565
06/02/2013 07:40:35	0.0565
06/02/2013 08:40:31	0.0562
06/02/2013 08:40:31	0.0562
06/02/2013 09:40:34	0.0556
06/02/2013 09:40:34	0.0556
06/02/2013 10:40:33	0.0551
06/02/2013 10:40:33	0.0551
06/02/2013 11:40:33	0.0546
06/02/2013 11:40:33	0.0546
06/02/2013 12:40:35	0.0541
06/02/2013 12:40:35	0.0541
06/02/2013 13:40:32	0.0533
06/02/2013 13:40:32	0.0533
06/02/2013 14:40:32	0.0529
06/02/2013 14:40:32	0.0529
06/02/2013 15:40:48	0.053
06/02/2013 15:40:48	0.053
06/02/2013 16:40:32	0.0532
06/02/2013 16:40:32	0.0532
06/02/2013 17:40:34	0.0535
06/02/2013 17:40:34	0.0535
06/02/2013 18:40:37	0.0544
06/02/2013 18:40:37	0.0544
06/02/2013 19:40:47	0.055

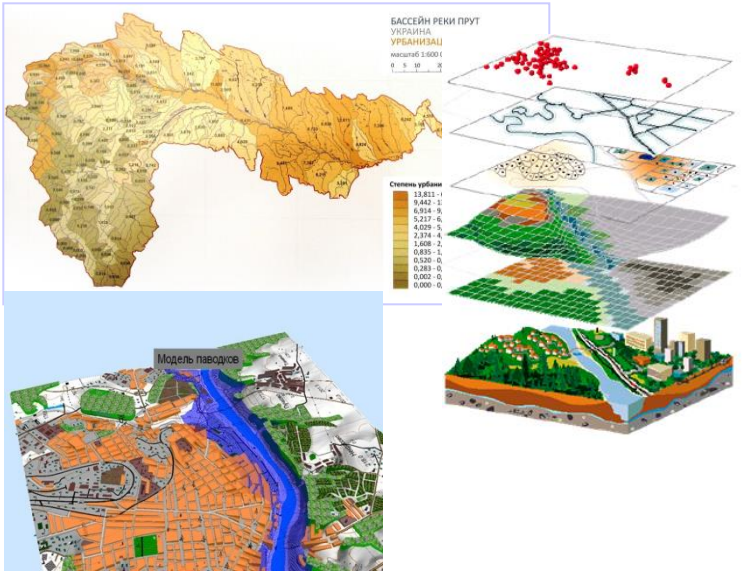
- Data validation – first cheack

- Stage discharge processing – harmonization at the borders areas by data expertize – under volume constrains

Metadata base and geodata base

Hydrological data base

Numerical data should be linked by maps –GIS applications – geodatabase structure for data harmonization – INSPIRE standards



Statistical analyzes, parameterization, processing and regionalization

Metadata base and statistical parameters data harmonization

Hydrological data base
Metadata base for site observation and river sector survey

Statistical analyzes-(homogeneity, data simulation, statistical distribution use) determining parameters

INTRANET APPLICATIONS

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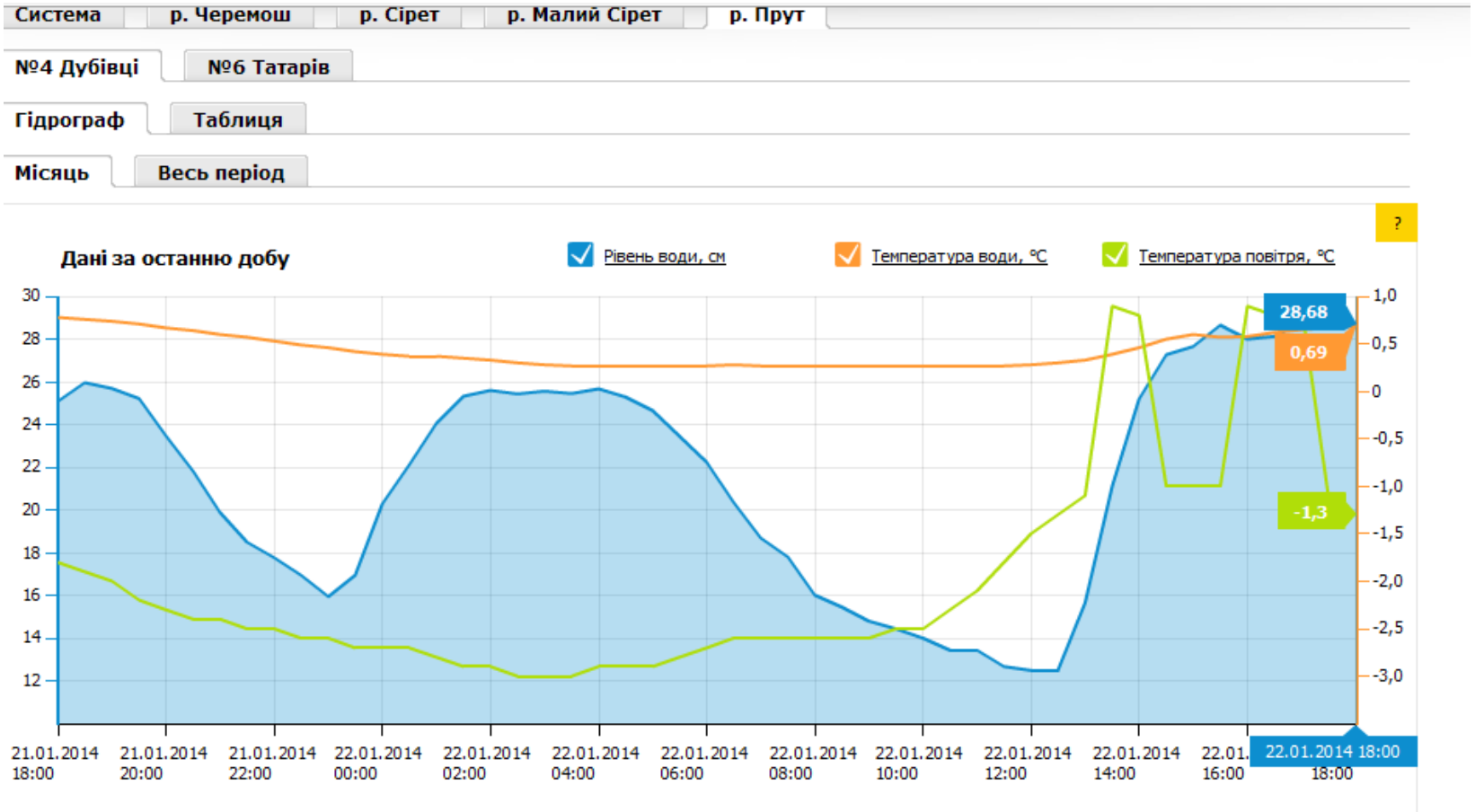
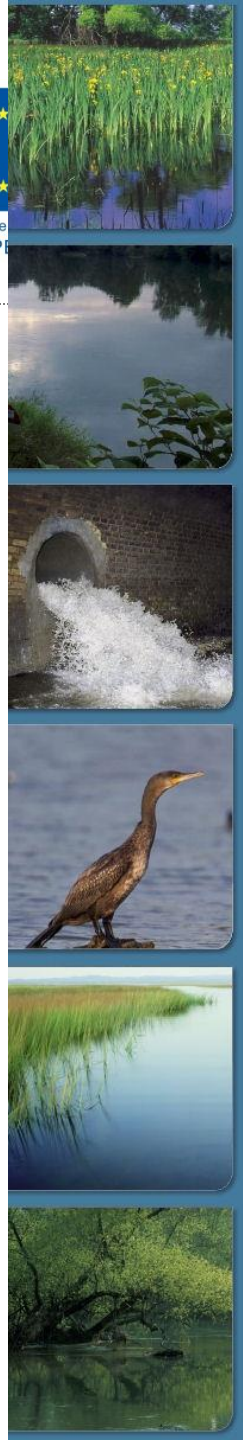
DISPLAYING OF DATA MEASUREMENTS ON WEBSITE (PORTAL)



Mechanism for transborder data harmonization: International co-operation in the water sector

- **Bilateral co-operation**
  - Transboundary (neighbouring countries)
  - With other countries
- **Multilateral co-operation**
  - International Conventions
    - » e.g. Helsinki, Danube Conventions - ICPDR
- **European (Union) level co-operation**
  - Common working platform (27 Member States)
  - Common basic legislation
- **Global level water co-operation**
  - WMO



INCREASING OF EFFICIENCY FOR DECISION MAKING

1 hour

3 hours

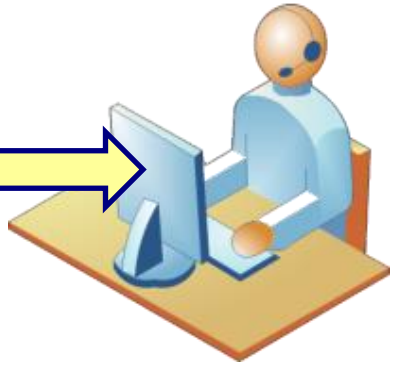
4-5 hours

5 minutes

Data collection

< 1 minute

Data transferring



1-2 hours

Data processing, forecasting, modeling

Decision making

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II SEDIMENT TRANSPORT MONITORING

Suspended load regime on the Danube – field surveys

Occasional survey (research projects): measurements in the whole cross section – several verticals

Long lasting monitoring: Representative localities (usually on the bridge) - one vertical

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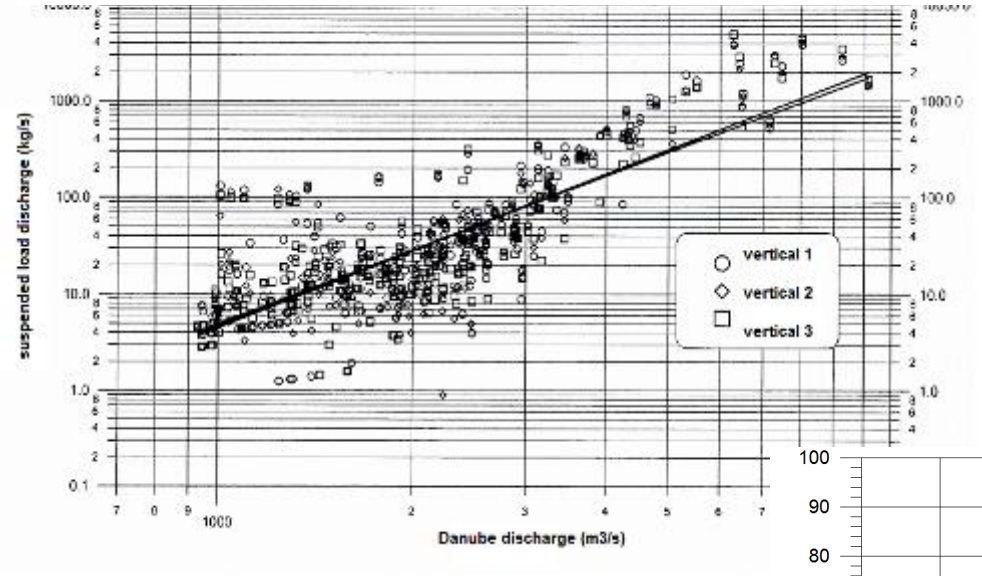
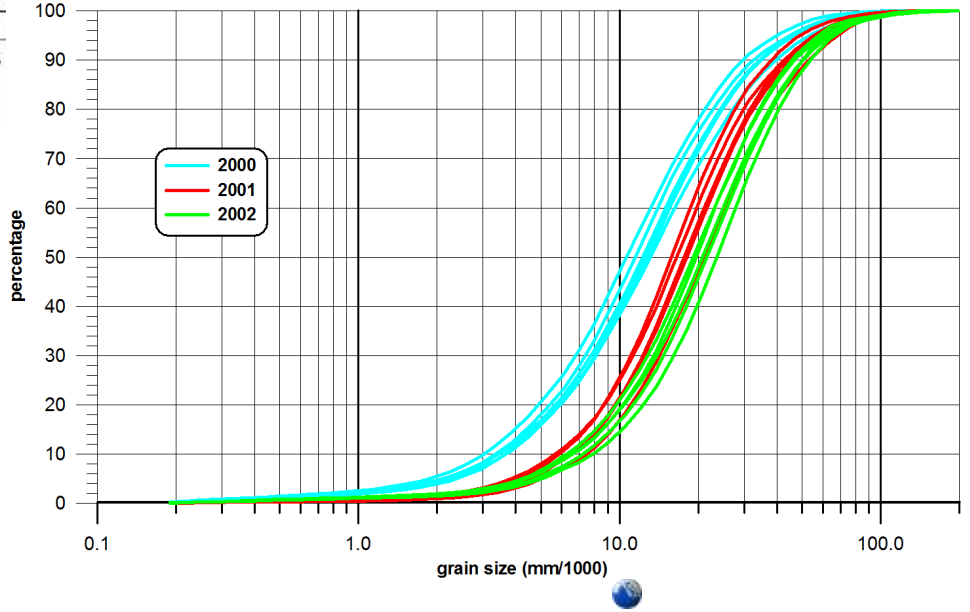
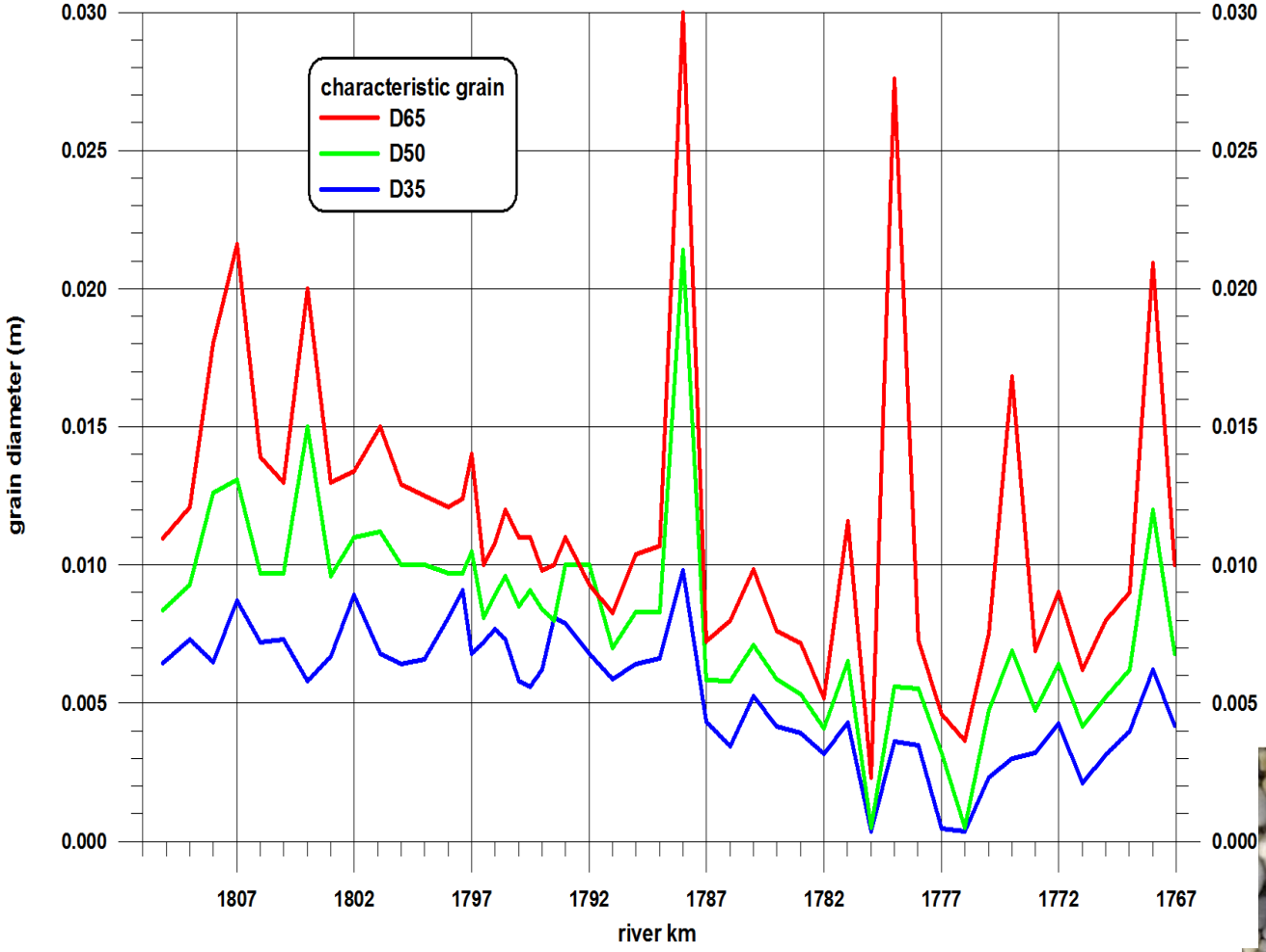
Monitoring of suspended load regime

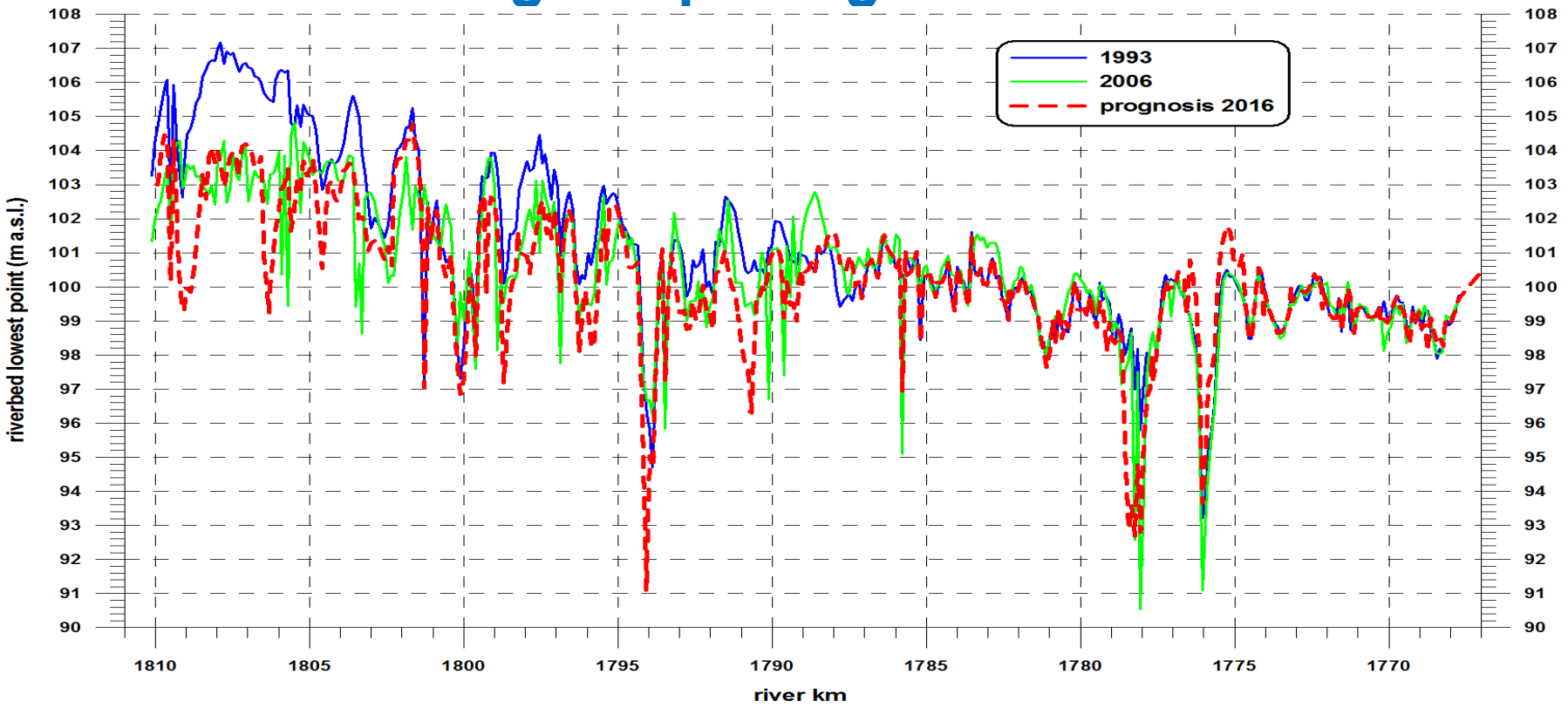




Danube bed material – detailed sampling



Prognosis of the Danube riverbed development using morphological model



- significant change of riverbed longitudinal slope
- intensity of riverbed erosion will decrease
- riverbed erosion will propagate further downstream

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Bedload sampler for the local Danube river conditions – consistency of measurements

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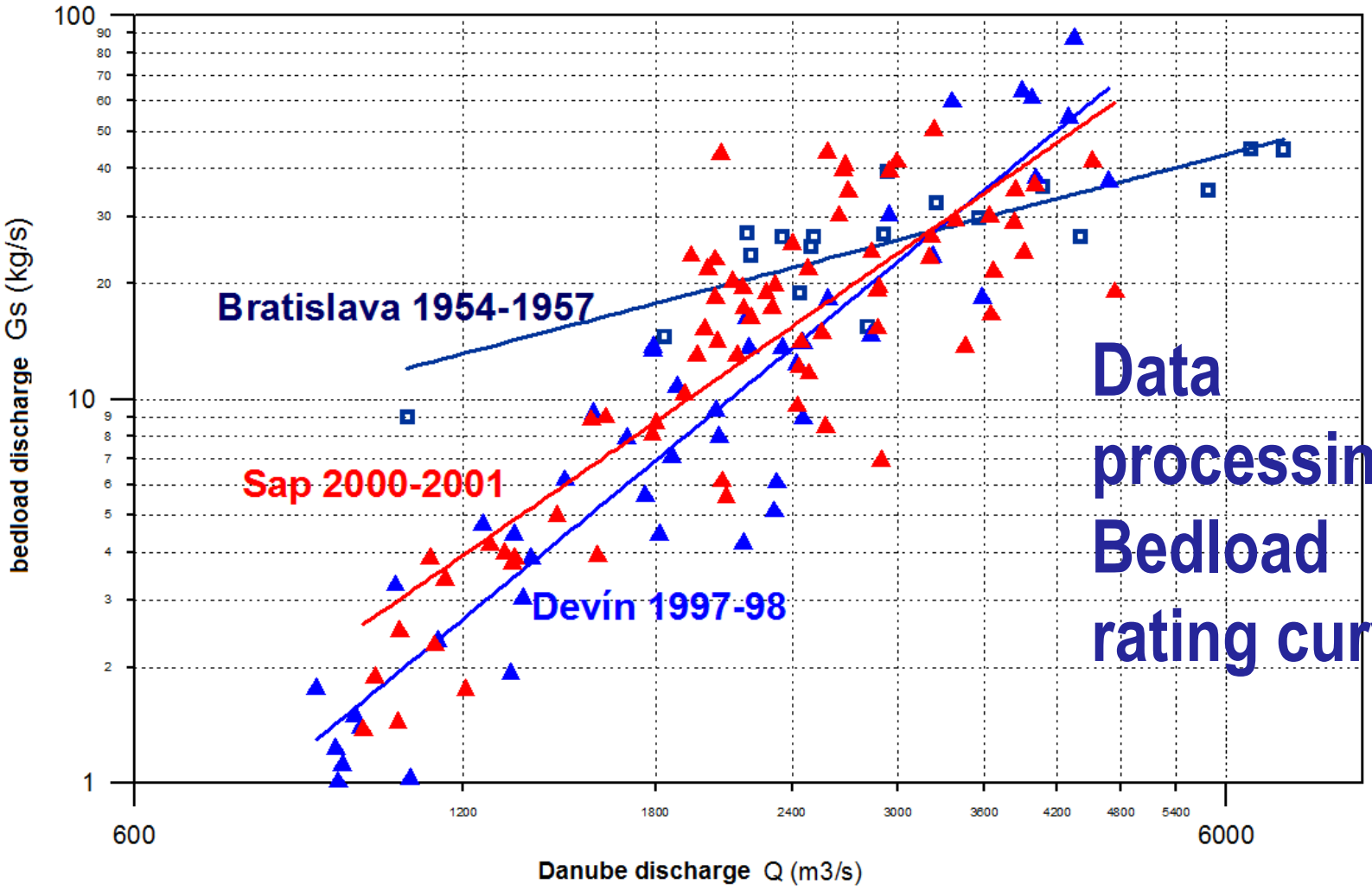
Data processing -Bedload rating curves



Data processing - Bedload rating curves

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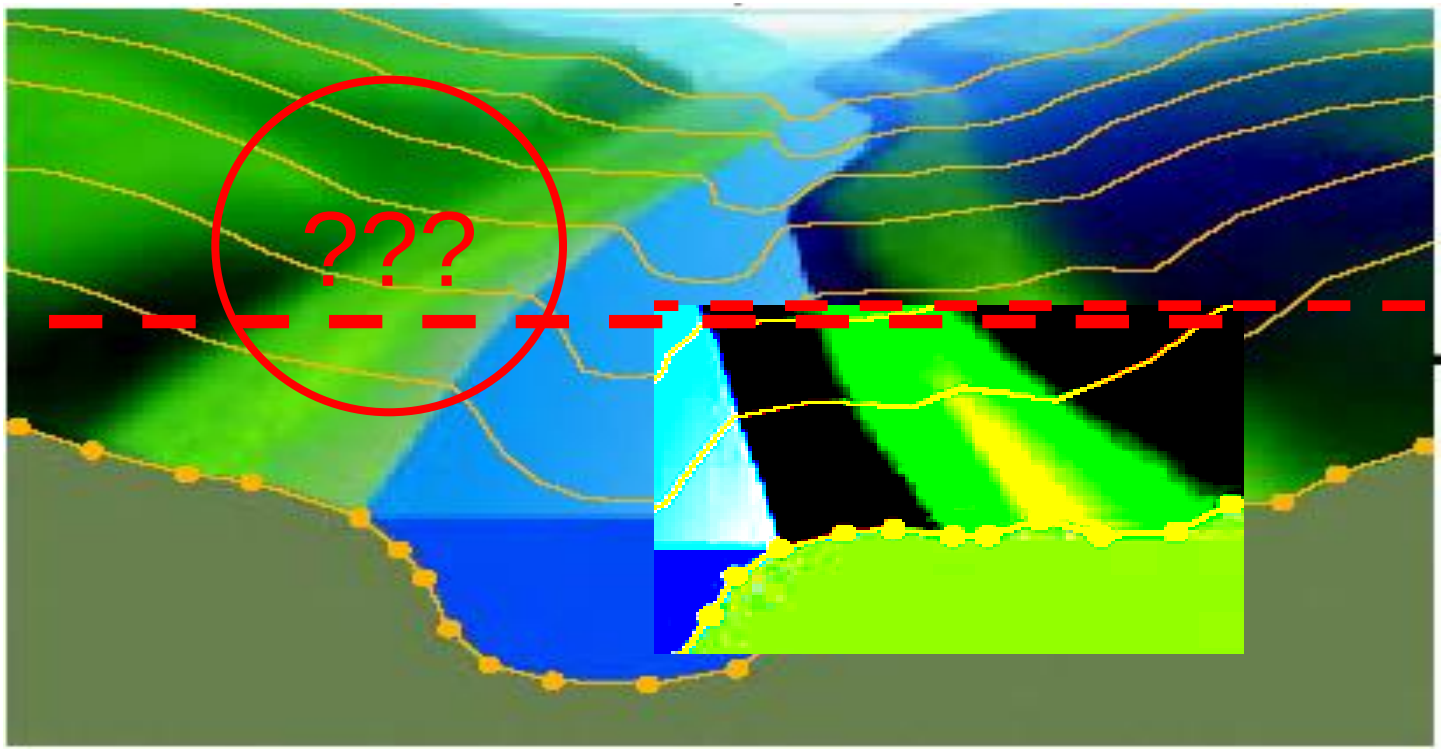
3. Mapping DTM and land cover data

Joint digital elevation model

Harmonisation of methods at national borders

National Border



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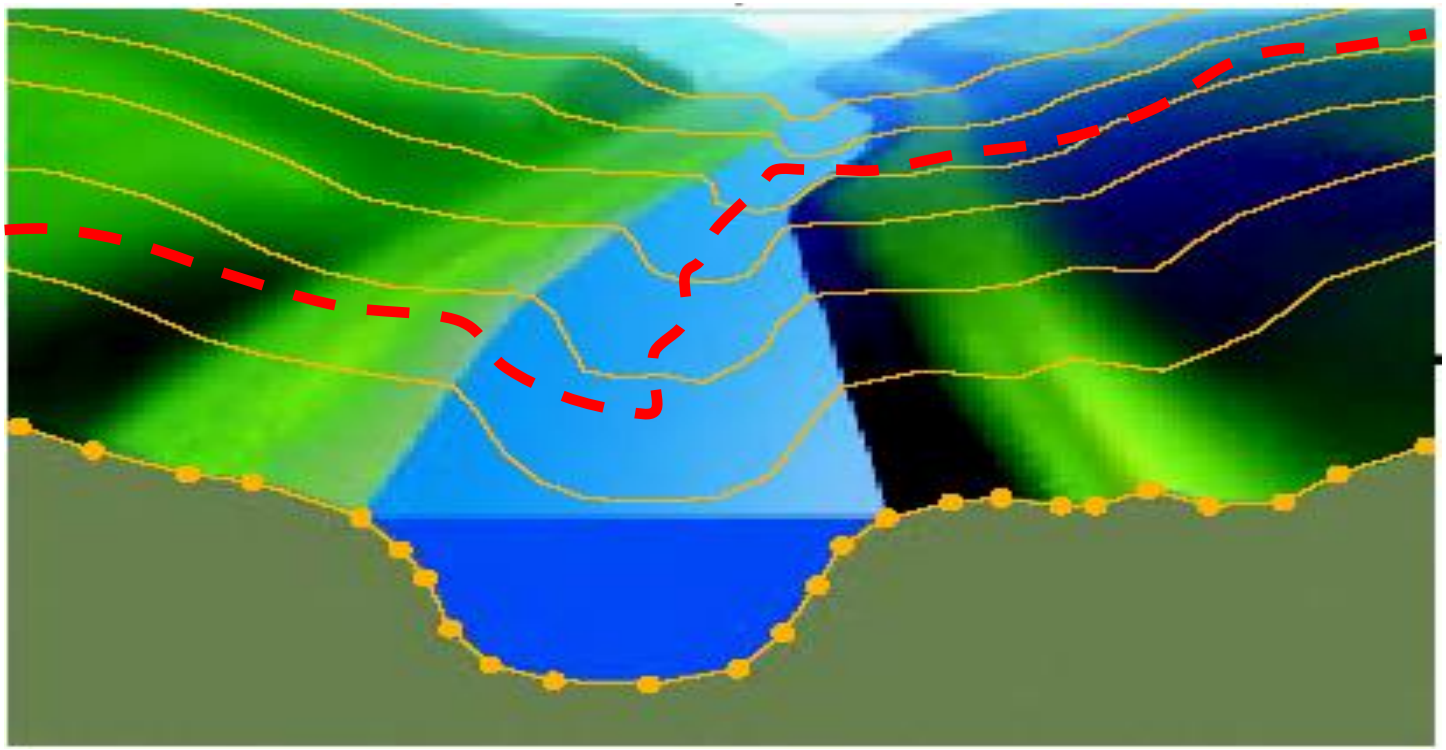
ONE system without national borders

National Border



Output : Joint digital elevation model

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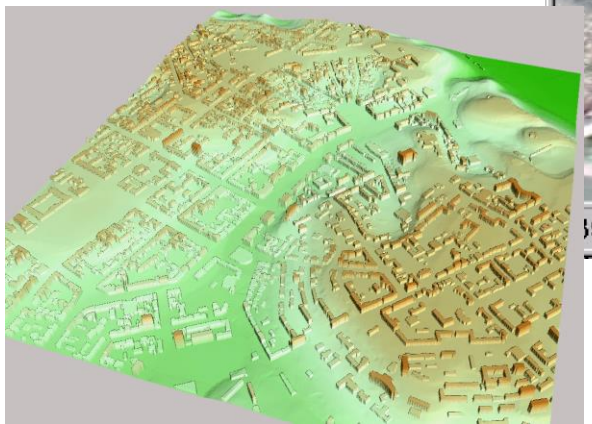
Digital terrain model for river basins

Using flexible GIS application, to integrate in DTM different land observations:

-satellite and aerial photography;
-orthophotoplans;
- Cross sections by GPS measurements



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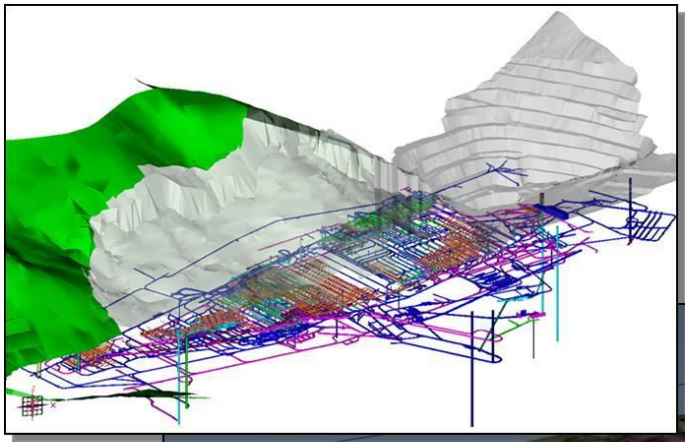
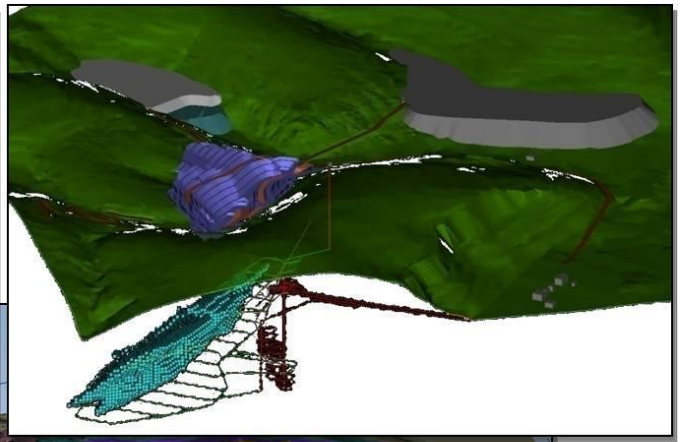
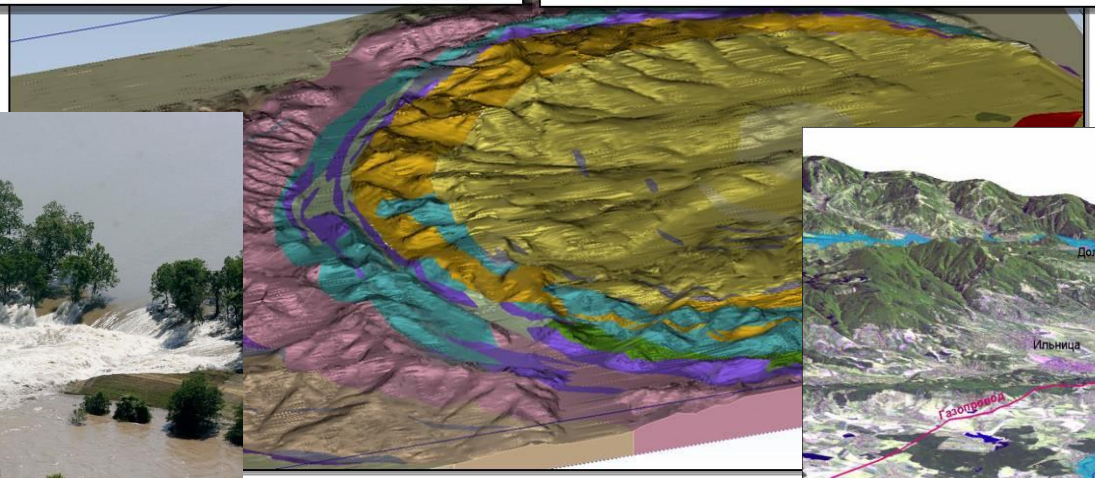
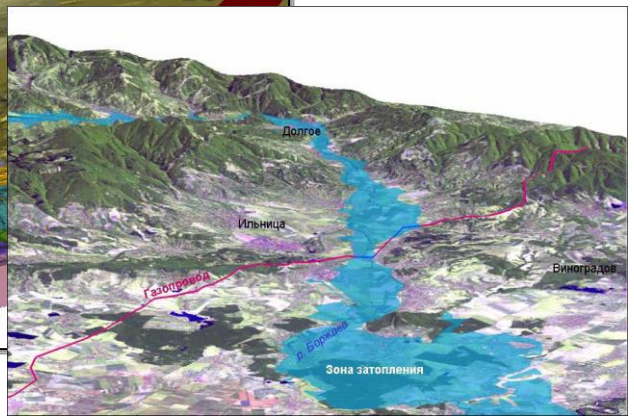
MODELLING OF FLOODING AREAS





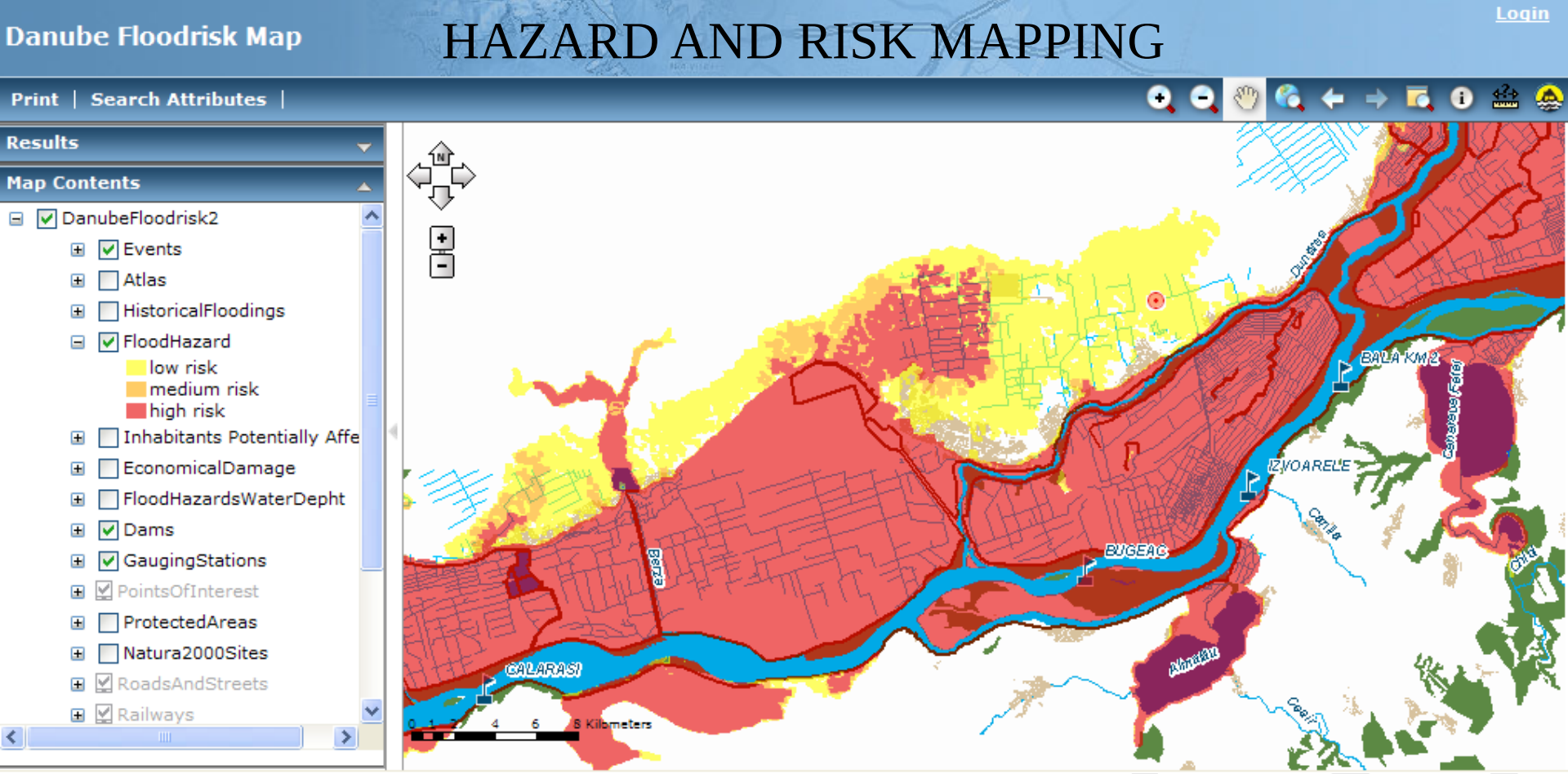




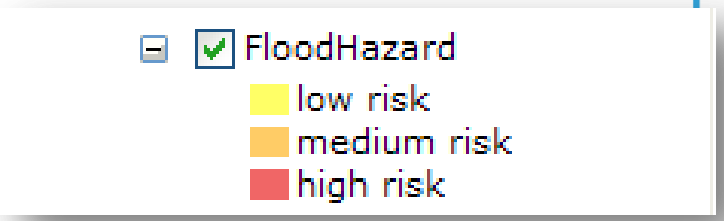
Hydraulic Calculations

- Basically, hydraulic calculations are carried out in 1-D. This is sufficient for the majority of rivers that flow in one compact channel. In cases of river mouths or braided river channels however, where there is no compact channel, a 2-D model is used.

HAZARD AND RISK MAPPING



for the Danube floodplains



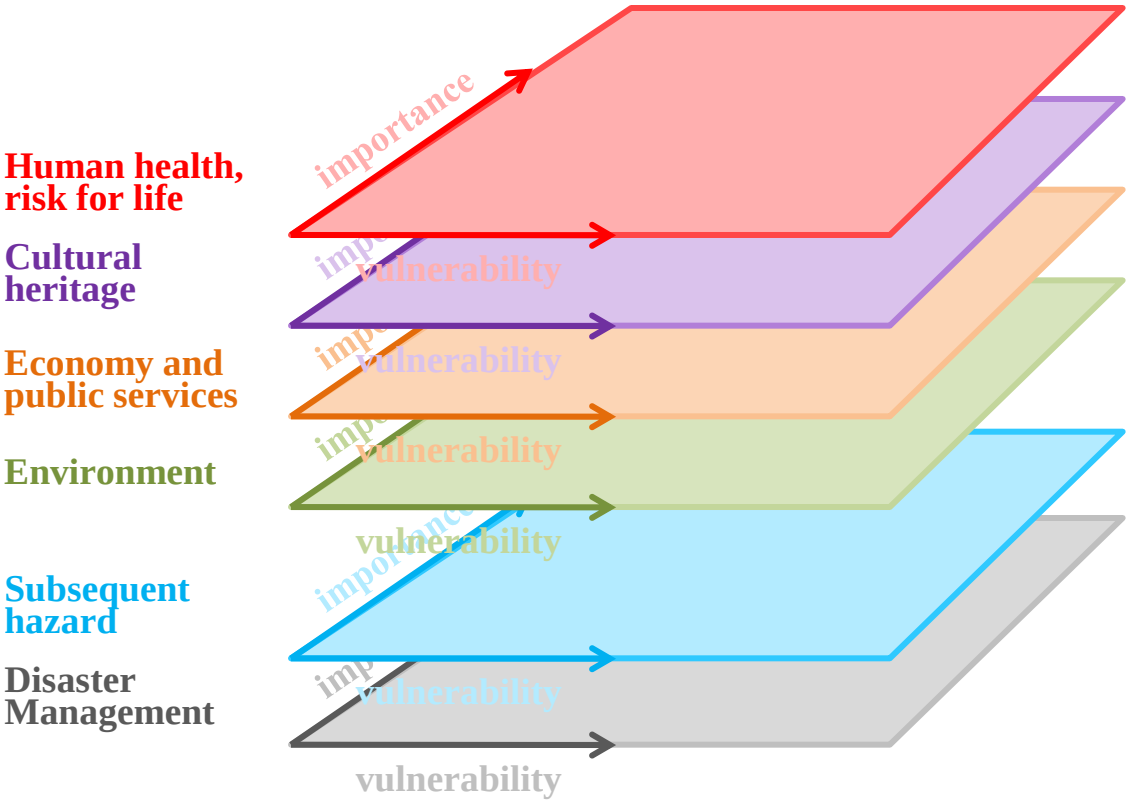
3 levels of flood hazard – downsttream of Calarasi town example

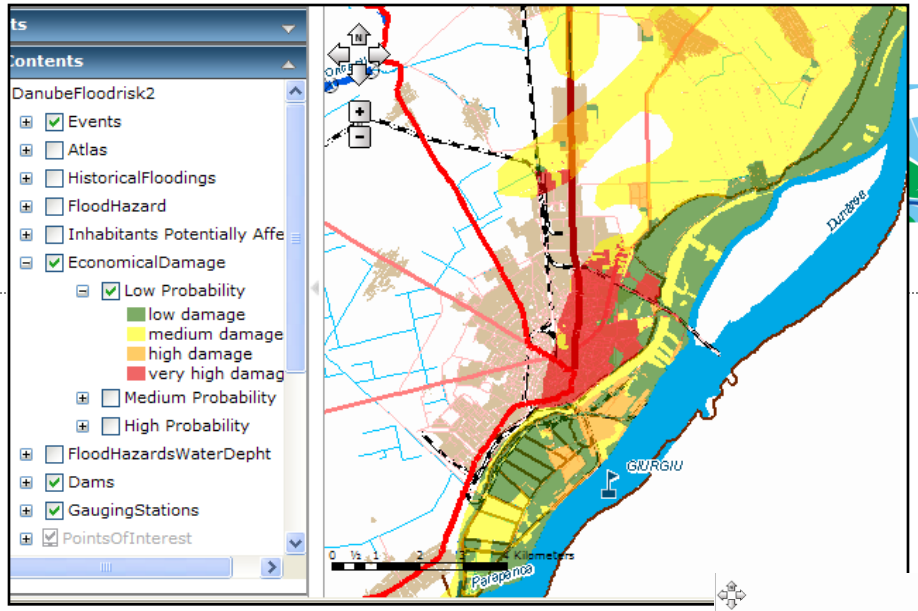
Jointly for our common future

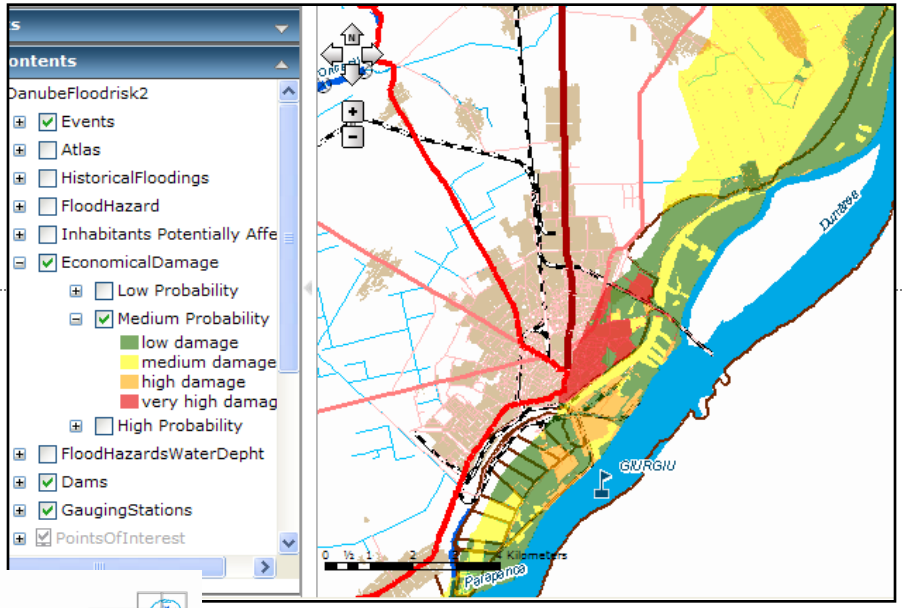
GEOINFORMATIONAL PORTAL

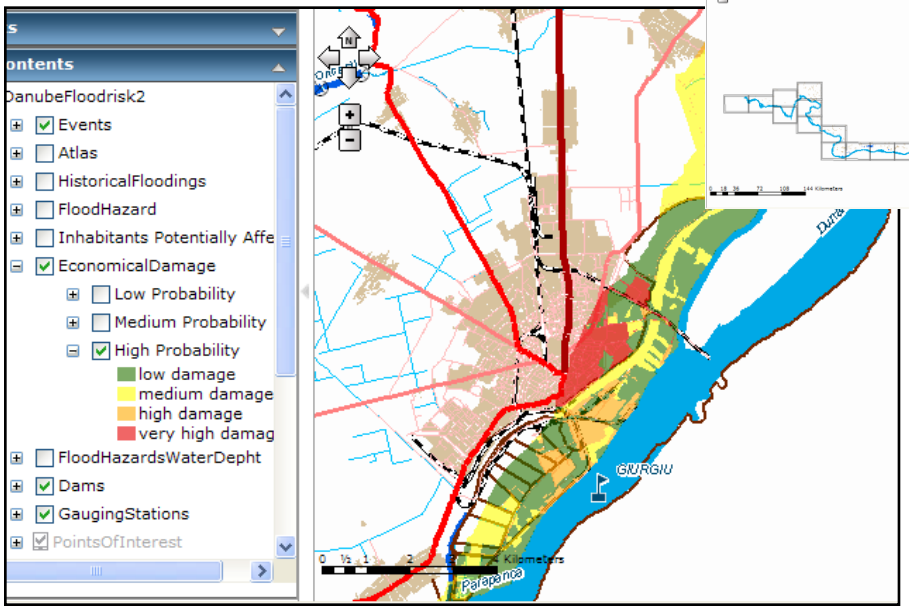
Evaluation of risk elements

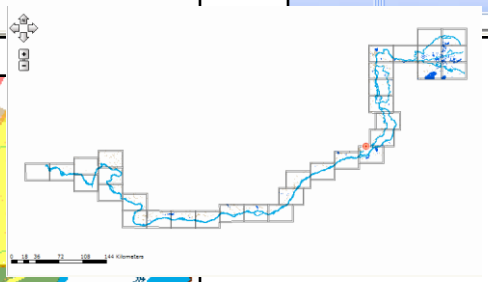
- Dimensions of risk / layers of relevance?



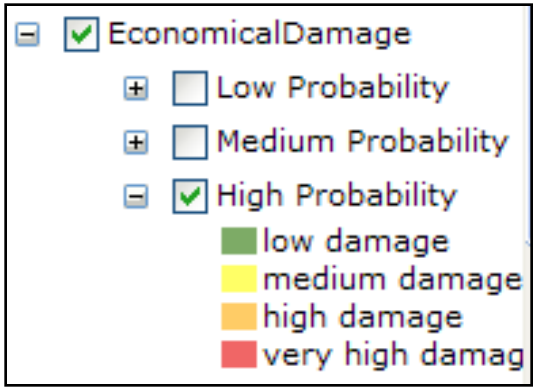








4 levels of economical damage – Giurgiu town area



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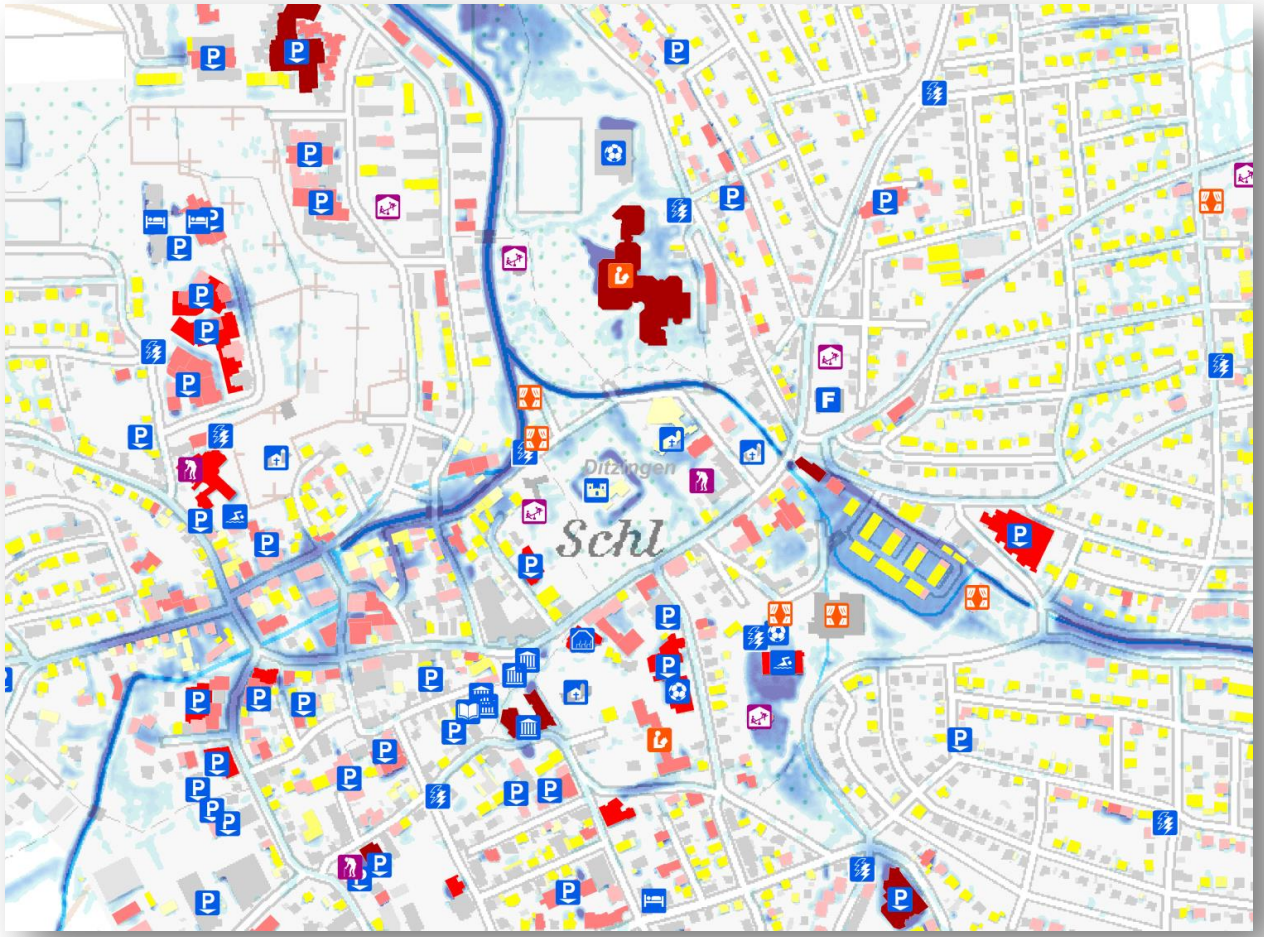
Sample using risk element symbols



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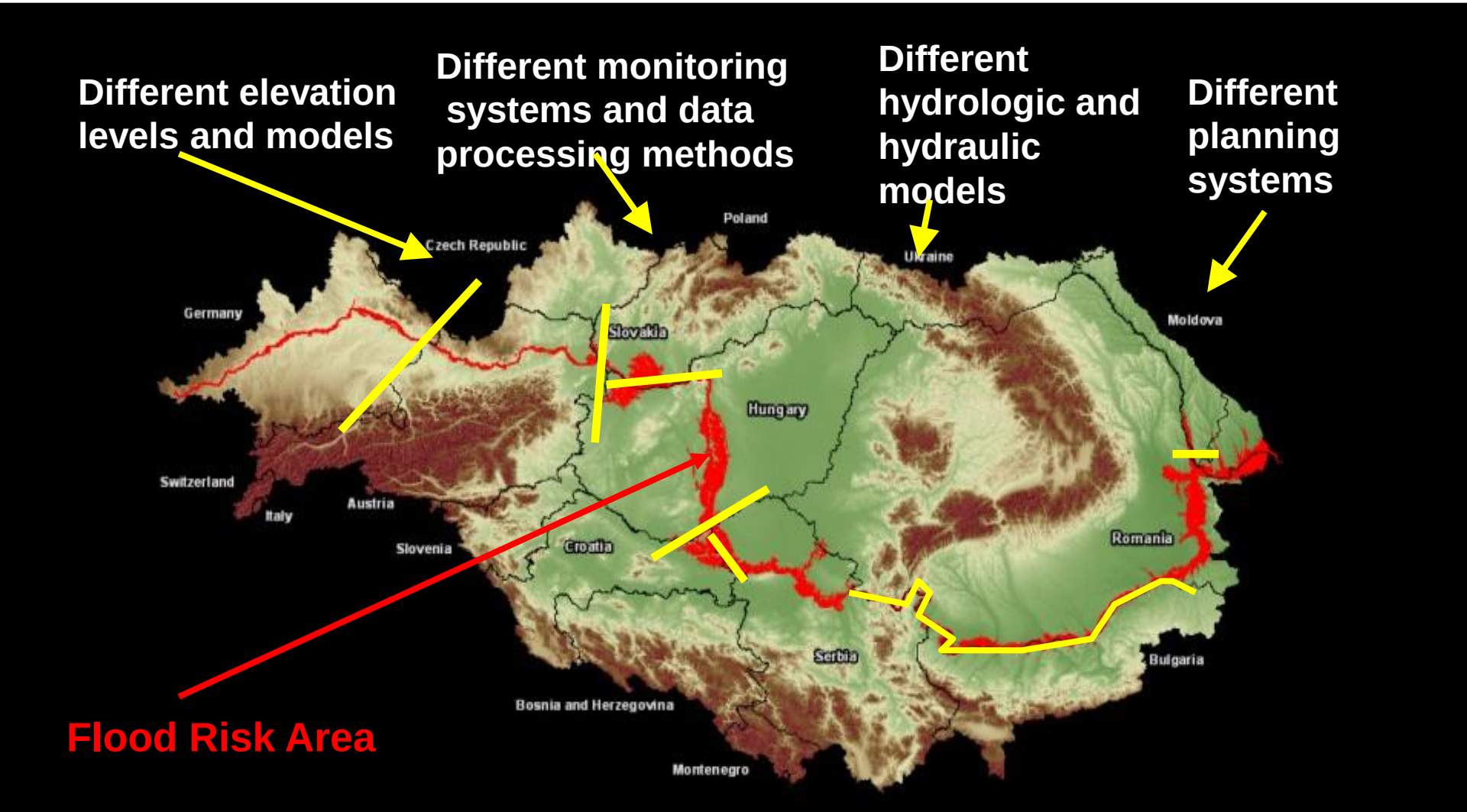
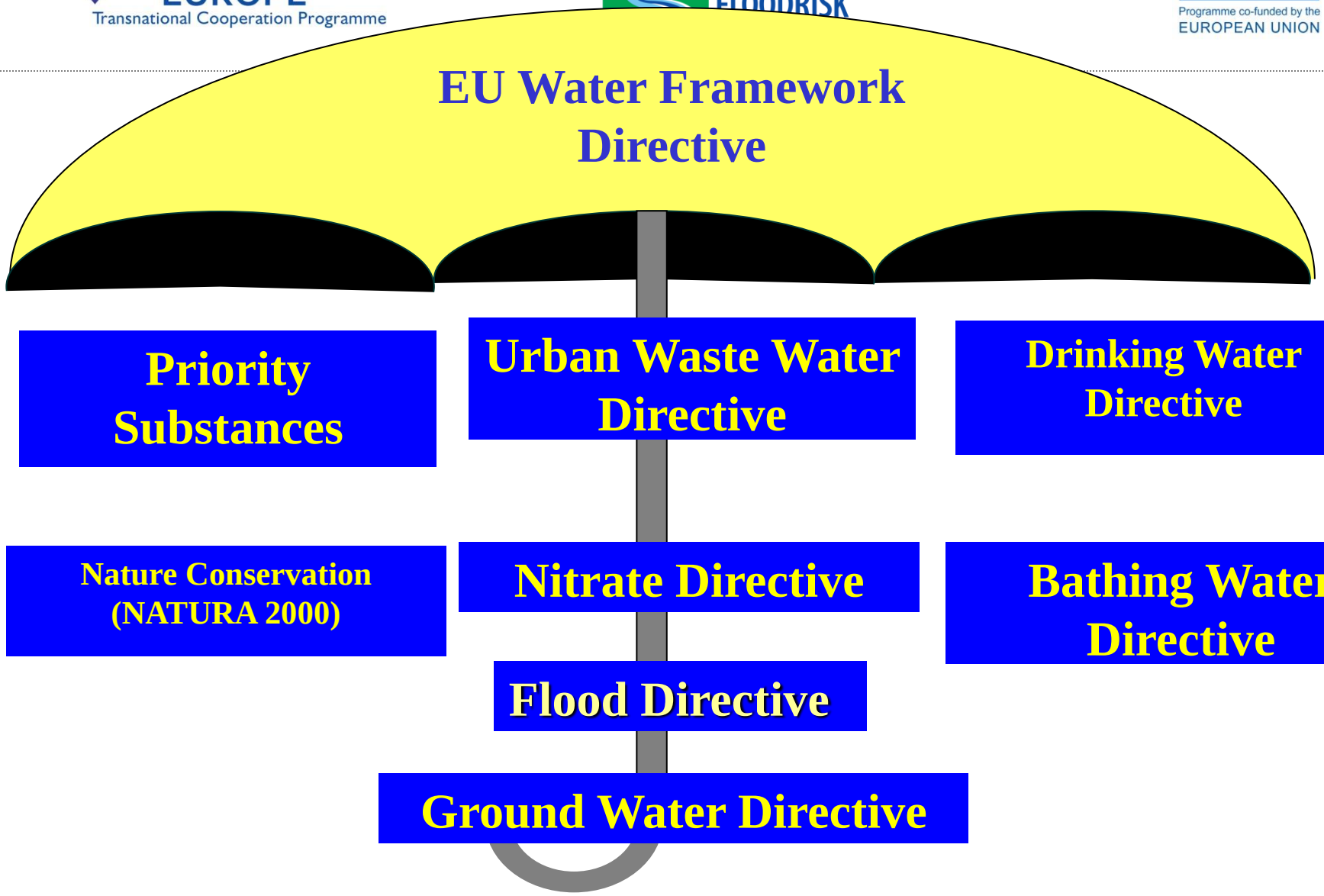
CONCLUSION: HARMONIZATION NEEDS



CONCLUSION: HARMONIZATION NEEDS

EU POLICY: Water Framework Directive

„Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy”


EU Water Framework Directive
Priority Substances
Urban Waste Water Directive
Drinking Water Directive
Nature Conservation (NATURA 2000)
Nitrate Directive
Bathing Water Directive
Flood Directive
Ground Water Directive
FUTURE CHALENGES

HYDROLOGY - Connection to updated Environment policy

Main findings of the **Water Blueprint (WFD implementation)**

- The biggest pressures for ecological status are
  - HYMO alterations (handled by **Action 10**)
  - Water over abstraction (**Action 11**)
  - Lack of ecological discharges (**Action 11**)
- Cause of poor chemical status of waters is:
  - Shortage of data (**Action 2 and 3**)
- Improvement needs for better water information system
  - WISE, INSPIRE, GMES, etc. (**by Action 3**)
  - Improving Science-Policy Interface (**Action 6**)
- More stronger cooperation at sub-basin levels **(Action 2 and 14)**
- More communication for transparency **(Action 12)**

Existing Situation

Basin-wide driving forces and impacts

- ⇨ Hydropower plants
- ⇨ Flood protection
- ⇨ Navigation
- ⇨ Climate change
- ⇨ Changes in land use
- ⇨ Point and diffuse source pollution

FUTURE CHALENGES

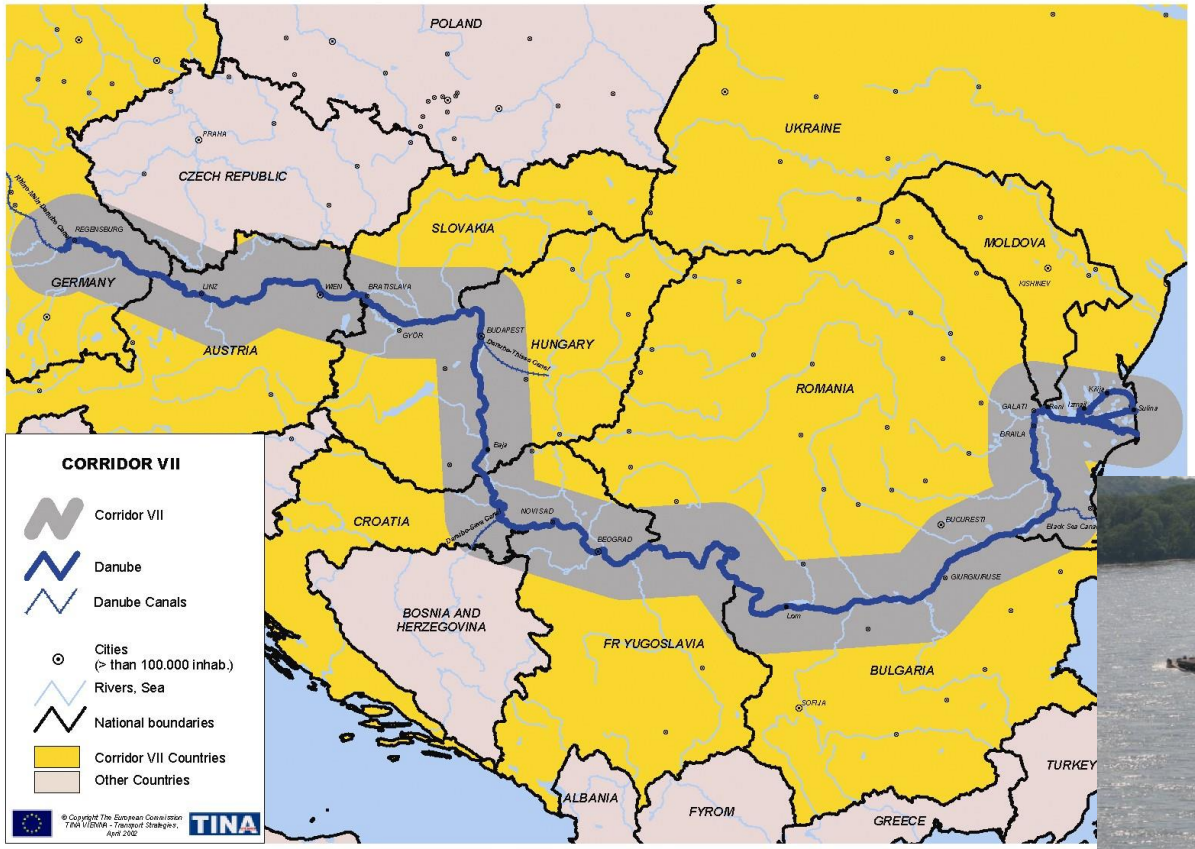
Hydropower-based Energy

78 barriers along the Danube

5 free-flowing sections

FUTURE CHALENGES

International Waterway



2411 km navigable (Sulina-Kelheim)

via donau, 2007

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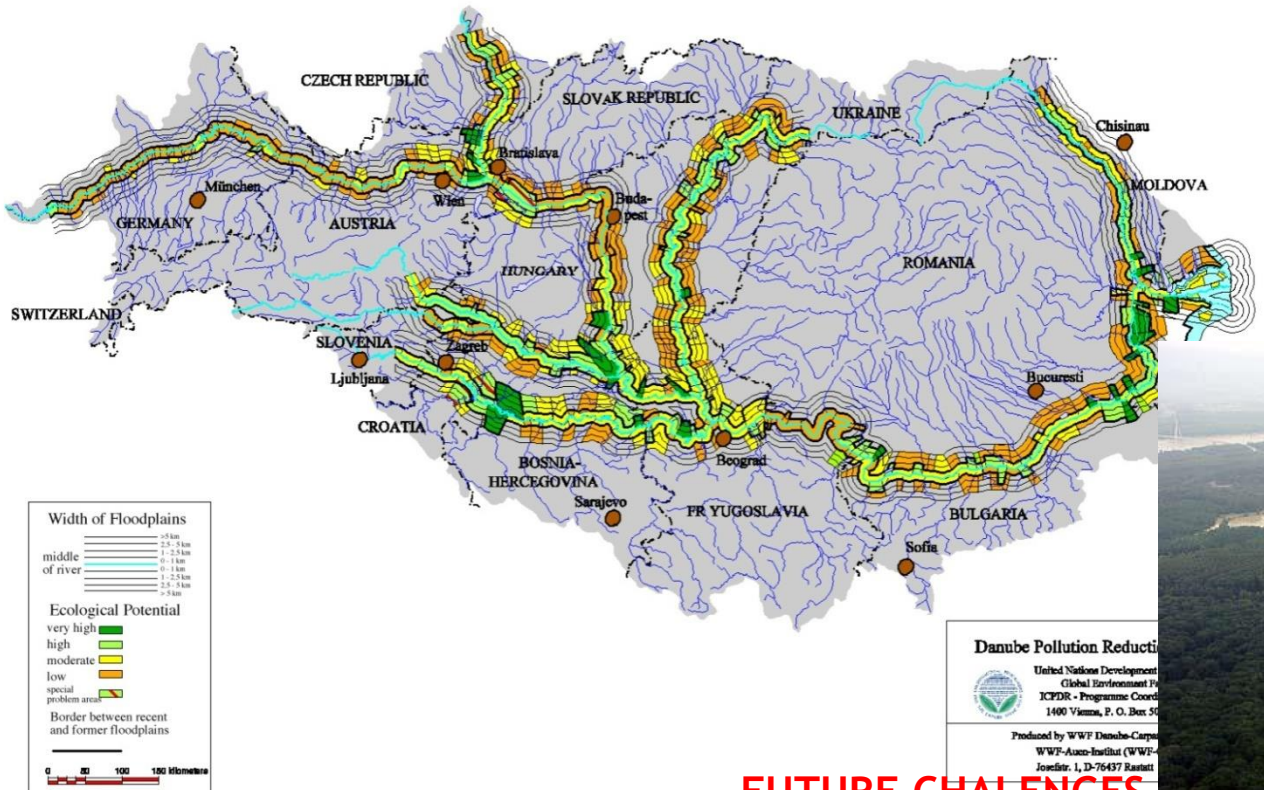
Flood protection, risk management

Ecological potential of floodplains in the Danube River Basin



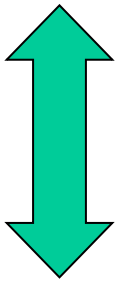
Loss of 80 % of the original floodplain area

FUTURE CHALENGES

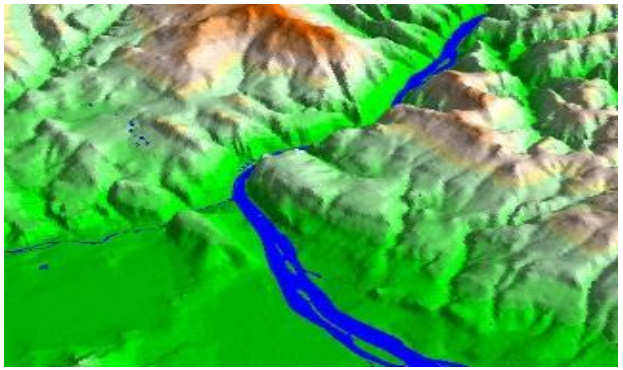
Dimensions of cooperation

Cooperation in the fields of different

- **between Sectors**
  (water management, spatial planning, etc.)
  → **horizontal cooperation**

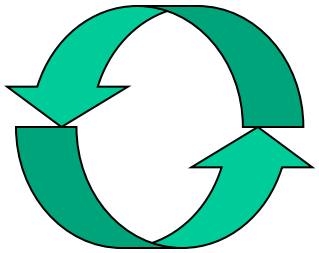


- **Levels of organisation**
  (from local to national actors)
  → **vertical cooperation**



- **Countries**

  → **transnational cooperation**



FUTURE CHALENGES

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Thank you for your attention!

Danube Floodrisk

Stakeholder oriented flood risk assessment for the Danube floodplains

Jointly for our common future