

Natural retention as a part of integrated water resources management - experience from Central and Eastern Europe

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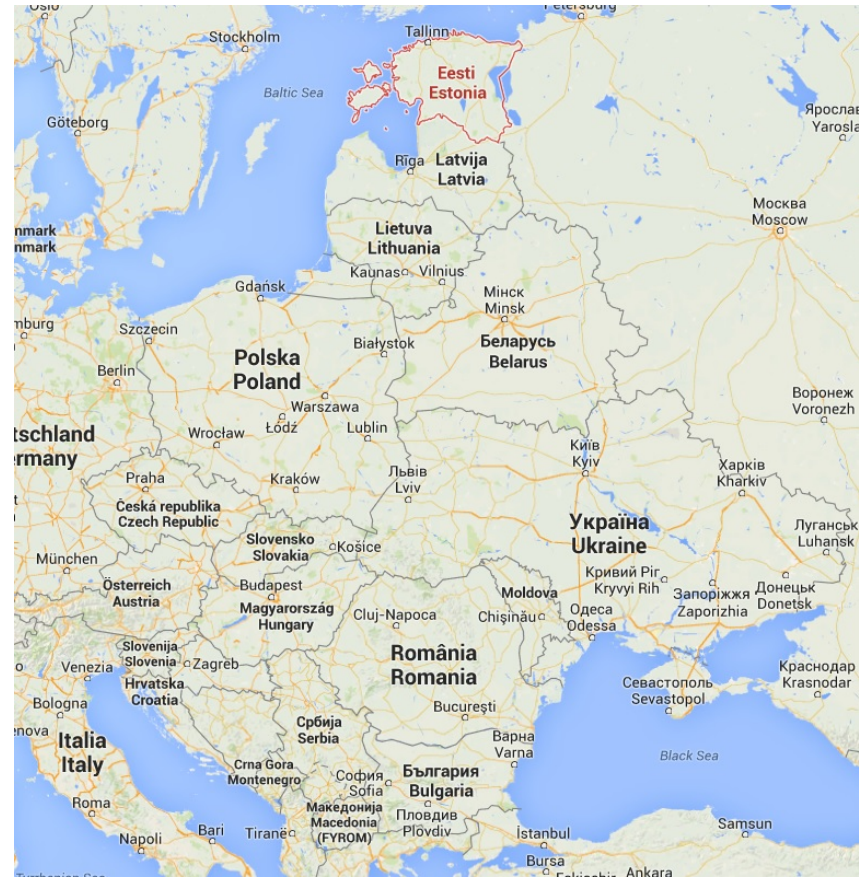
Activity 5.3.

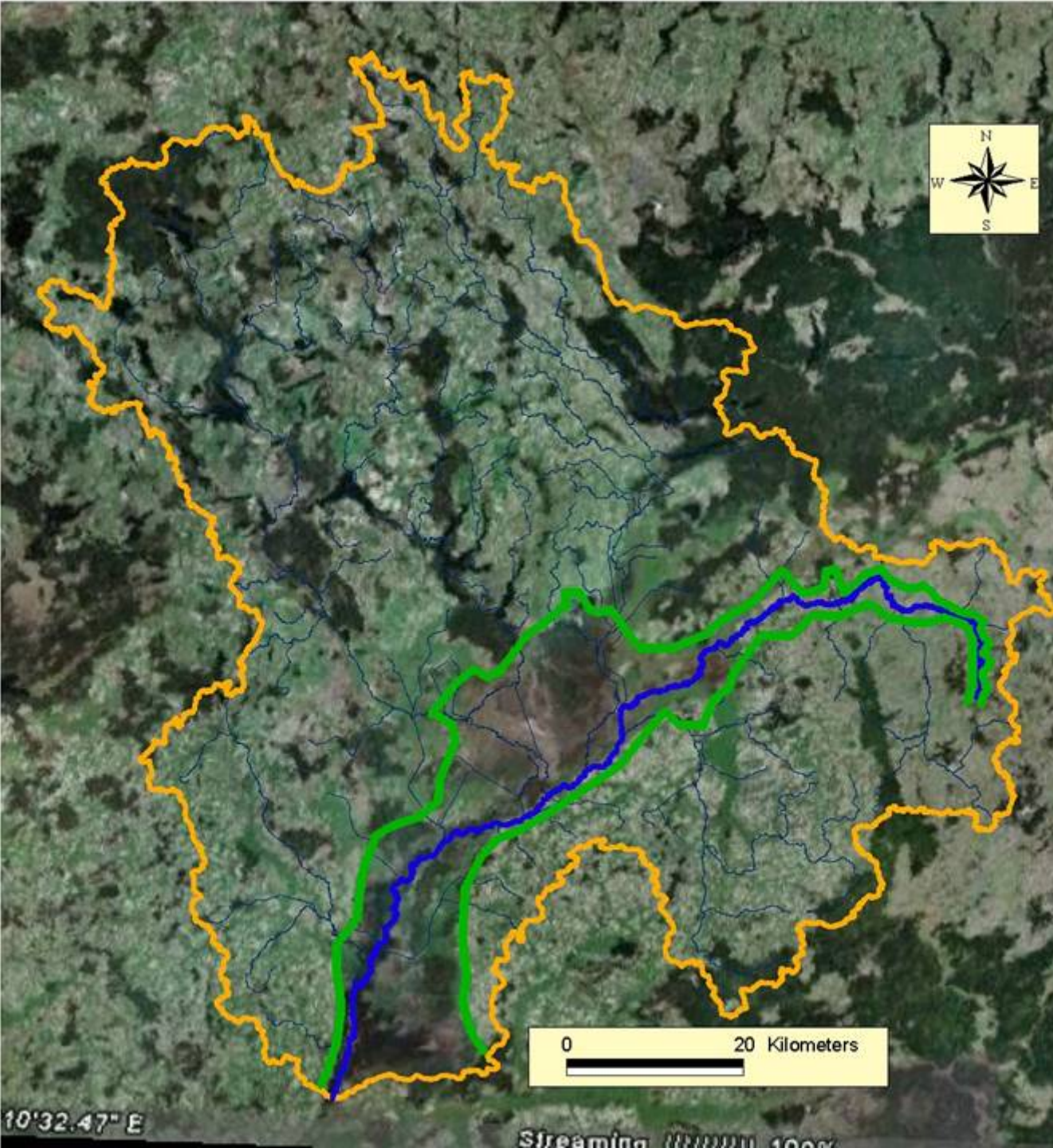
NATURAL SMALL WATER RETENTION MEASURES

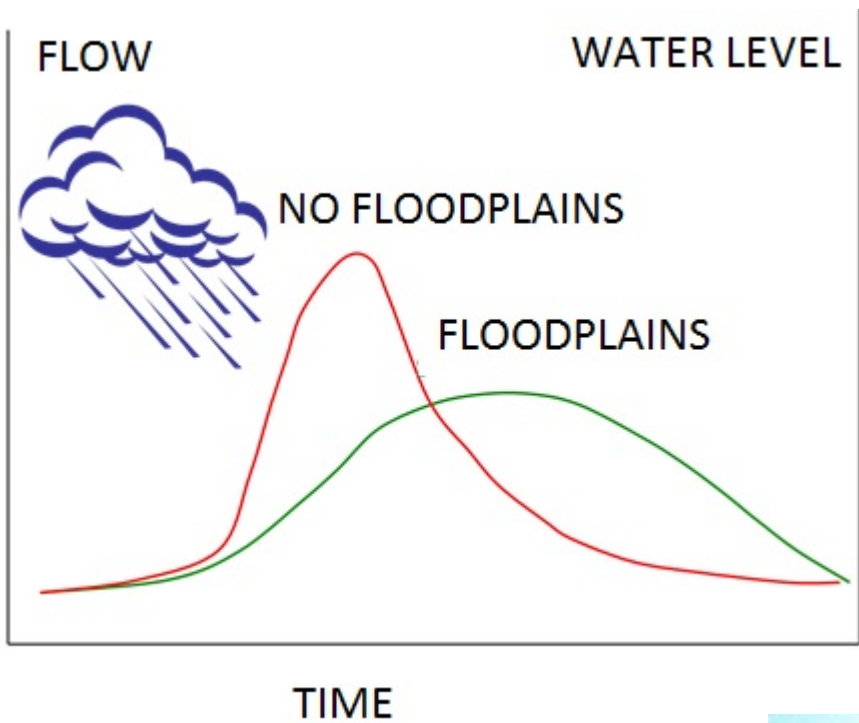
**Integrated Drought Management
in Central and Eastern Europe**

Questions

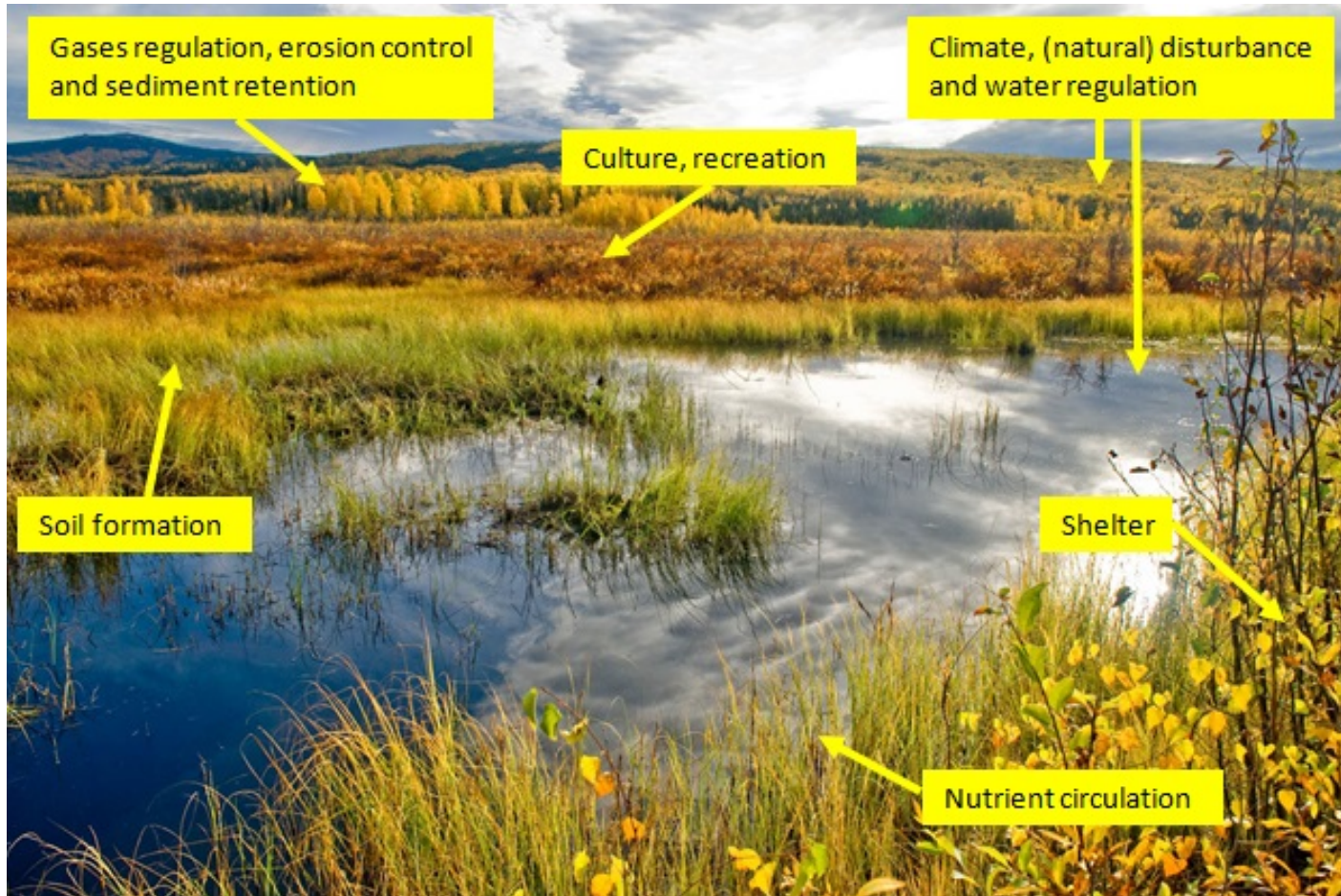
- What is landscape (small) retention?
- How to choose the catchment for the retention measures?
- How can we evaluate the results?







"Small retention"



Small water retention vs. Natural retention

- Natural water retention
 - **Permanent or temporary water bodies and measures that enable water retention on site (of its origin)**
 - **Natural appearance enabling diverse ecosystem services (not only water retention)**
 - **Activities focusing on prolongation of the water cycle by increasing the capacity to retain rainwater (slow drain), stop pollution and reducing energy losses of water and sediment movement.**
- Small water retention means not only the retention of surface water with water *or damming up watercourses*, but also agricultural practices, phyto land improvement and afforestation to increase the retention of soil, regulation of rivers such as changes in cross-section troughs and longitudinal slope and the use of natural floodplains and landscape depressions.

Measures...

Water resources	Systems
Landscape (habitat) retention	Systems that create appropriate land use structure through the set up of arable lands, grasslands, forests, lands of ecological use, water holes
Soil retention	Crop systems that affect water management in soil profile, particularly the increase of potential water retention in soils
Ground waters	Cultivation and reclamation systems to inhibit the surface runoff and to increase the recharge of ground water reservoirs
Surface waters	Hydrotechnical systems of distribution and management of water including the construction of small reservoirs, outflow control from the draining systems

An aerial photograph showing a landscape with a dense forest of tall, thin trees on the right and top. A large, cleared area of dry, brownish ground occupies the center and right. In the bottom left, there is a rectangular field of young, green plants in neat rows. A dirt road or path runs along the left side of the field and curves towards the cleared area. A small, fenced-in area with several trees is visible in the center of the cleared area. The overall scene suggests a transition from forest to agriculture or a study site.

Common agreement about positive role of forests.

Question of ET increase remains open.

Common agreement that useful both
for quality & quantity improvements.

Solutions toward bigger buffer capacity.



Open question of landscape
manipulation towards bigger retention.

Open question on effectiveness.

Open question on controversy on
longitude (dis)connections.



Restoration of Karst ponds

Rehabilitation of clay pits



Catchment scale analysis

The analysis should be carried out for **increase the flexibility of planning** (areas and specific locations) as well as **evaluation of potential investments** as a part of river basin management plans.



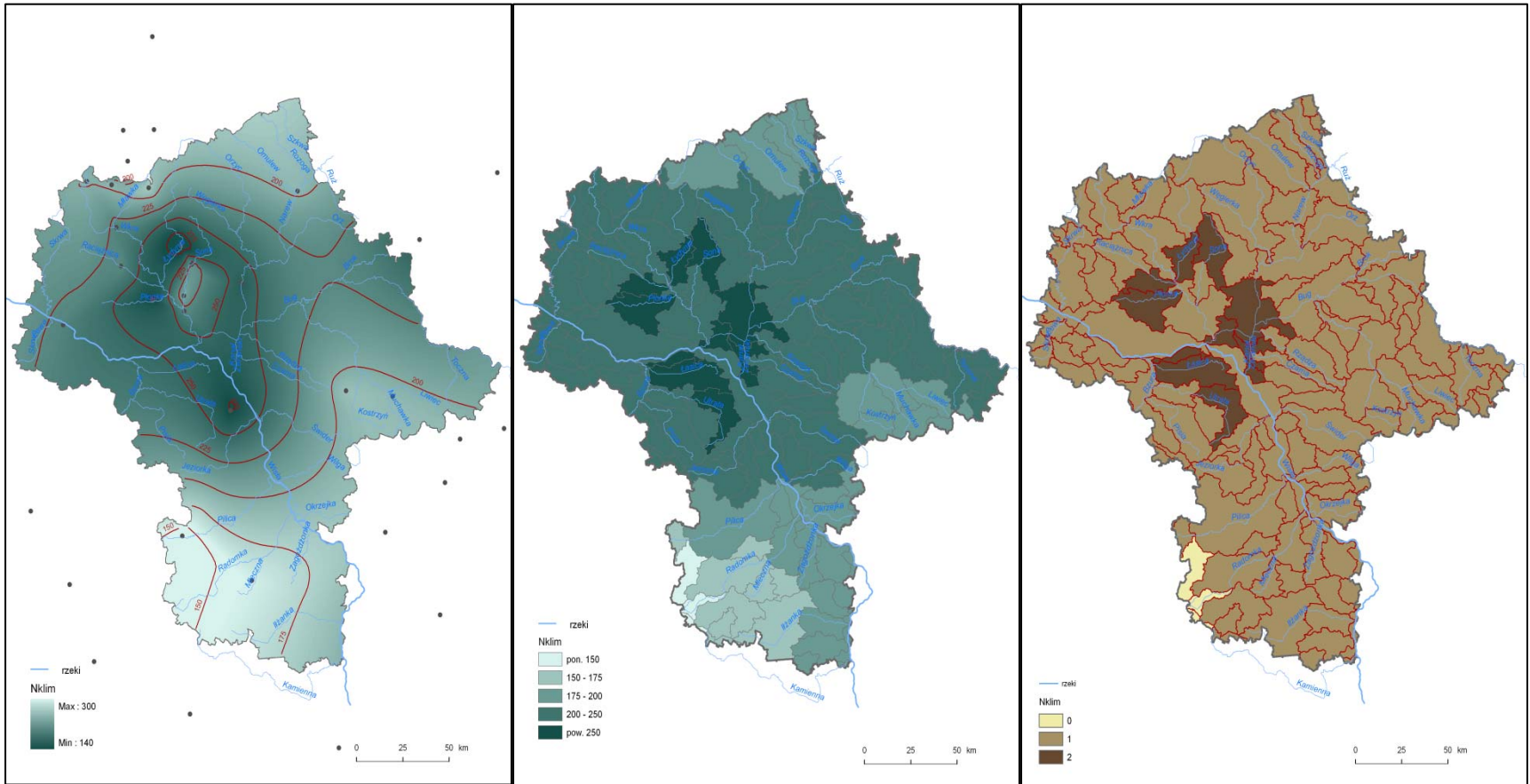
List of potential indicators

- **climatic conditions:**
 - atmospheric precipitation deficits
 - precipitation frequency lower of 50% of the long-term average
- **hydrological conditions:**
 - average low-flow from long period (outflow from 1km²)
 - flow ratio of the probability of exceeding the maximum equal to 1% of the average low-flow
 - surface areas intensively developed in the flooded zone
- **hydrogeological conditions :**
 - soil water retention
 - renewable groundwater resources module
- **land development (participation in catchment of Water Bodies):**
 - forest
 - lakes and reservoirs
 - urban areas
 - orchards and vegetable crops
 - arable land

Evaluation steps

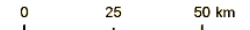
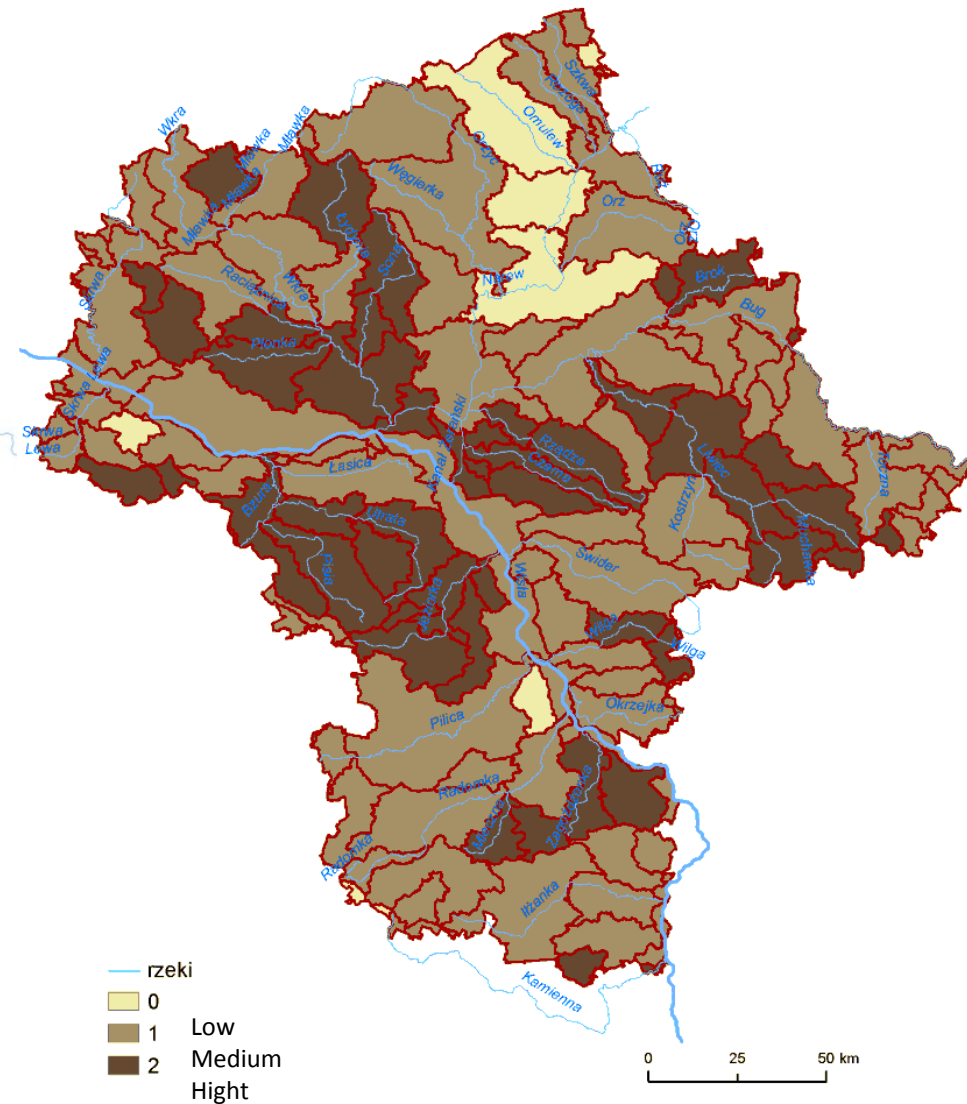
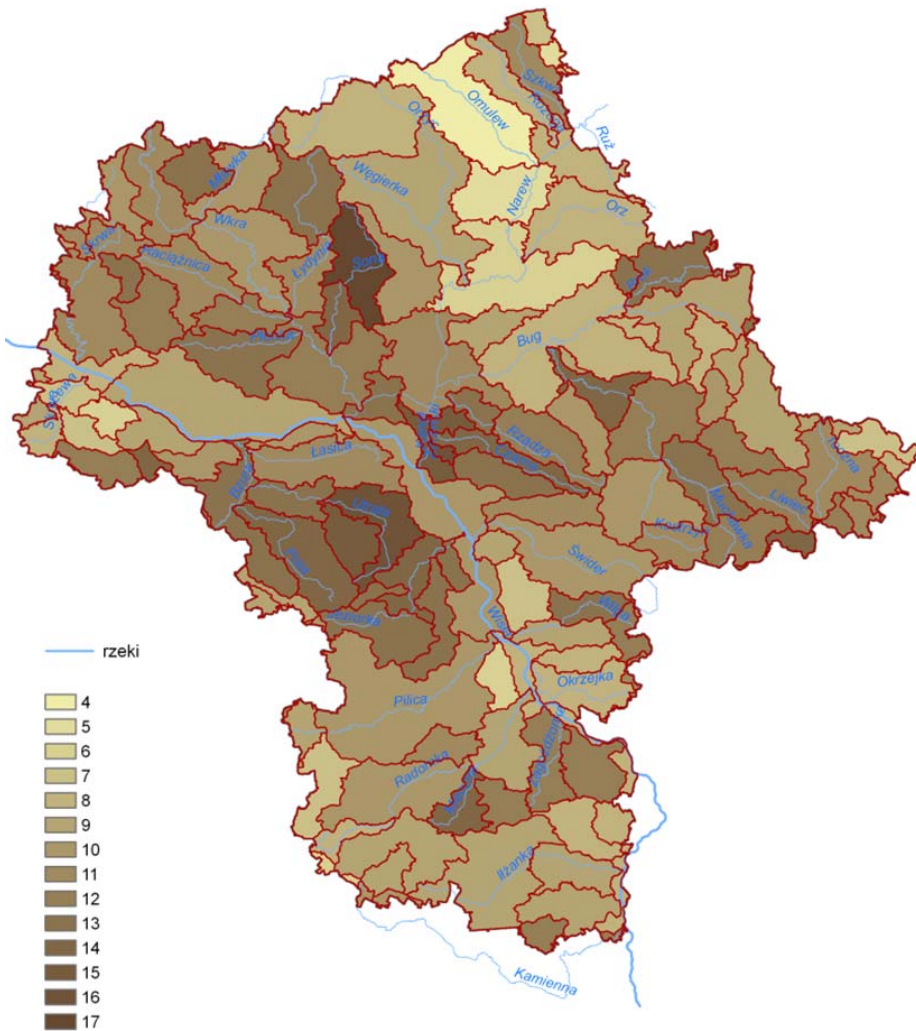
- define thresholds **for individual indicators** of high (2), medium (1) and low (0) level needs to increase small retention in (integrated) Water Bodies (WB)
- determine the **numerical values of each indicator** for all WB
- **making partial evaluations** of all WB in terms of the indicators adopted by three-point scale
- calculation of the **total assessment for each WB**
- **establish threshold values** for cumulative assessment for categorizing WB into three classes:
 - WB, where the development of small retention is highly desirable (**high priority**)
 - WB where the development of small retention is beneficial (**medium priority**)
 - WB, where there is no need to increase the retention (**low priority**)

Example of rating for " Atmospheric precipitation deficits "



Final Evaluation

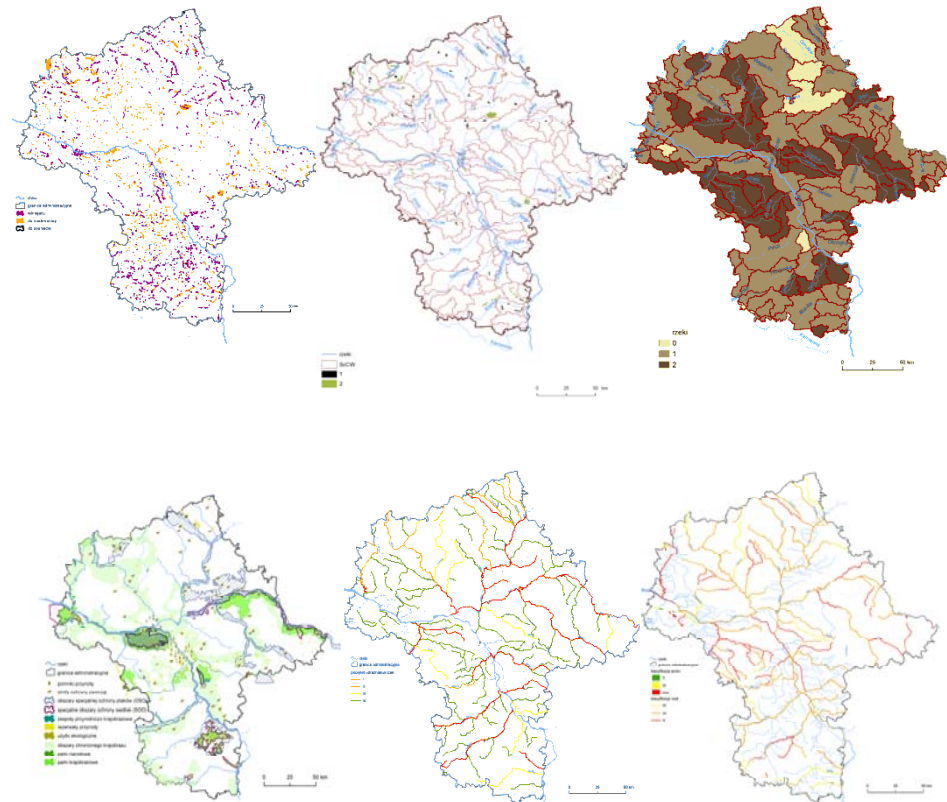
priority	part [%]
high	32
medium	61
low	7



Restrictions for the development of technical measures in small retention

Additional criteria

- Protected Areas
- Programes for fish migration
- Surface water quality



IWRM Perspective

- Humans and ecosystems are interdependent
 - Both rely directly and critically on water
 - ecosystem goods and services need protection
 - without their protection, societal welfare will fail
- Interference by humans on ecosystem can be:
 - direct (local water flows and pathways) or
 - indirect (modifying soil permeability, vegetation, runoff)
- Water's ecological functions perturbed by human actions:
 - land use, biomass production, water pollution, degradation
- Key challenge is to identify and confront:
 - biotic interlinkages between freshwater pathways and ecosystems
 - Social and economic dimensions of water use

IWRM – as an integration tool – can play a significant role – particularly related to developing alternatives and understanding the impact of tradoffs in different water functions.

Conclusions

- N(S)WRM can be seen as a part of the river basin management plans;
- N(S)WRM – step toward sustainability
- It is a great variety of potential measures in the catchment – we should choose the best ones for each catchment;
- Number of measures matters!
- Application of GIS based evaluations allows to take into account **environmental conditions** in the assessment of investment.