Projects: Technology Agency of the Czech Republic, No SS07010401

Multisource remote sensing in water management analyses to support natural flooding and the transformation effect of the floodplain

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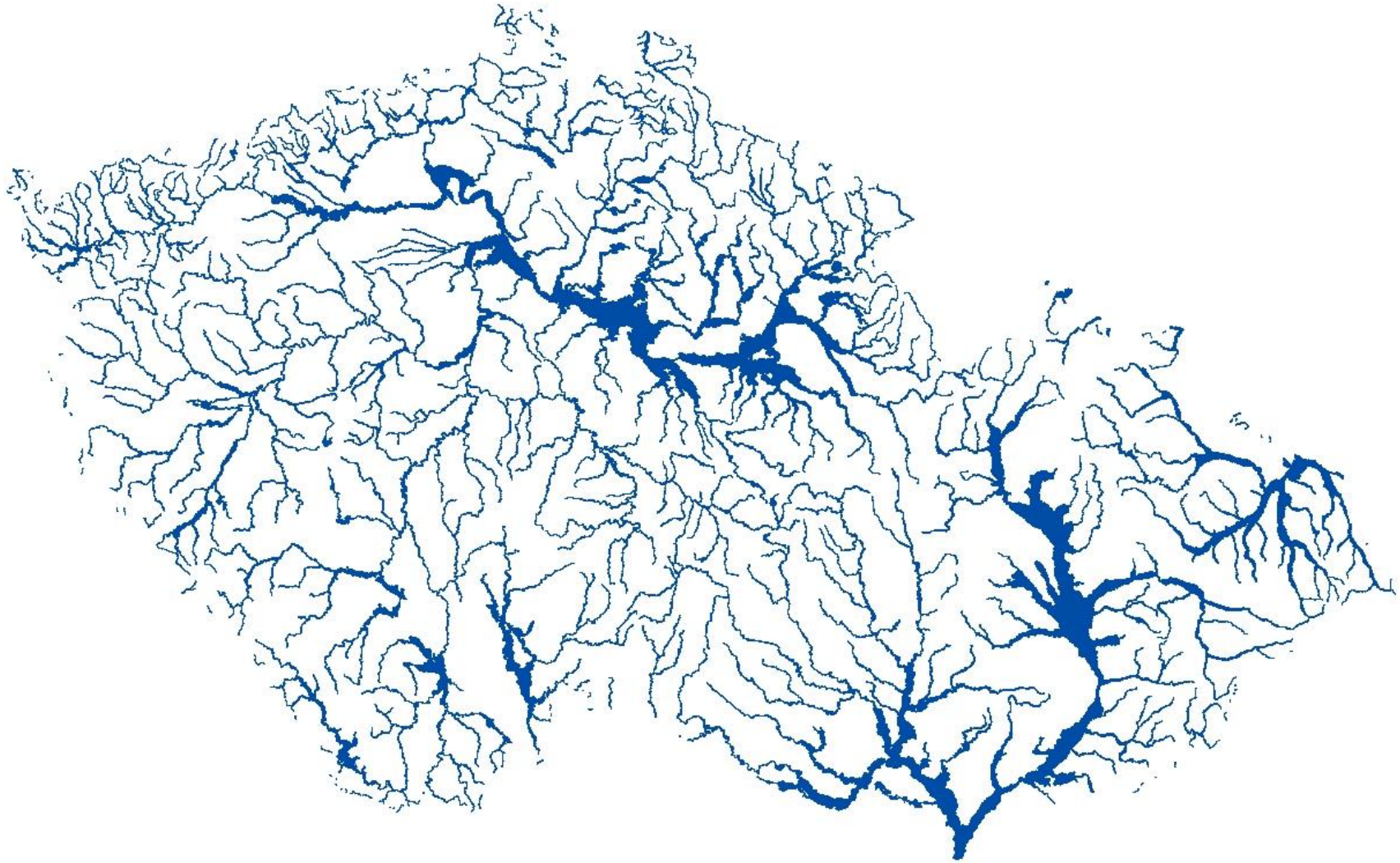
Czech Republic

Title of the project

NIVALIS - Water management analysis to support natural flooding and the transformation effect of the floodplain

Motivation

How to keep more water in landscape, or “sensitive/reasonable water management” in landscape



Floodplain area = 8.3%

of total Czech territory

The call of the Czech Ministry of Environment as a part of mitigation and adaptation EU strategies for **climate change**

The roots of the problems:

- increasing average temperature
- total sum of precipitation does not change significantly, **but changes in the distribution pattern** – > short, heavy storms -> high risk of **floods** < > **drought**

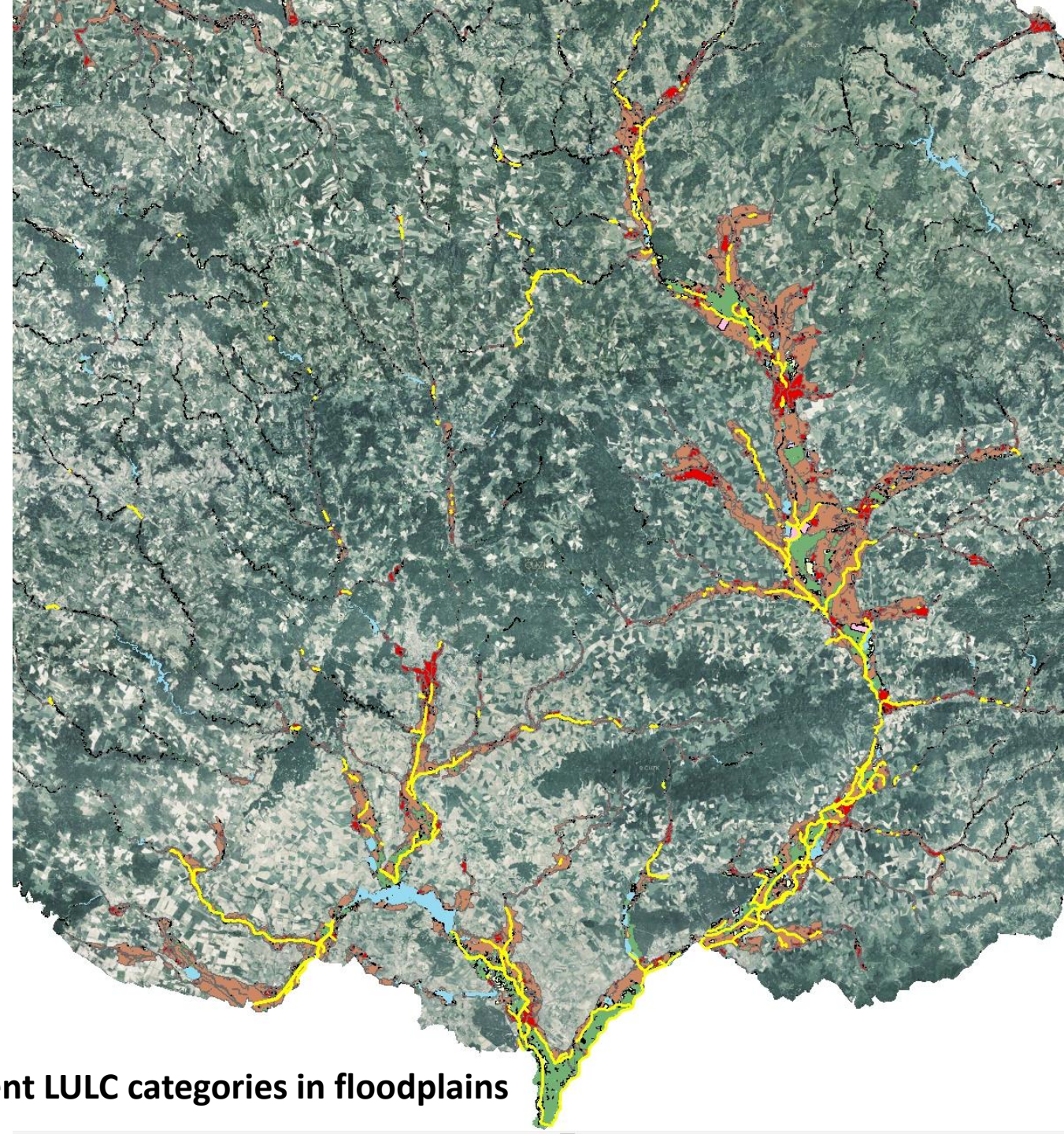
Heavy floods (Q_{100}) in **Moravia 1997** and **Bohemia 2002**

Reaction on floods – protecting levees/dikes along rivers, dams, etc.


Schindler

Together with former levees/dikes more than **thousand km of protective levees** along the main streams and around settlements at Morava river basin – resulting in artificial **draining water from landscape** and in **complicated system**

Consequence - deficiency of underground/surface water, impact on vegetation, agriculture crops, forests, biodiversity, etc.



Different LULC categories in floodplains

Recent protective system

The aim of the project

To provide methodological support for the assessment of the possibilities of **reconnecting the disused parts of the floodplain to the watercourse** and their use for **flooding,** including the **revitalisation measures**

Looking for a compromise – **enough protection**, mainly in the build up areas and for technical infrastructure (roads, trails,...), but **more water** to “natural” landscape **when drought periods**

Technical solution – removing redundant and useless dikes/levees, potentially managing water régime by technical tools

How to discover redundant dikes/levees?

Multidisciplinary approach

- historical water regime of the floodplains (**RS and GIS analyses**)
- knowledge of basin managers
- knowledge of local population
- **hydrological modelling**

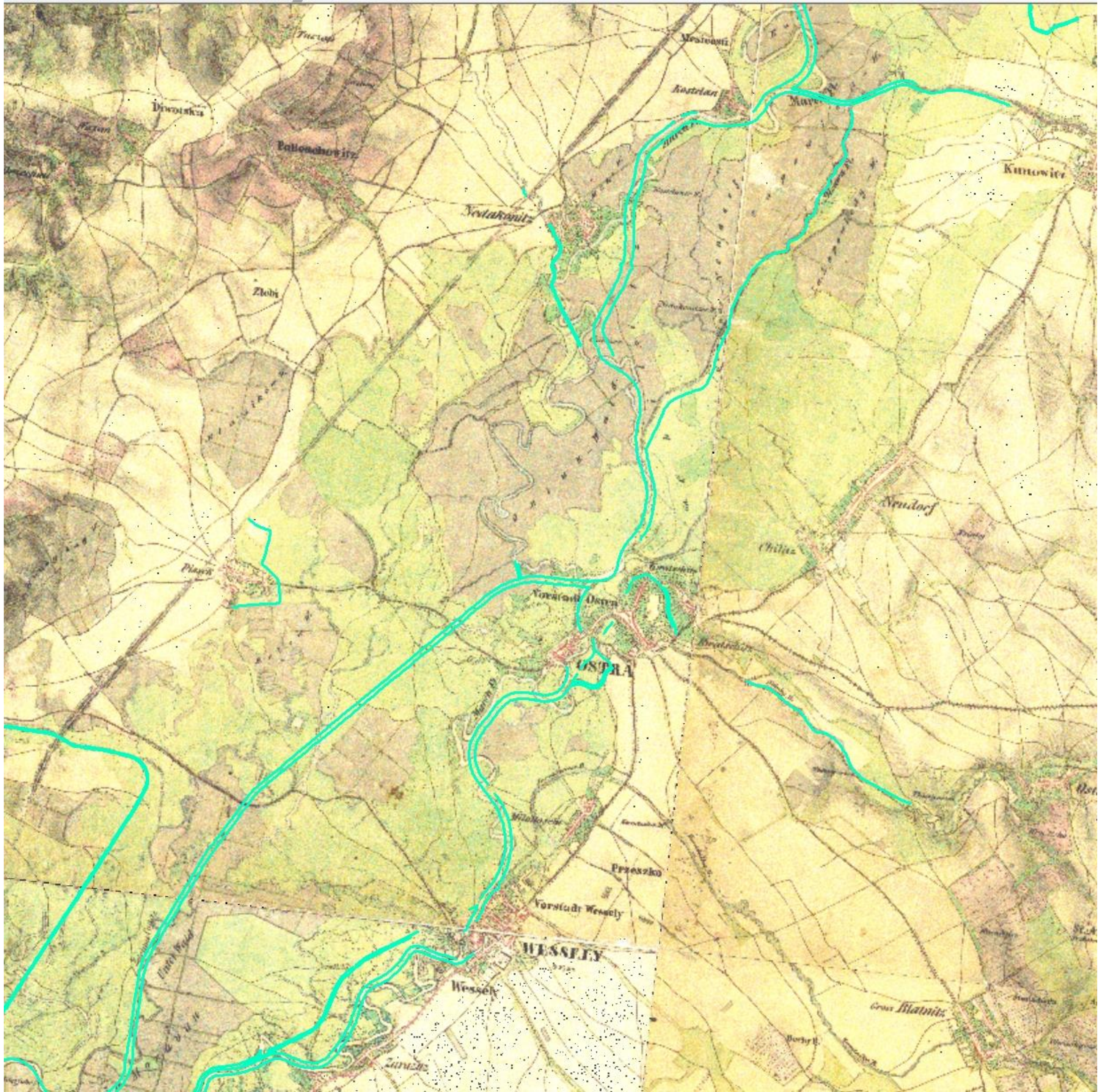
Historical maps – mostly for better understanding earlier development of the territory
1720

1720

Kunwald
Bisentz
Pisek
Milotitz
Waczenowitz
Radnik
Sarasitz
Lyderzowitz
Kozogedek
Rosnowa Lhota
Strasnitz
Scherawineck
March fl.
Petrow
Bowalow
Lhota
Kneschdub
Sudomierzitz
Zerotin

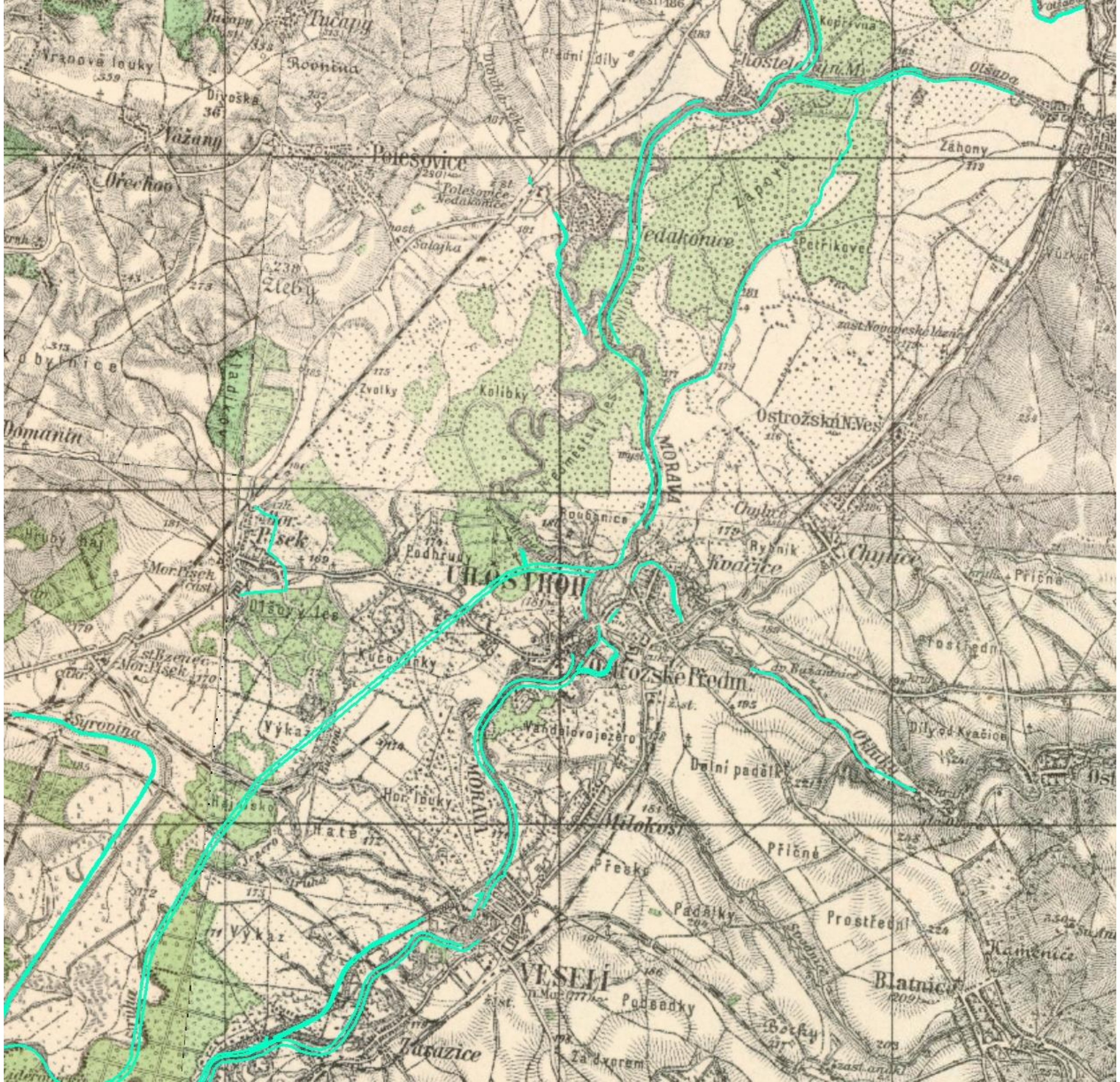
1760-80

1760-80



Nedakonitz
Kunowitz
Neudorf
OSTRA
Przeszko
Vorstadt Wessely
WESSELY
Wessely

1760-80



Tučapy
Vážany
Polešovice
Ořechov
Nedakonice
Petříkovec
Záhony
Kolíbky
Ostrožská N. Ves
Domanín
Chylice
Kvačice
Rybník
Podhradí
Mor. Písek
Olšový les
Výkaz
Hor. louky
Vandalovo jezero
Dolní padělky
Milokošť
Přečné
Padělky
Prostřední
Kamenice
Blatnice
Veselí
Zarazice
Za dvorem
Olšava
Morava

Remote sensing multiscale/multisource data and GIS

History of **changes** in

- building protective levees/dams/dykes (partially from project partner)
- local targeted development (buildings, roads, etc.)
- changes in flood plains “behavior”- water régime, temperature, vegetation cover, underground water table

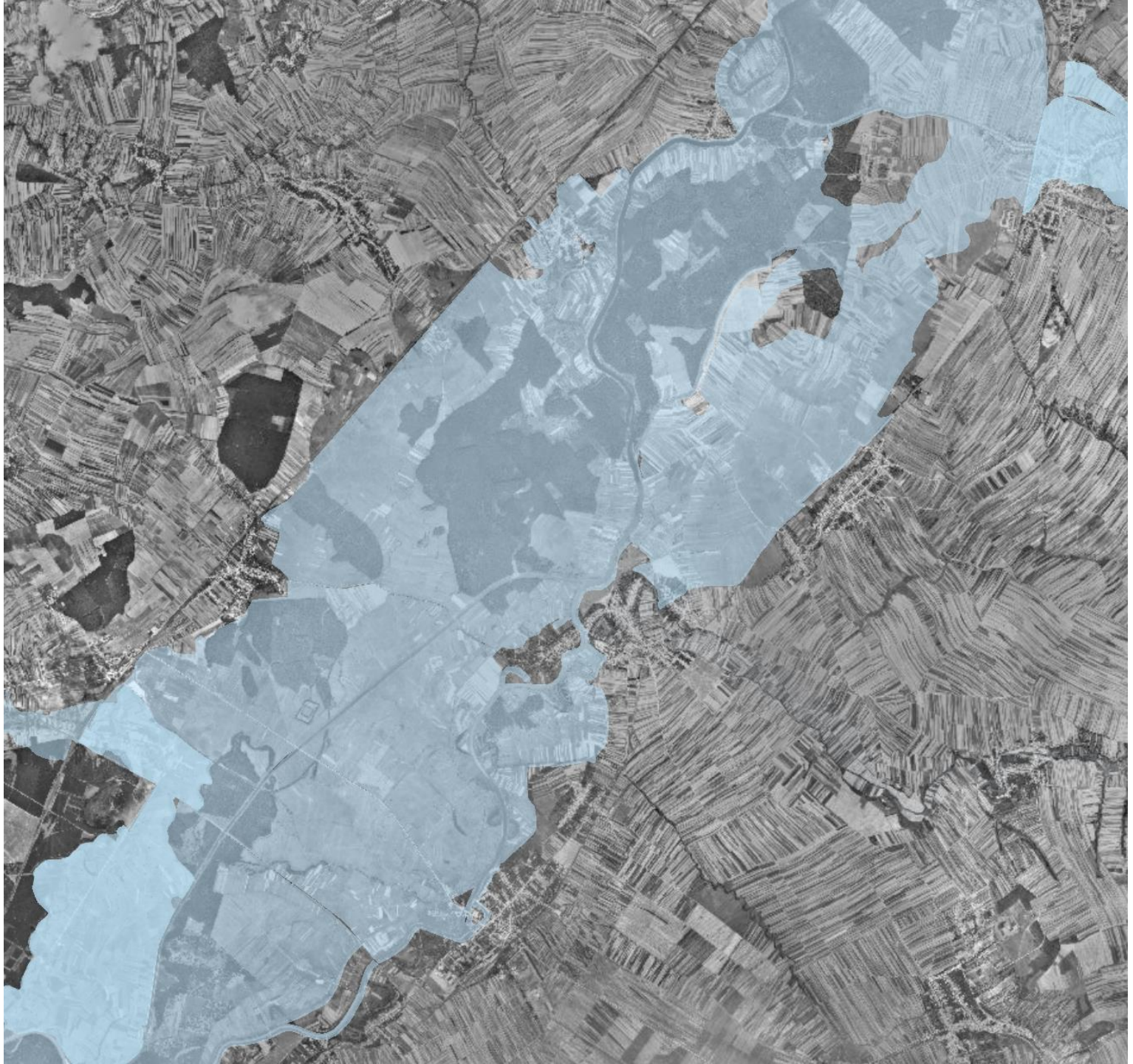
satellite – products of MODIS, Landsat, Sentinel (LCLUC, NDVI, evapotranspiration)

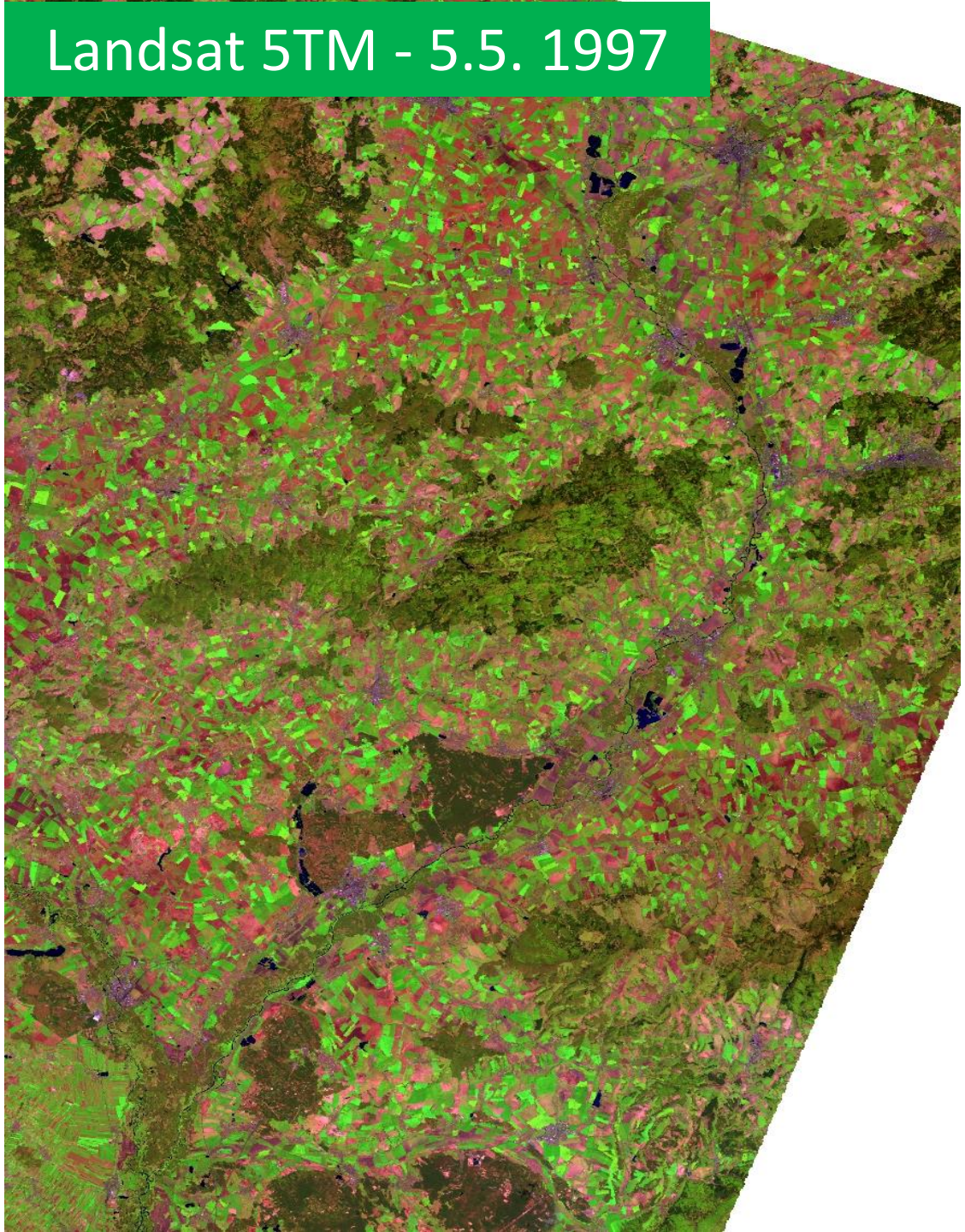
airborne – historical photos, recent detail scanner data(FLIS HS and LiDAR)

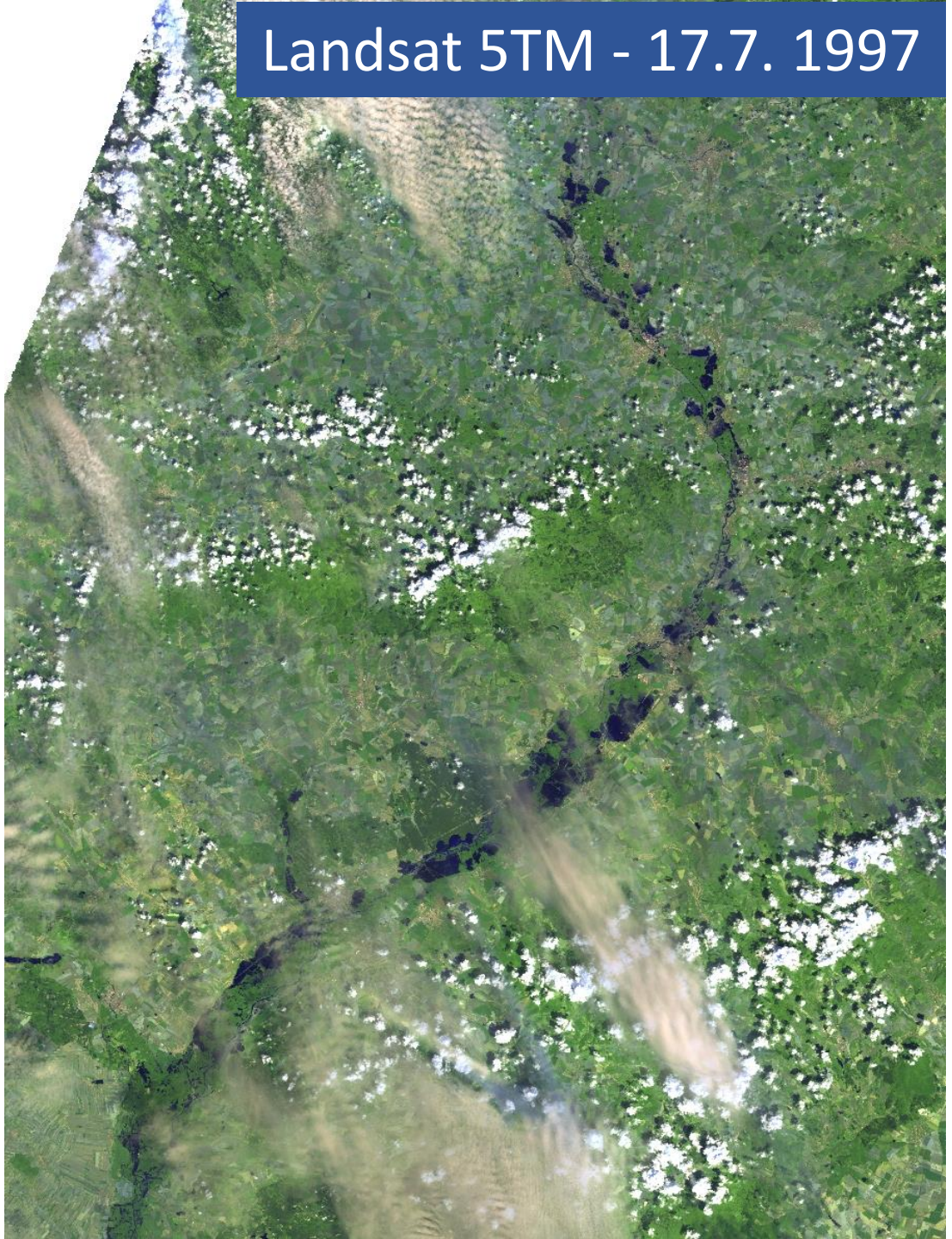
weather data (temperature, precipitation)

Aerial photos
1951-52

Aerial photos
1951-52
Q_{100}

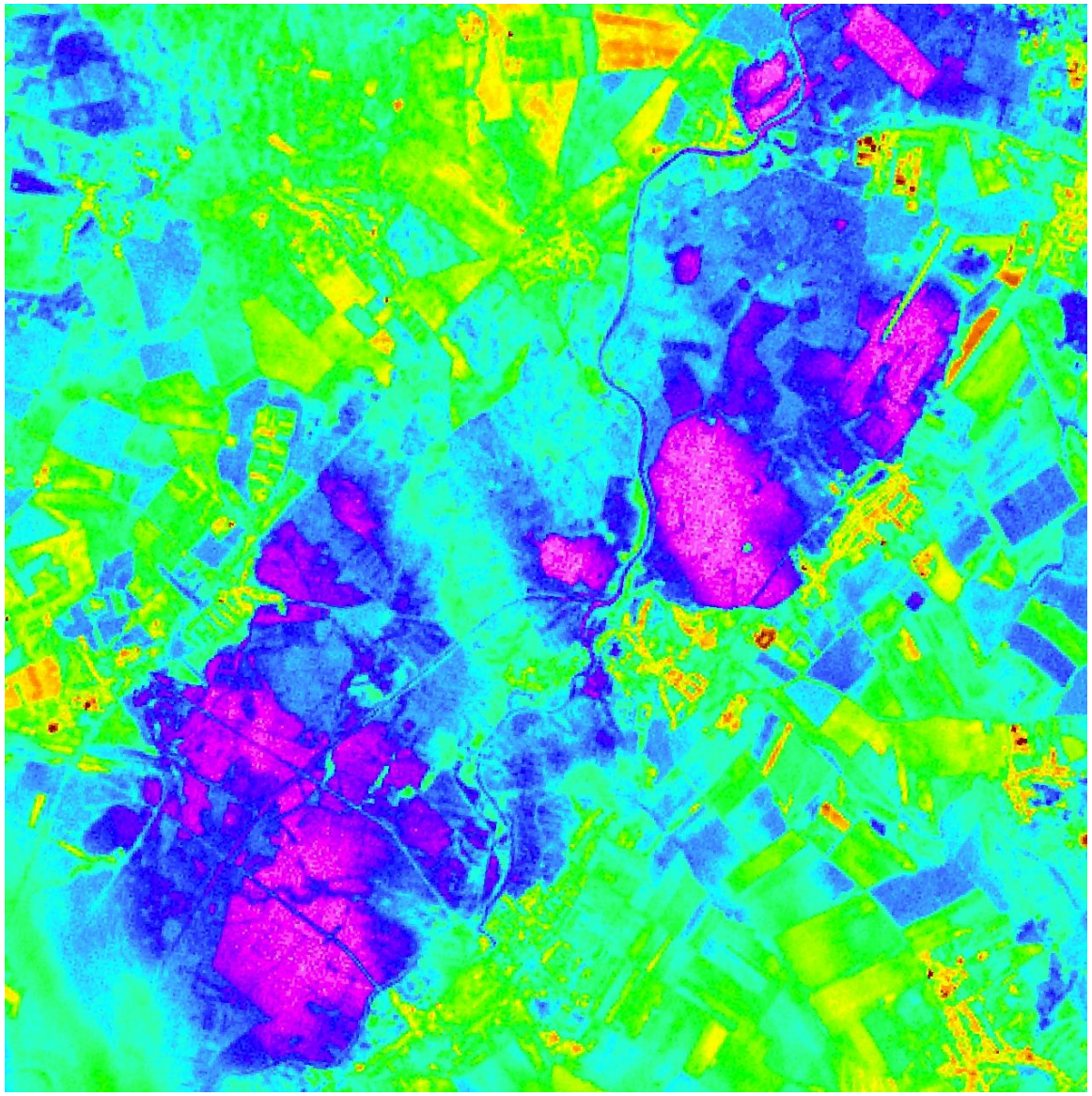



Landsat 5TM - 5.5. 1997


Landsat 5TM - 17.7. 1997

Landsat 5TM - 5.5. 1997
before floods

Landsat 5TM - 17.7. 1997
during floods



Next steps:

- **input to hydrological models**
- **risk analyses**
- **submission of solution to local government, stakeholders and local population**

- Law directives and regulations (ministries)
- Detail technical study and plans
- Realization

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Thank you for your attention

Inputs to hydrological models

Geographical data of the area of interest

- **Digital Terrain Model – G5**
- **Transverse and longitudinal profiles of flows - HEIS**
- **Accurate surveying of dams - geodetic or detailed DEM (20 – 30 cm)**
- **ZABAGED** or other documents on the territory Basic maps
- Orthophotomaps

Hydrological data

- **Watershed data** , links to neighboring watersheds – G5, LULC from satellite, Lidar CG
- **Rainfall** - data from rain gauge stations - CHMI (**CG** - daily, hourly, interpolation from stations in map form)
- Data on **runoff conditions** - **land use and surfaces** (ZABAGED, LPIS, LULC – **FLIS)**
- **Water flow data** – basic characteristics, link to other flows?
- **Flow series** in selected profiles - delineation of case sites according to water measuring stations or request ČHMÚ, basic hydrological data - **basic. characteristics , volumes and shapes of real and theoretical flood waves**
- Data on **temperature and runoff regime**, ice phenomena on streams, etc. - **PMO**

Branch water management and technical data

- Handling rules of protective objects (drawing documentation)
- **State of protective dams** and related objects (routing, surveying, photography)

Ecological data

- data on **the character of the territory** (forests, fields, ...)
- **important landscape elements and biotopes** (e.g. NATURA2000, migration corridors, PLA, PR, PP, ...)
- **sociological** - depending on the area being addressed individually - demography, endangered property,...

The proposed project focuses on the issue of water management and the possibility of water retentionin the countryside. The results of the project will be applied in the process of planning the development of the territory, especially inarea of the valley floodplain and will serve as support for the decision-making process in the event of interventions infloodplains. In accordance with the requirements of European institutions for the restoration of the natural landscapethe project will focus on the possibilities of opening the valley floodplain in the form of modification or removalof redundant protective dams, which is fully in line with the priority objective of the program. Attention will be directed to the possibilities of a global solution, as well as suitable additions or modificationsof the existing dike systems in order to achieve a good state of the waters according to national legislative requirements. The water management approach will take into account both watershed management issuesas a whole, as well as environmental issues. This will be emphasized as part of the project solutionboth locally and globally.

Obrázky:
historický snímek, popř. Corona
celé území z Landsatu povodní
celé území s hrázením
území s Qs vodou
vybraná území

Popis vstupů do modelů
nějaký název modelu
risk analýza

Postup

1. motivace
2. cile metodika
3. historie, poc hraze, dusledek povodni
4. z ceho identifikovat uzemi pro odstraneni hrazi: data, jak uzemi funguje z pohledu vodniho rezimu, pokryv, evepotranspirace
5. podklady pro modely pro overeni vhodnosti uzemi
6. risk analyza
7. nazory stakeholders