ptima

Project presentation: Optimised management strategies for the Biosphere reserve Lobau, Austria - based on a multi criteria decision support system

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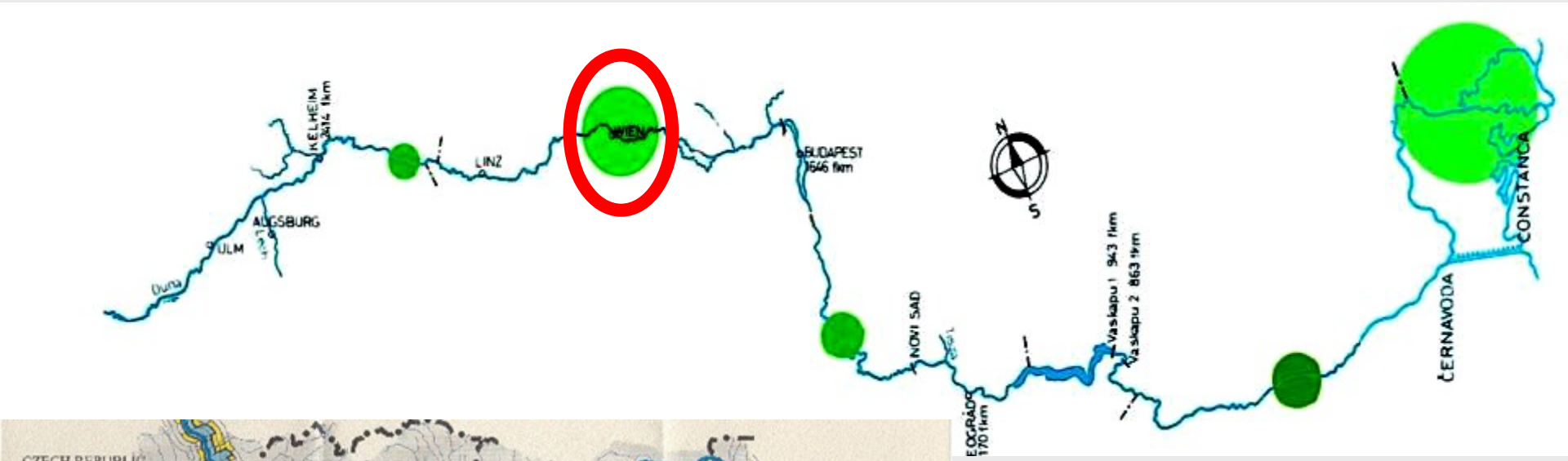
3 *Vienna Ecology Center, University of Vienna.*

4 *Institute for Hydraulic and Water Ressources Engineering, Technical University of Vienna.*

5 *ÖIR - Austrian Institute for Regional Studies and Spatial Planning.*

6 *Water Resources Research Center (VITUKI), Hungary*

Background: situation in the Danube River basin



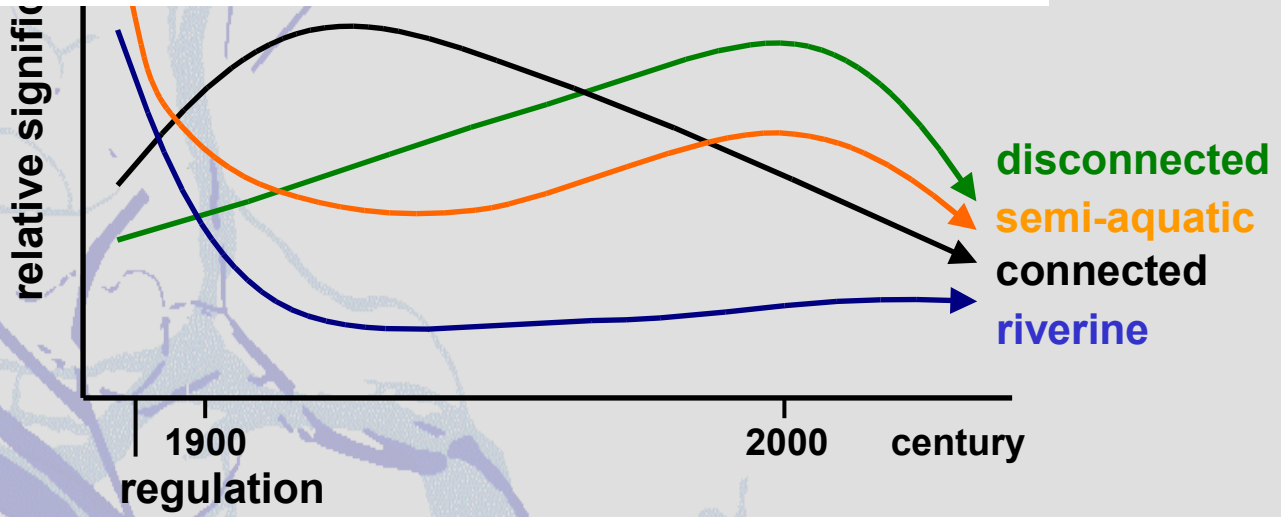
80% loss of floodplain area remaining 20% reduced connectivity

Background: Danube from Vienna to Bratislava

Background: development in the floodplain Lobau

Redrawn after Schiemer (1999)

without management - most aquatic and semi-aquatic habitats will disappear



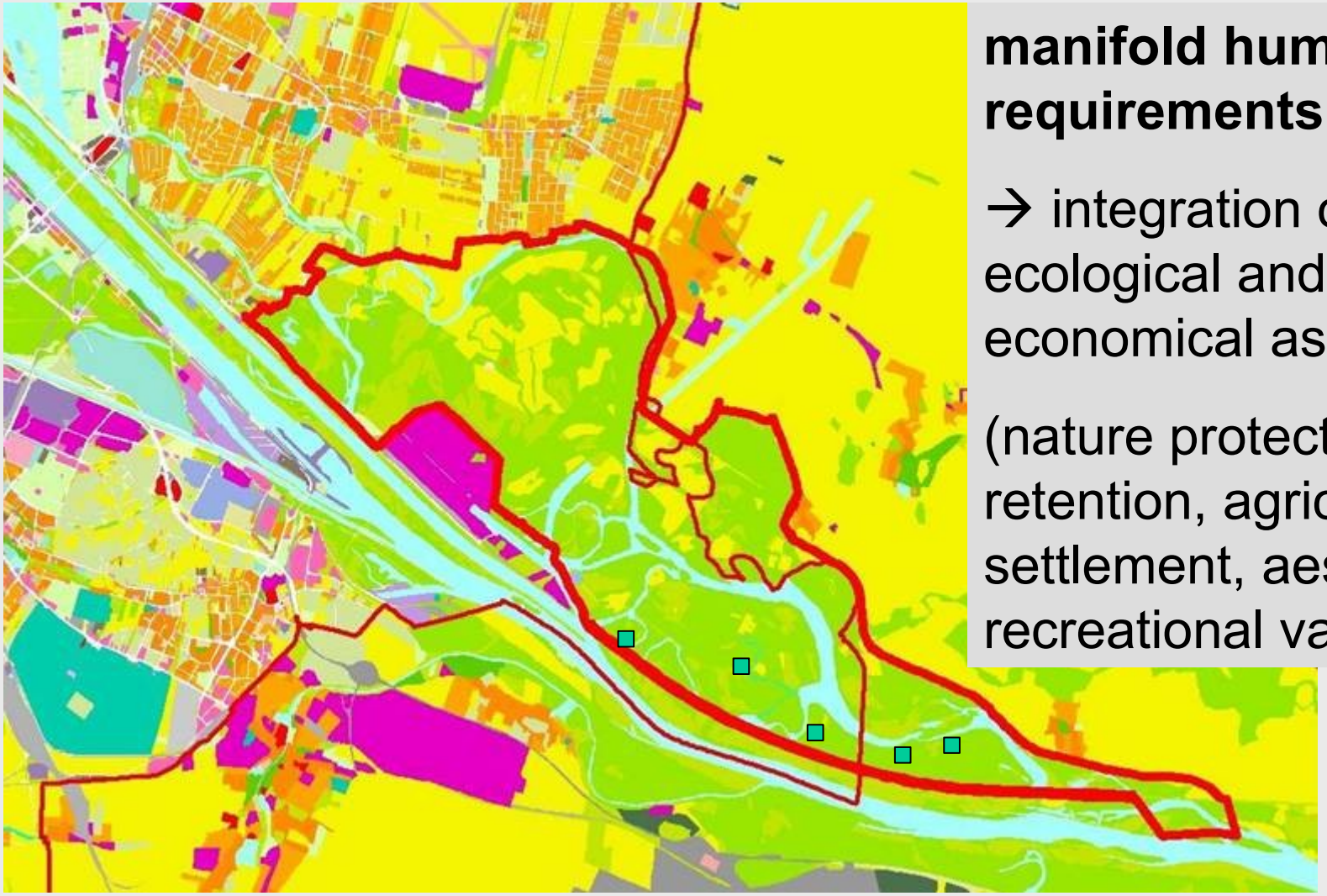
decoupled former dynamic floodplain

decrease of aquatic and semiaquatic habitats

still high biodiversity (UNESCO MaB, Natura2000, NP)

Vision: sustainable & adaptive management LOBAU

arable farm land | meadow & wood land | industry | residential area | groundwater wells

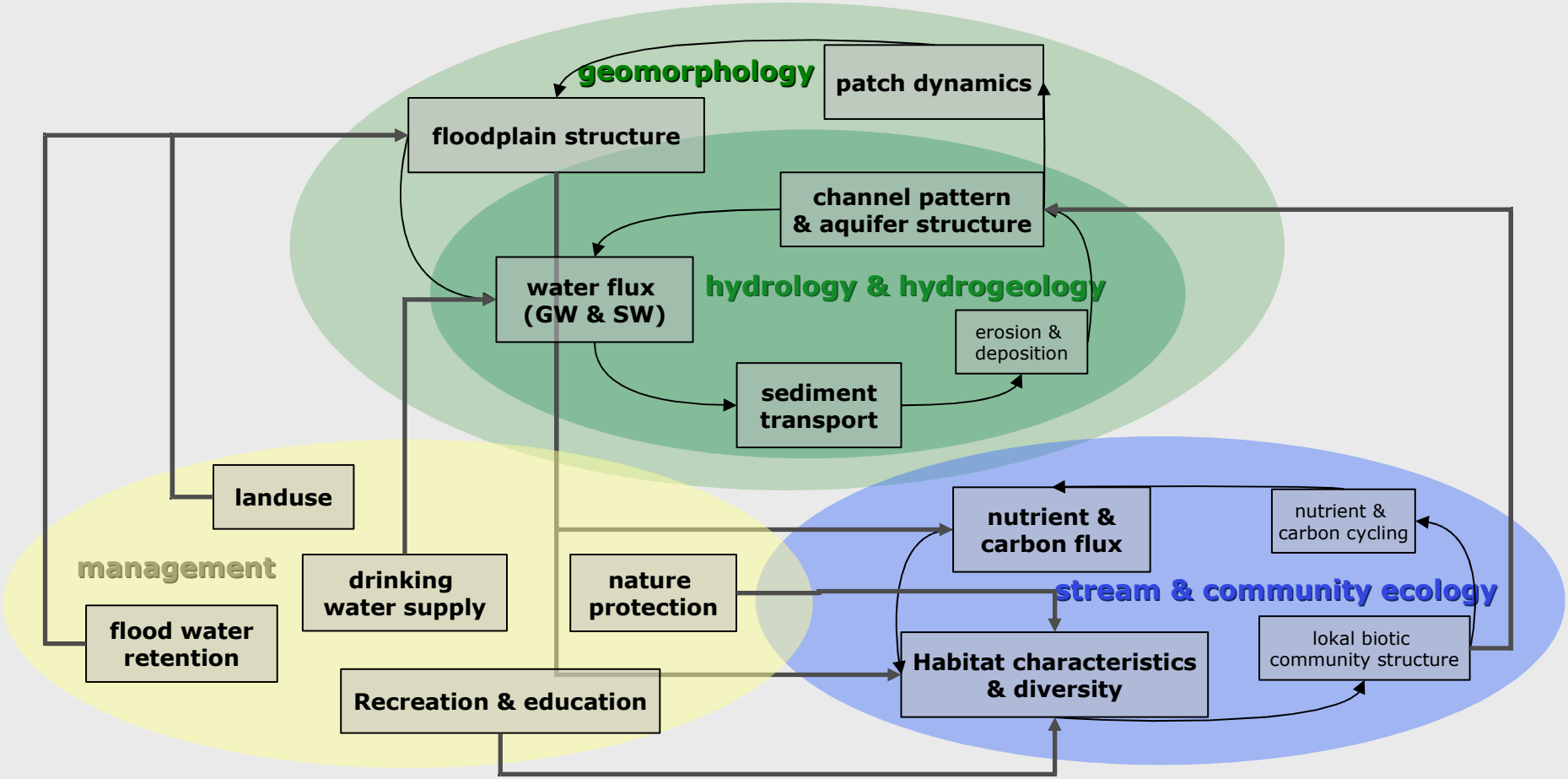


manifold human requirements

→ integration of ecological and socio-economical aspects

(nature protection, flood retention, agriculture, settlement, aesthetic & recreational values, …)

Interdisciplinary approach



after Poole 2002

Central questions of proposed research

- What are the **long-term effects** of the human-induced hydrogeomorphic alterations in the Lobau? What motivation drives the alterations in riverine landscapes (risk minimisation and human benefits)?
- To what extent is the **current ecological development** of the Lobau **reversible**?
- Which strategies can be applied to **combine ecosystem functions with socio-economic services** for a sustainable, integrated development in the Lobau?
- Range of **management alternatives**:
    - lentic, back-flooded lake system (present situation)
    - highly dynamic, lotic, channel-like system

Project structure

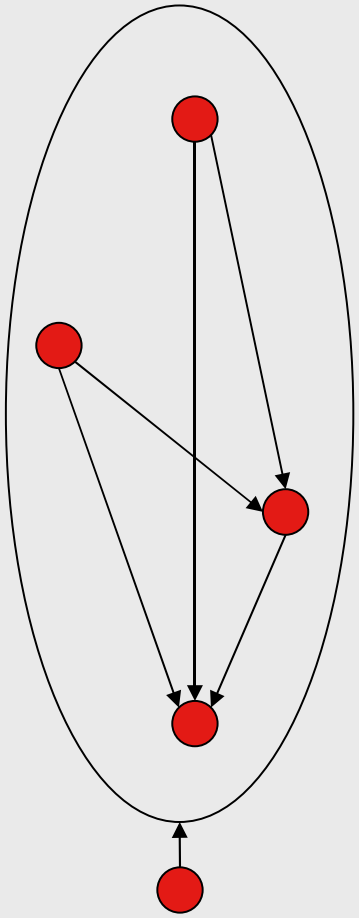
WP1 - Interdisciplinary analyses of pre-regulation dynamics, landscape features and human interferences

WP2 - Hydrodynamic and groundwater modelling

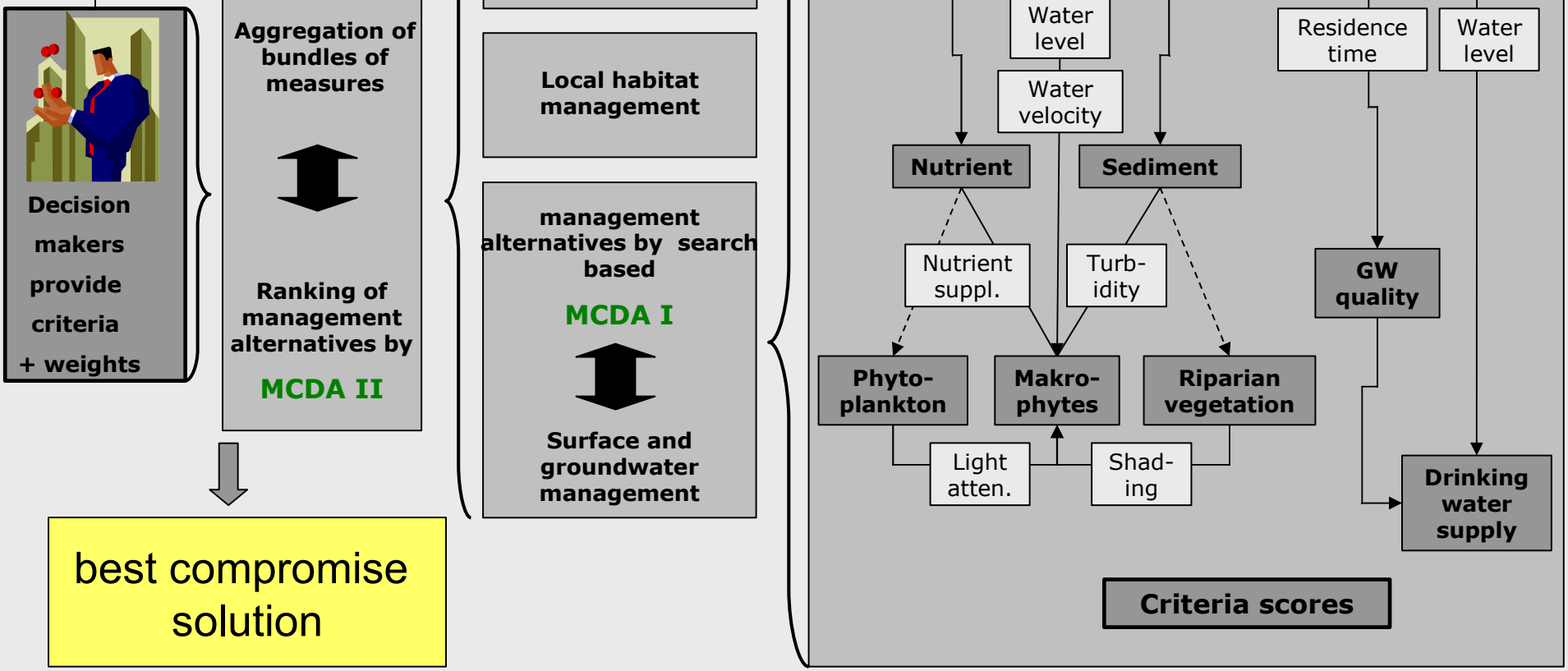
WP3 - Ecological and socio-economic modelling

WP4 - Aggregation of the DSS using multi-criteria decision analysis (MCDA)

WP5 – Project management



Objectives and structure of workflow



WP1 – land use change: data sources & methods

Data sources:

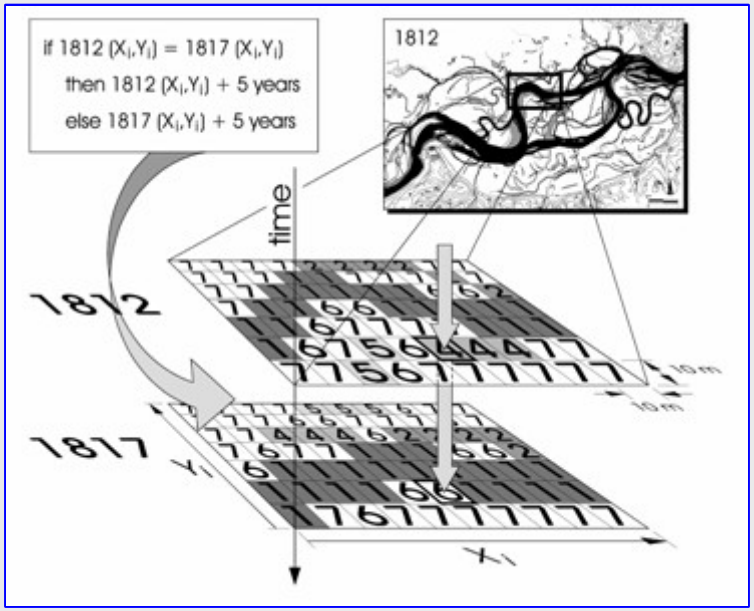
- **historical maps** (cadastral surveys, topographic maps etc.) as basis for land use data (identification of different types of land use)
- **written archival and published information** (forestry/hunting, water management strategies, cadastral surveys, etc.) as basis for socio-economic status (different types of human uses, management practices and their impact on the natural system in the study area)

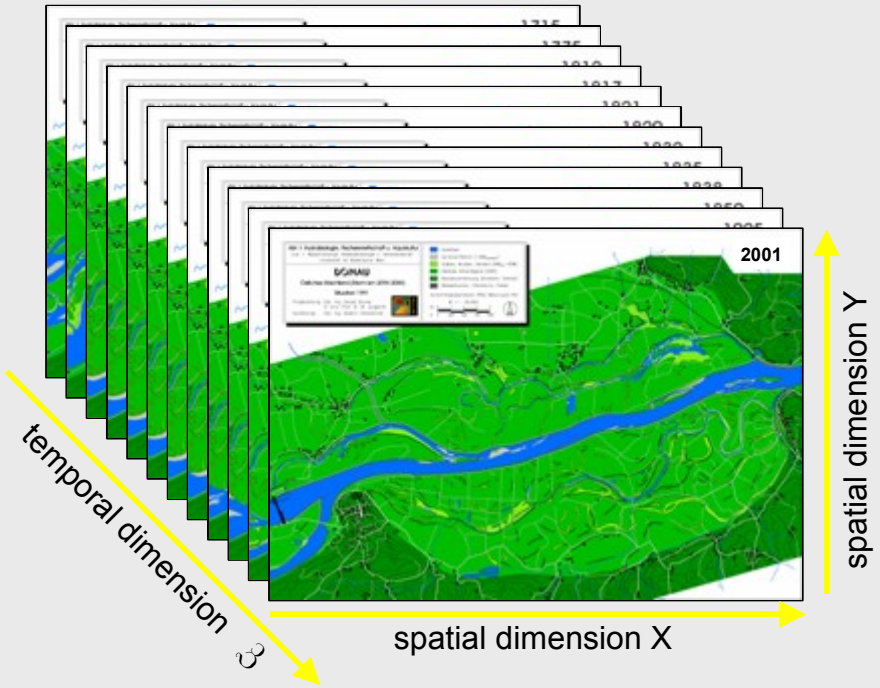
Goals and methods:

- Qualitative / descriptive analysis of the ecological and socio-economic development of the Lobau in the last 200 years
- GIS based analysis of land use and land use change for different points in time in the last 200 years
- (semi-)quantative analysis of the socio-economic system for different points of time by means of different criteria and indicators (identification of criteria and indicators together with WP 3 and 4)
- identification of driving forces and relevant changes for different points in time

WP1 – Historical development: sources & methods

- data inquiry (archives)
  => historical sources
- detailed & accurate
  maps 1726 – 2001
- digital correction
  with current landmarks

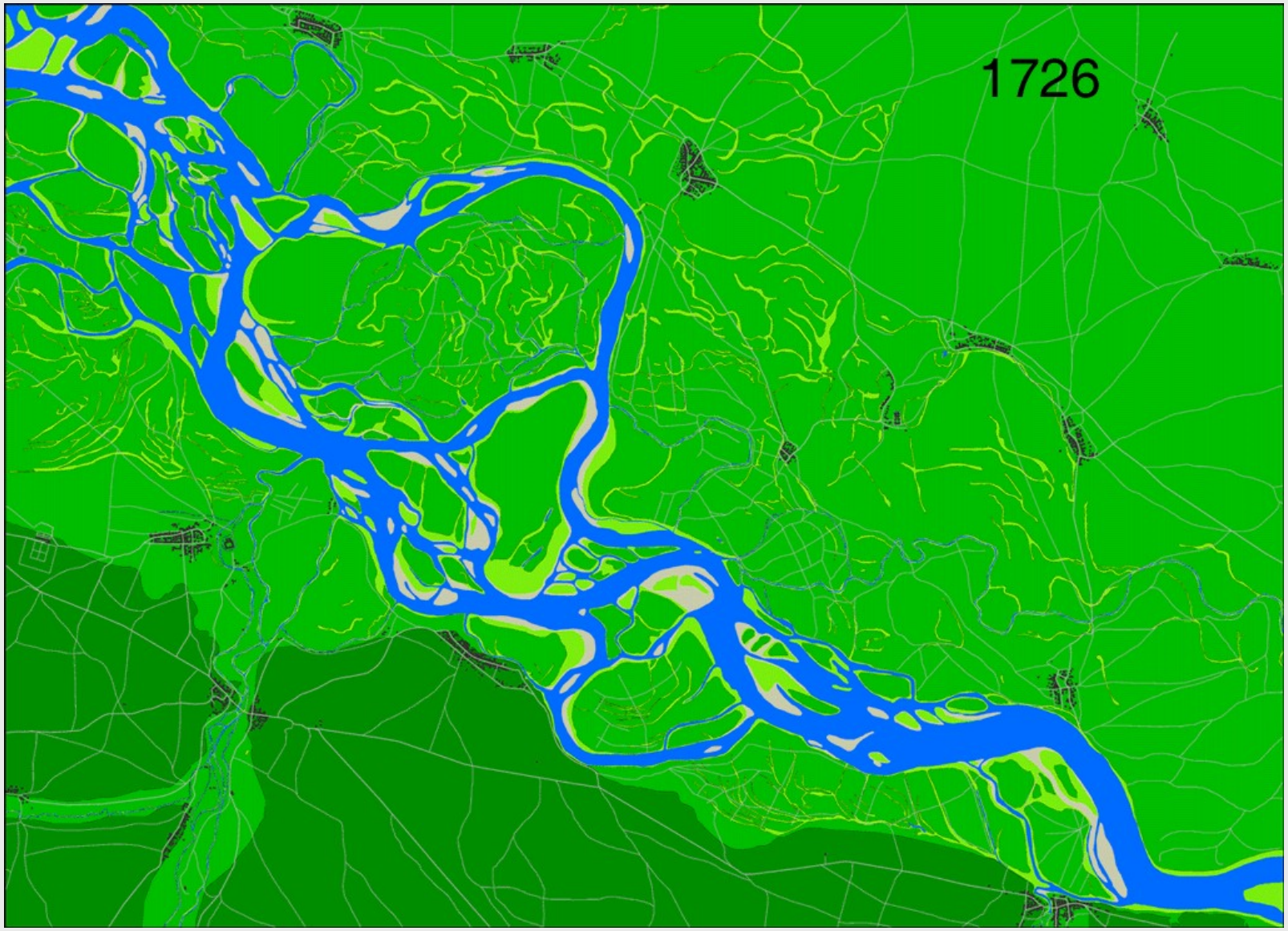




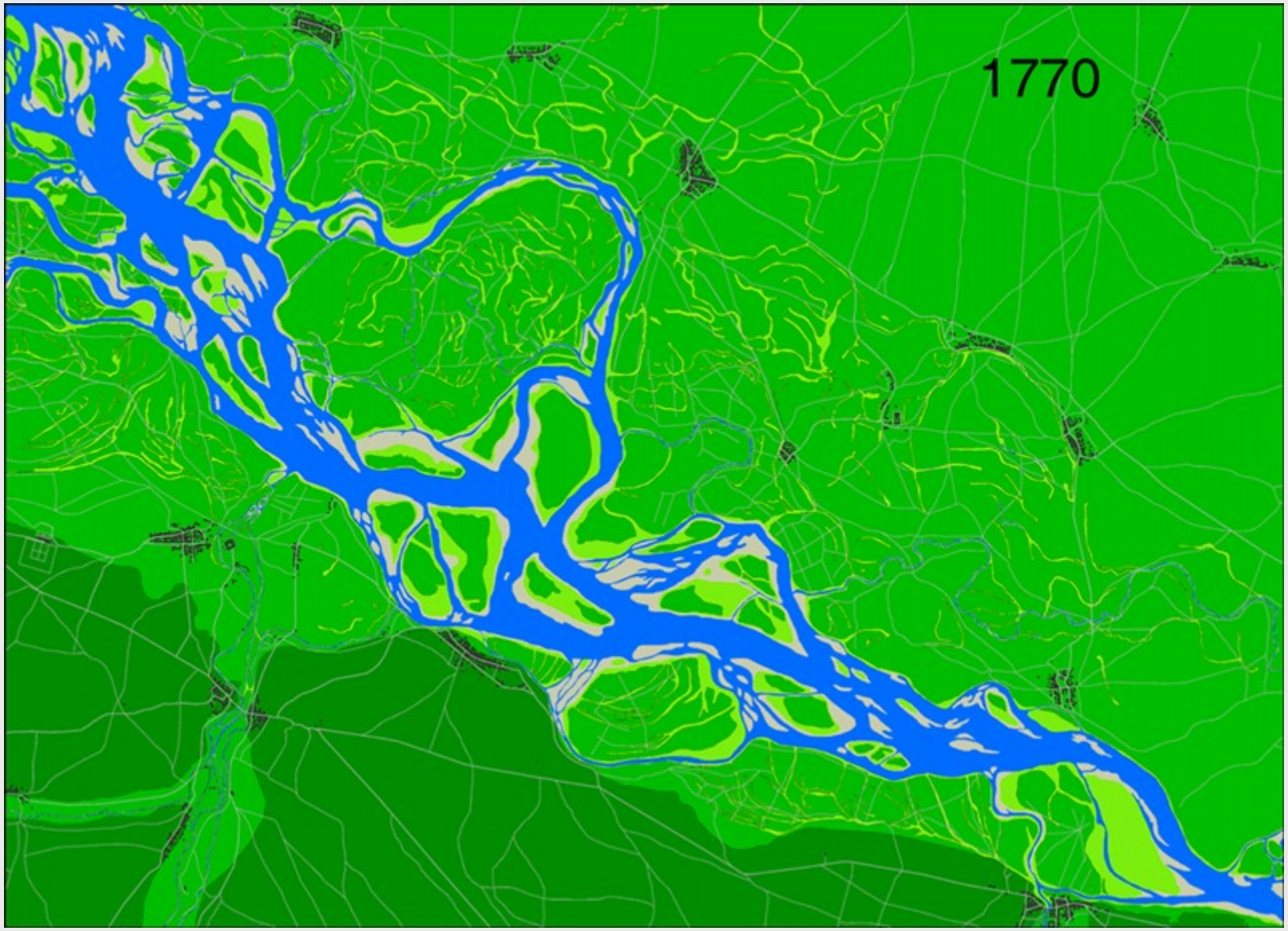
- GIS: vectorization
- Raster GIS: habitat
  turnover & site age

methodology: Hohensinner et al. 2004, 2005, in press

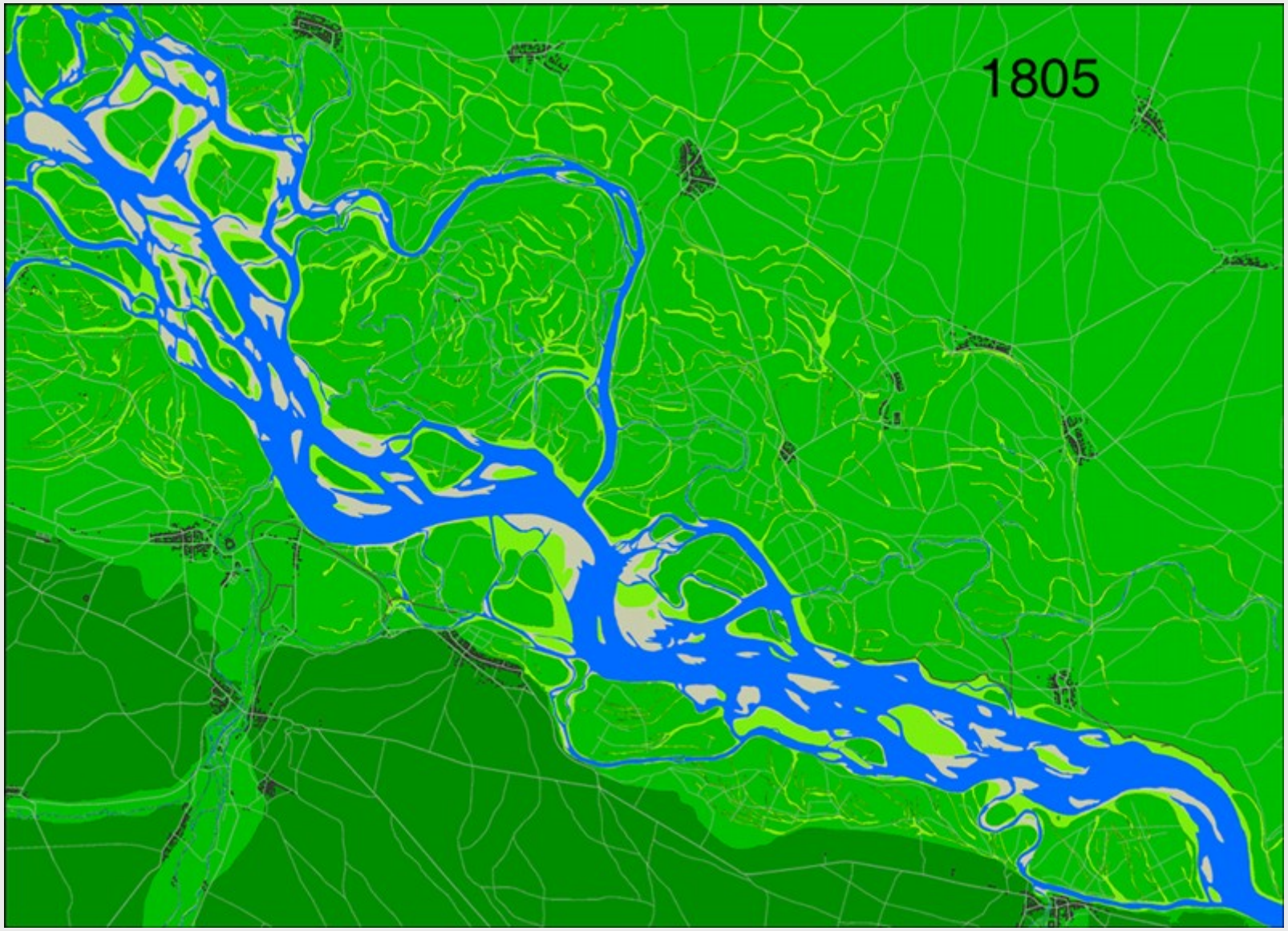
WP1 – historical development 1726 - 2001



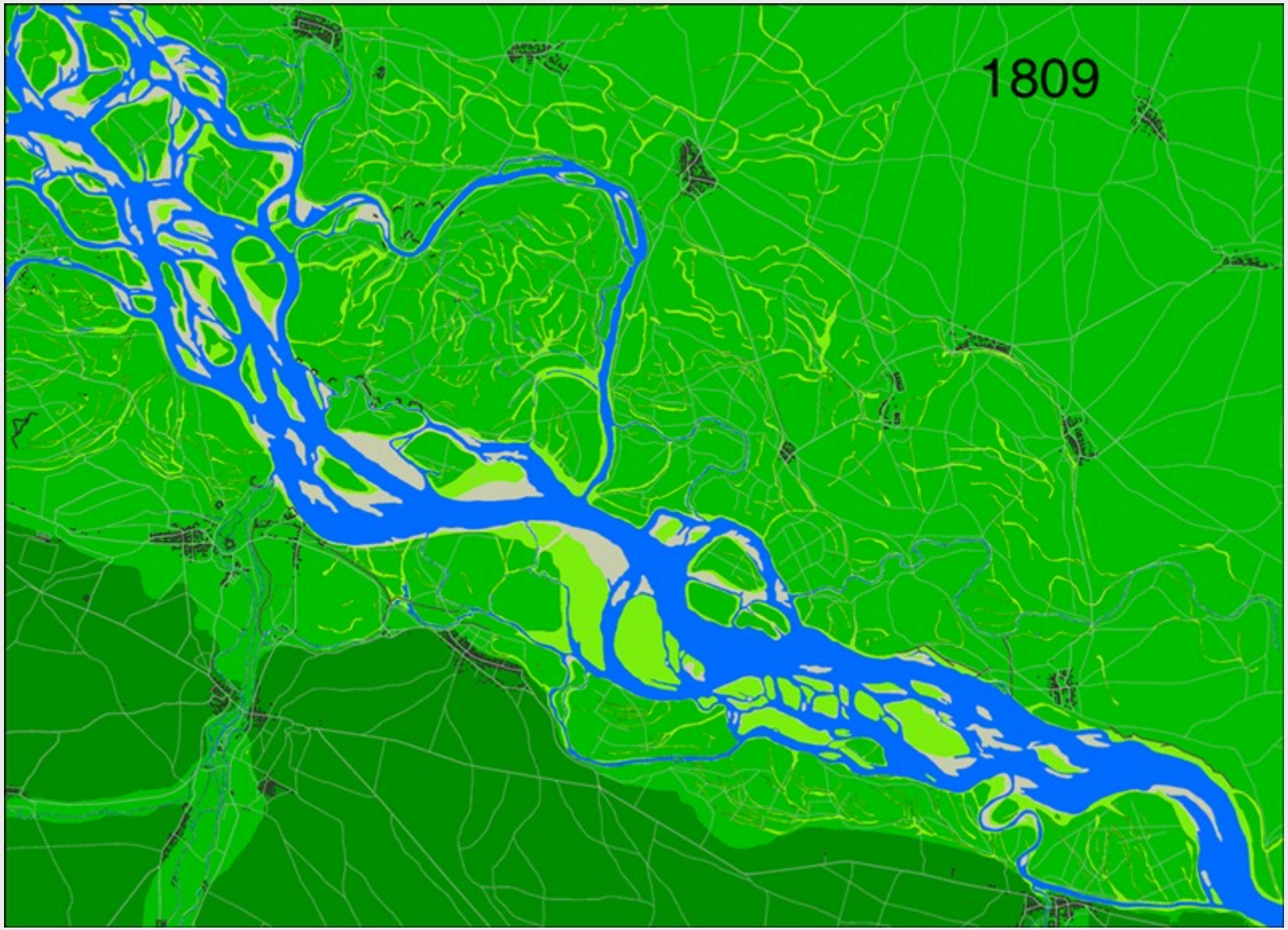
WP1 – historical development 1726 - 2001



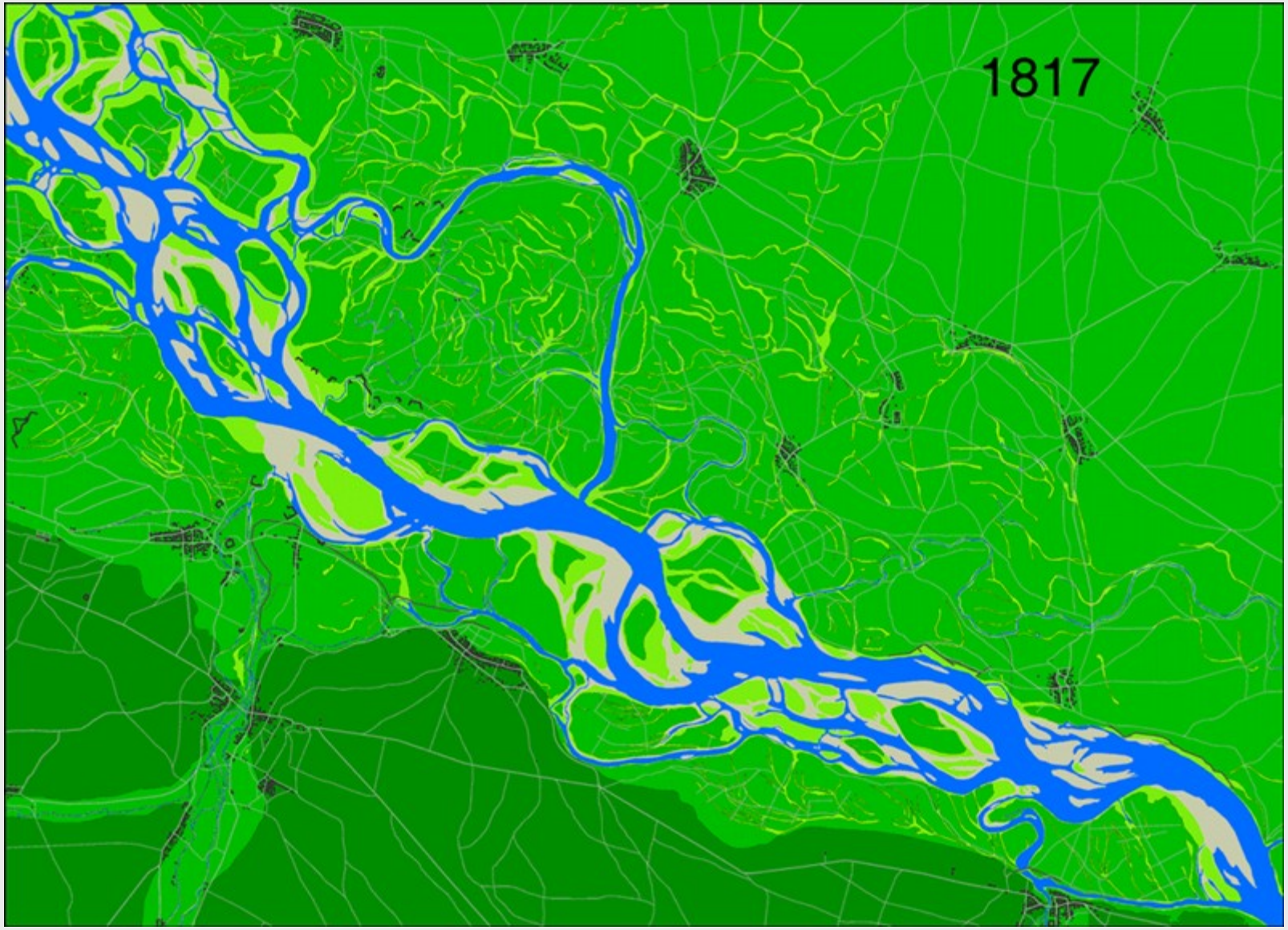
WP1 – historical development 1726 - 2001



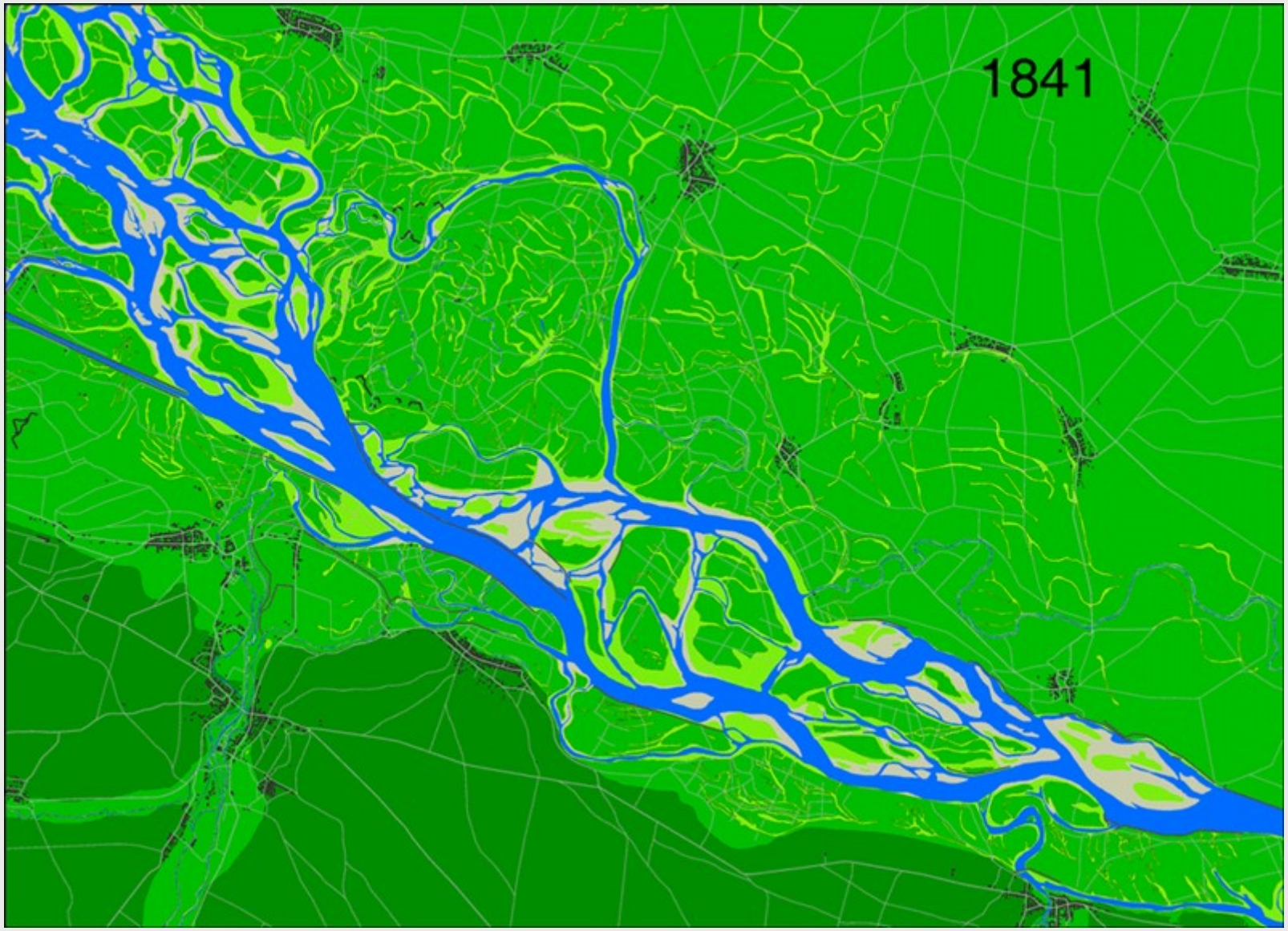
WP1 – historical development 1726 - 2001



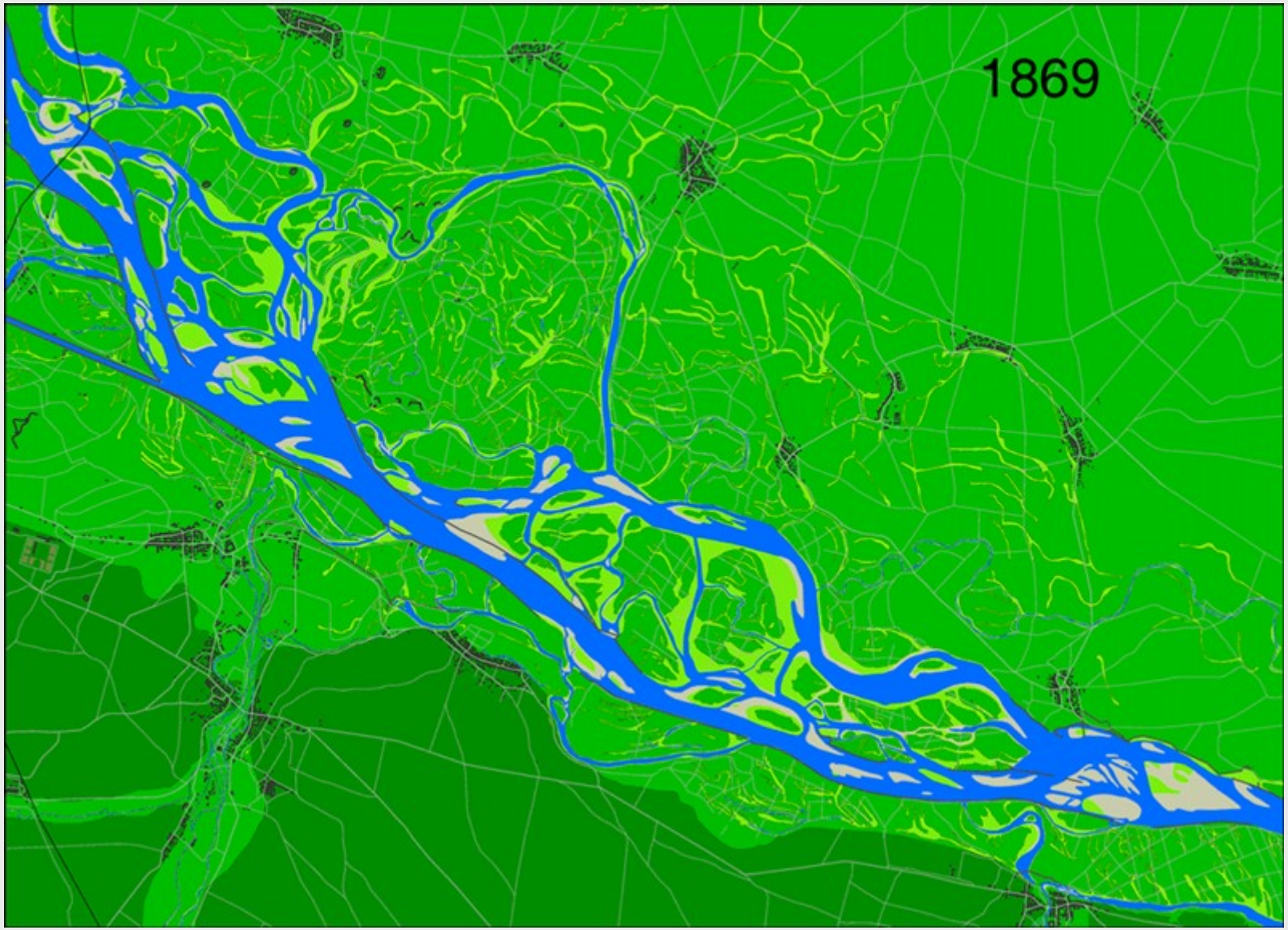
WP1 – historical development 1726 - 2001



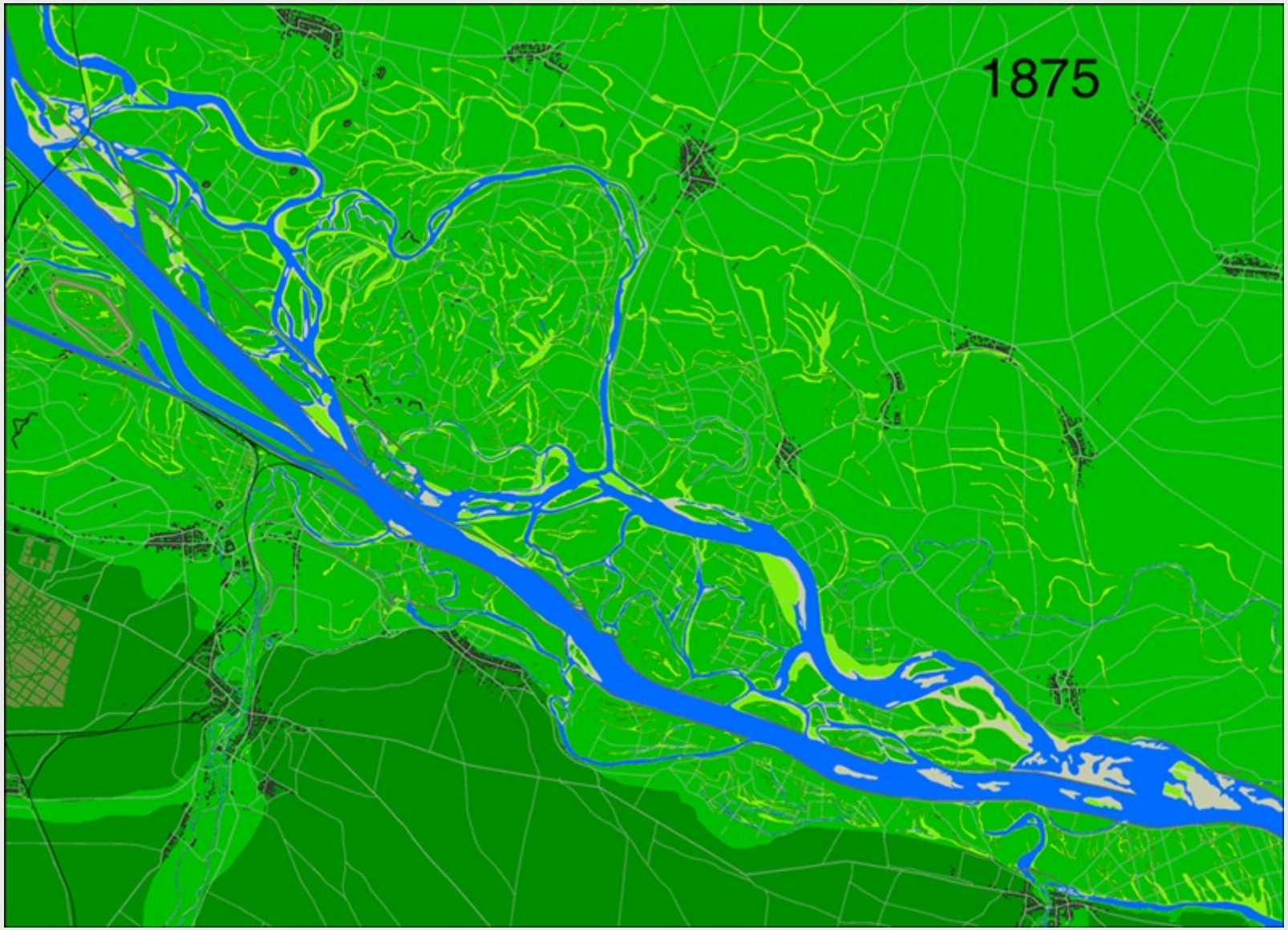
WP1 – historical development 1726 - 2001



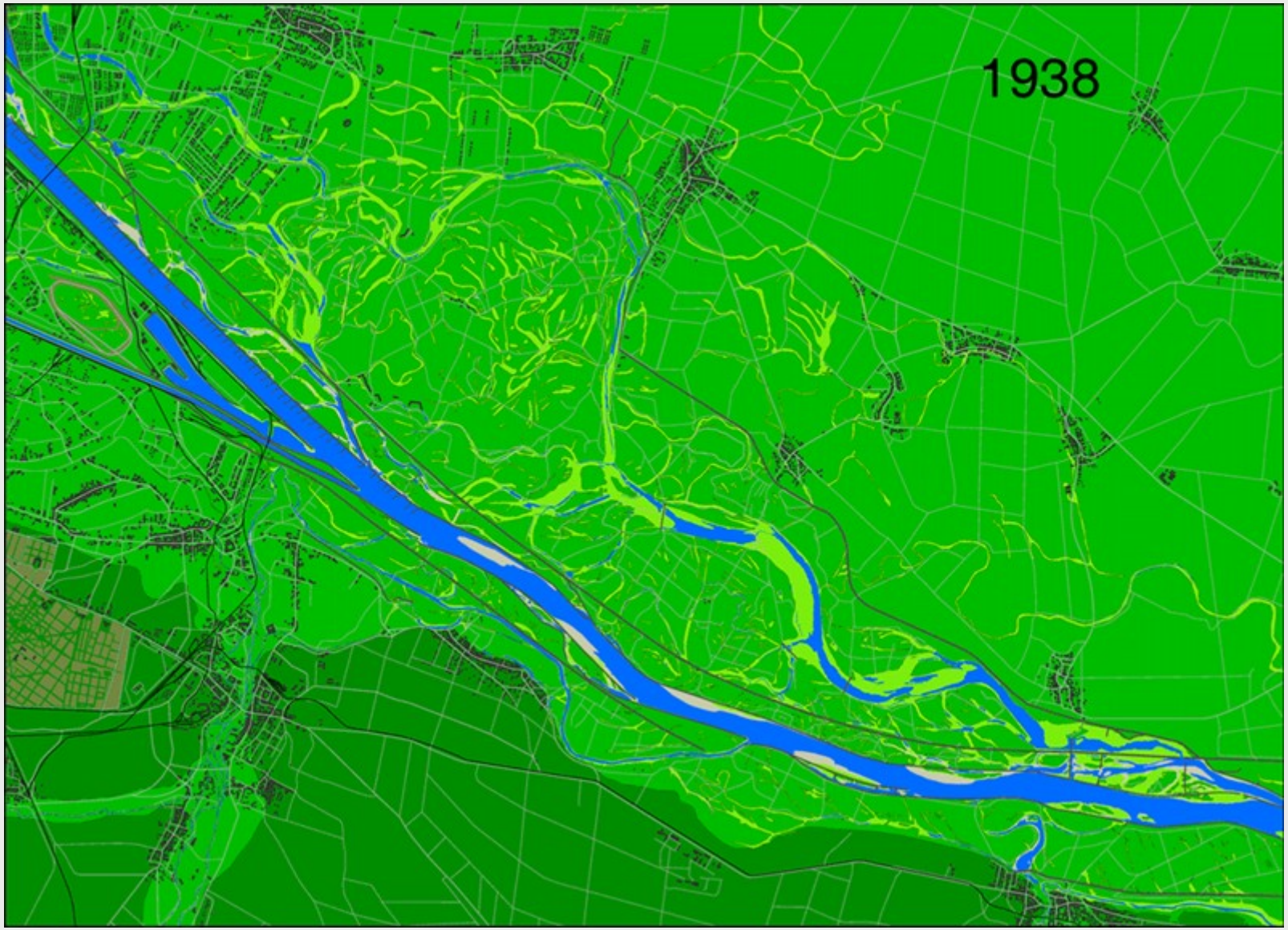
WP1 – historical development 1726 - 2001



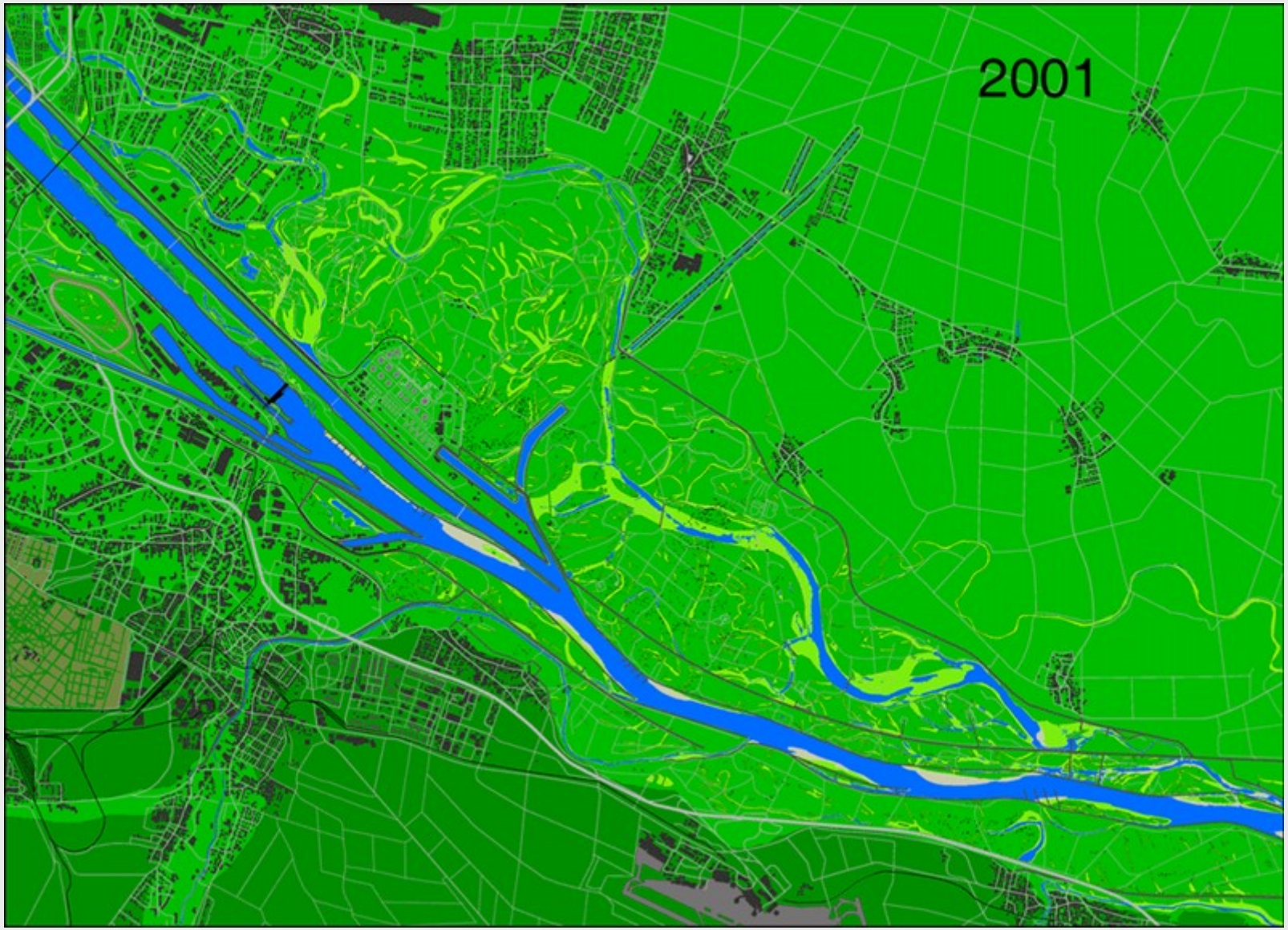
WP1 – historical development 1726 - 2001



WP1 – historical development 1726 - 2001

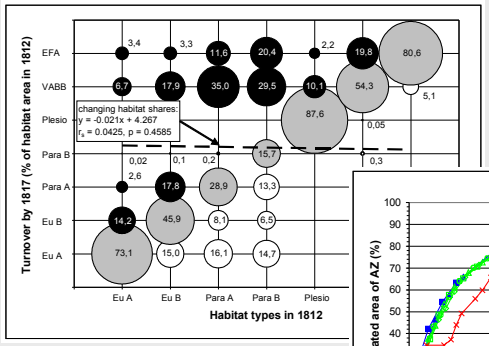


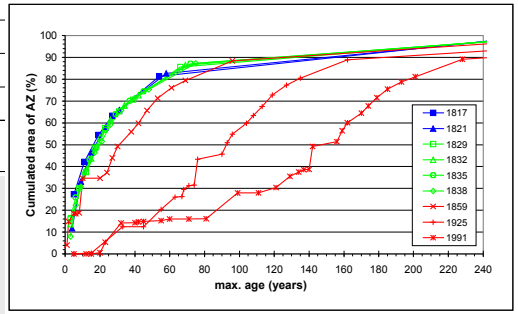
WP1 – historical development 1726 - 2001



WP1 – historical analyses: output

- natural hydromorphological patterns
- spatial habitat turnover
- age of floodplain vegetation sites / habitat age structure
- historical depth of groundwater table at charact. water levels
- changes in land use patterns





1830

1870

2000

WP2 – simulation surface-ground-water interactions

3 implementation approaches are possible

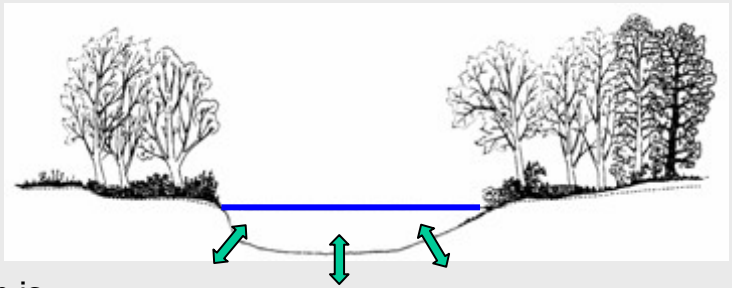
DAFLOW model routes flows through a system of inter-connected 1D channels and subdivides the system into a series of branches.

HEC-RAS 1D hydraulic model for a full network of natural and constructed channels.

US Army Corps of Engineers

FEFLOW full 3D groundwater model including saturated and unsaturated zone as well as rivers.

WASY GmbH.



The models are coupled by adding an exchange between each subreach and specified ground- water cell.

The water exchange for each subreach is computed on the basis of the stream-aquifer head difference, the streambed thickness, stream width, and streambed hydraulic conductivity.

Development of the model coupling is needed.

HPP_GMS is a 2D finite element groundwater-model.

G. Blöschl, A.P. Blaschke
Technical University of Vienna

MODFLOW simulates ground-water flow through a three-dimensional grid of cells.

H.E. Jabsen, A.W. Harbough
U.S. Geological Survey

Used approach depends on

data availability and computing time

WP3 – ecological & socio-economical modelling

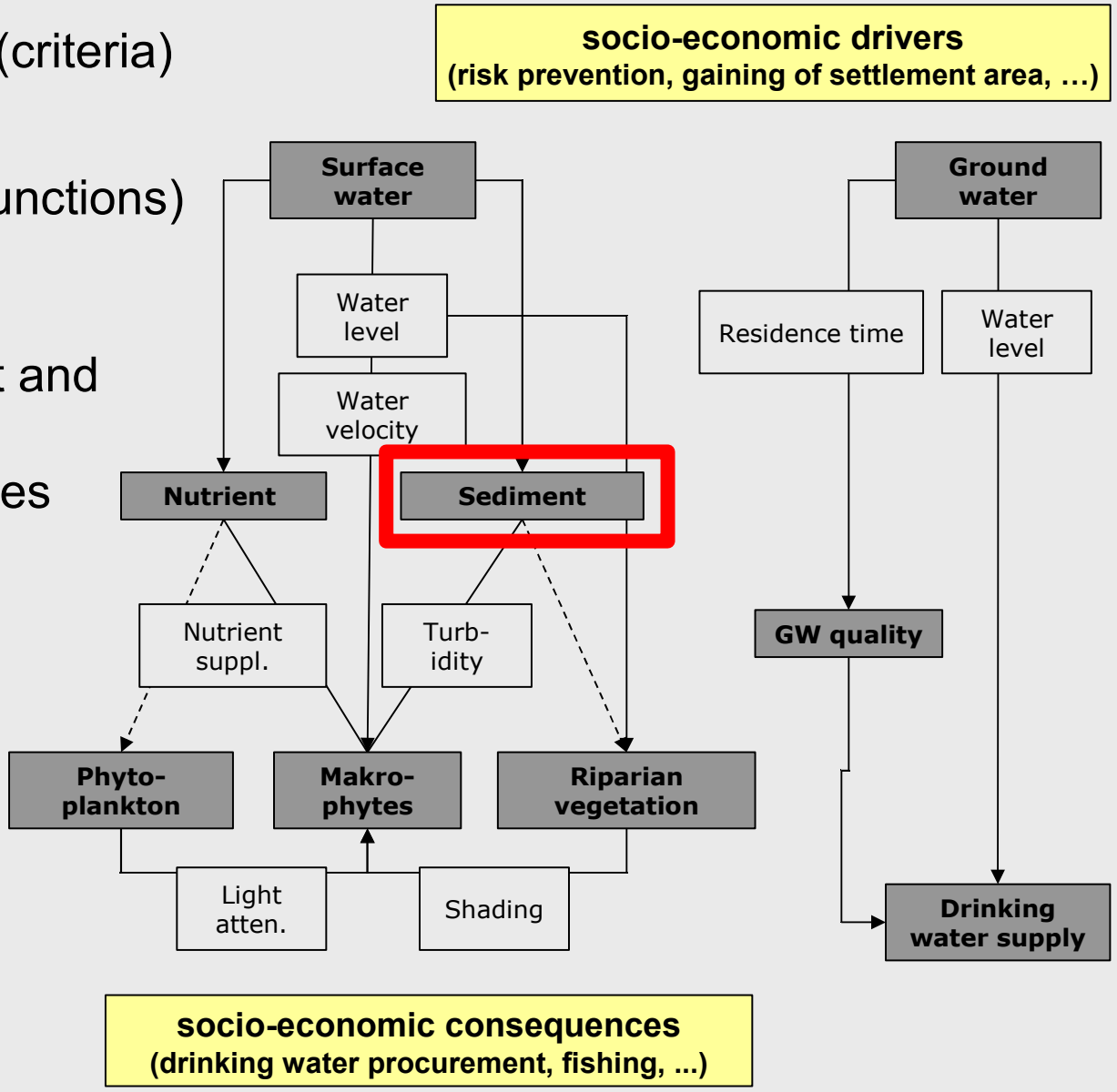
-define indicator sets (criteria)

-develop predictive submodels (criteria functions)

-interlink submodels

-identification of direct and indirect effects of environmental changes

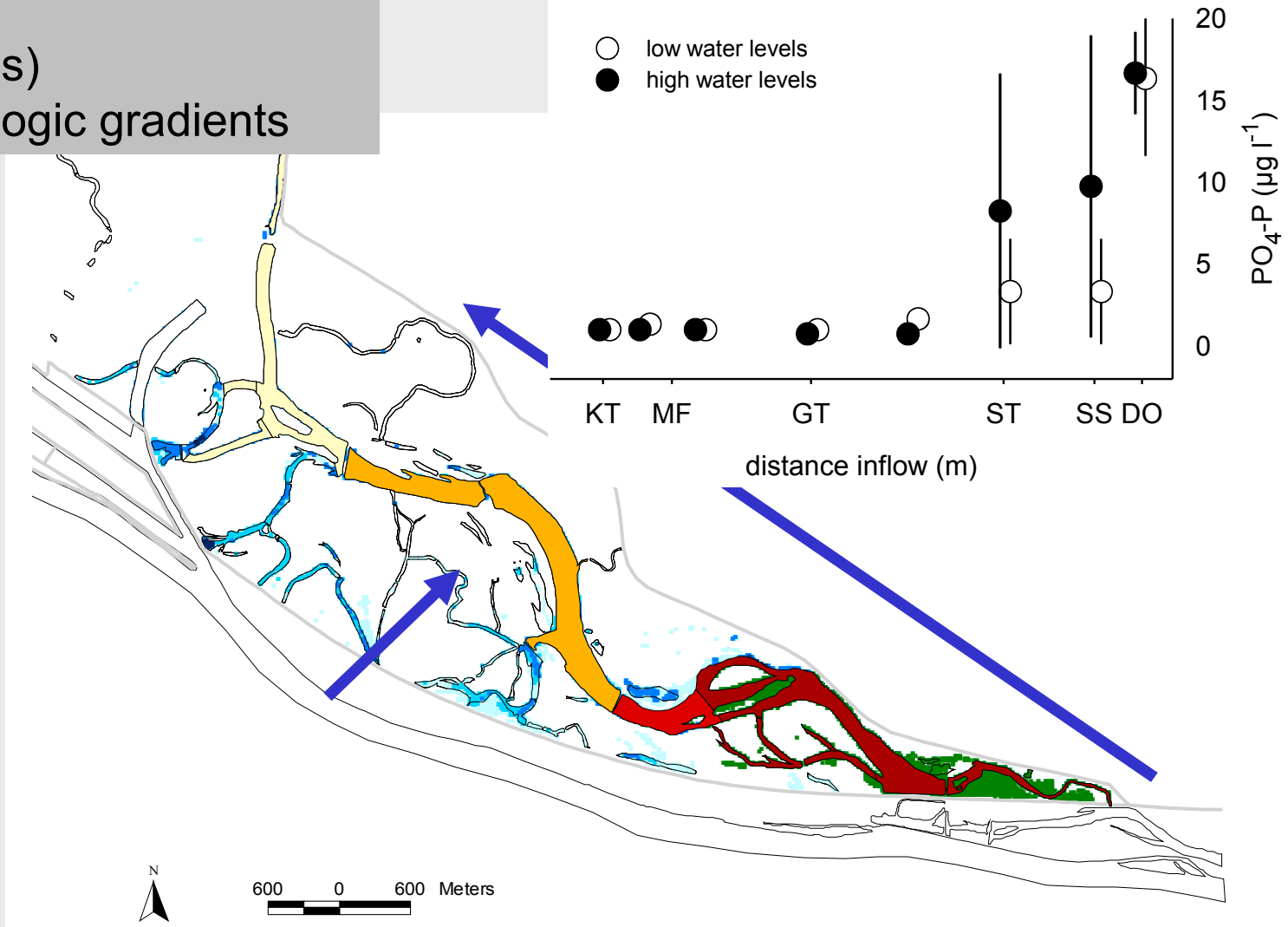
-input for MCDA 1



WP3 – ecological & socio-economical modelling

- develop predictive submodels

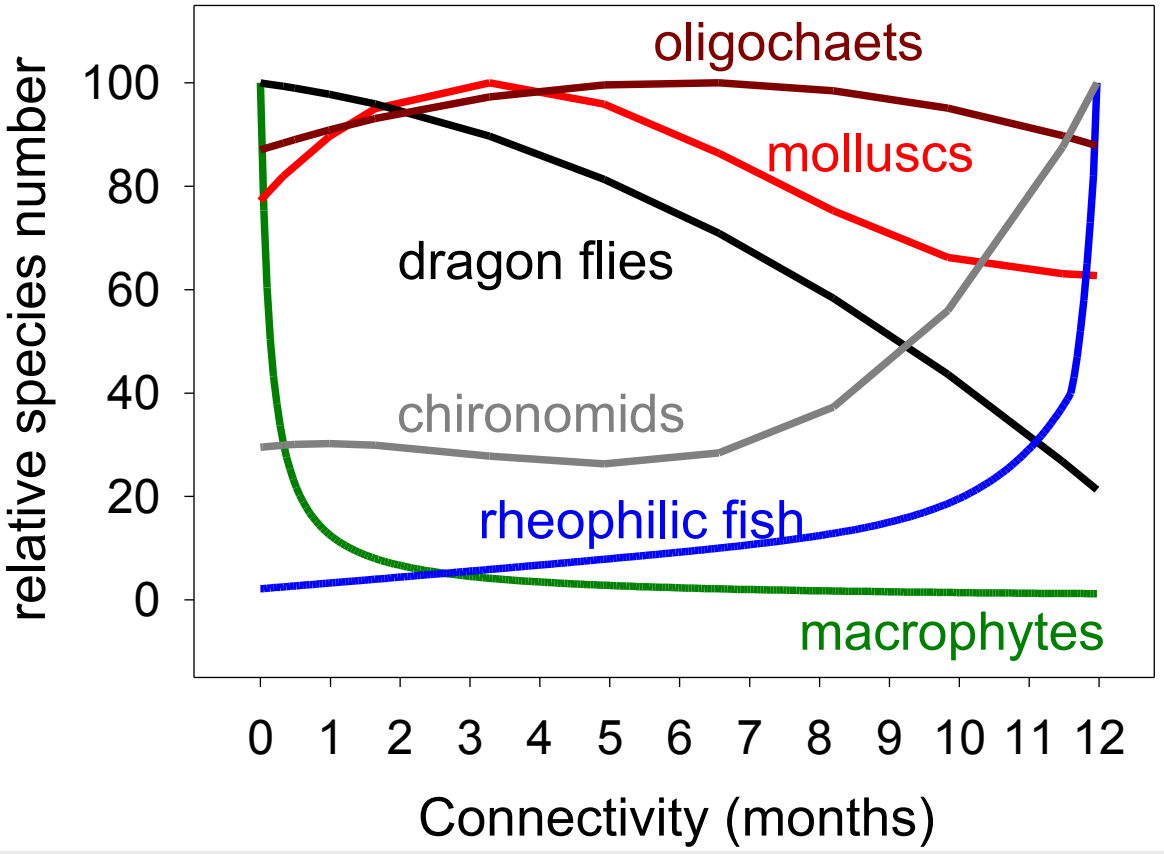
(criteria functions)
based on hydrologic gradients



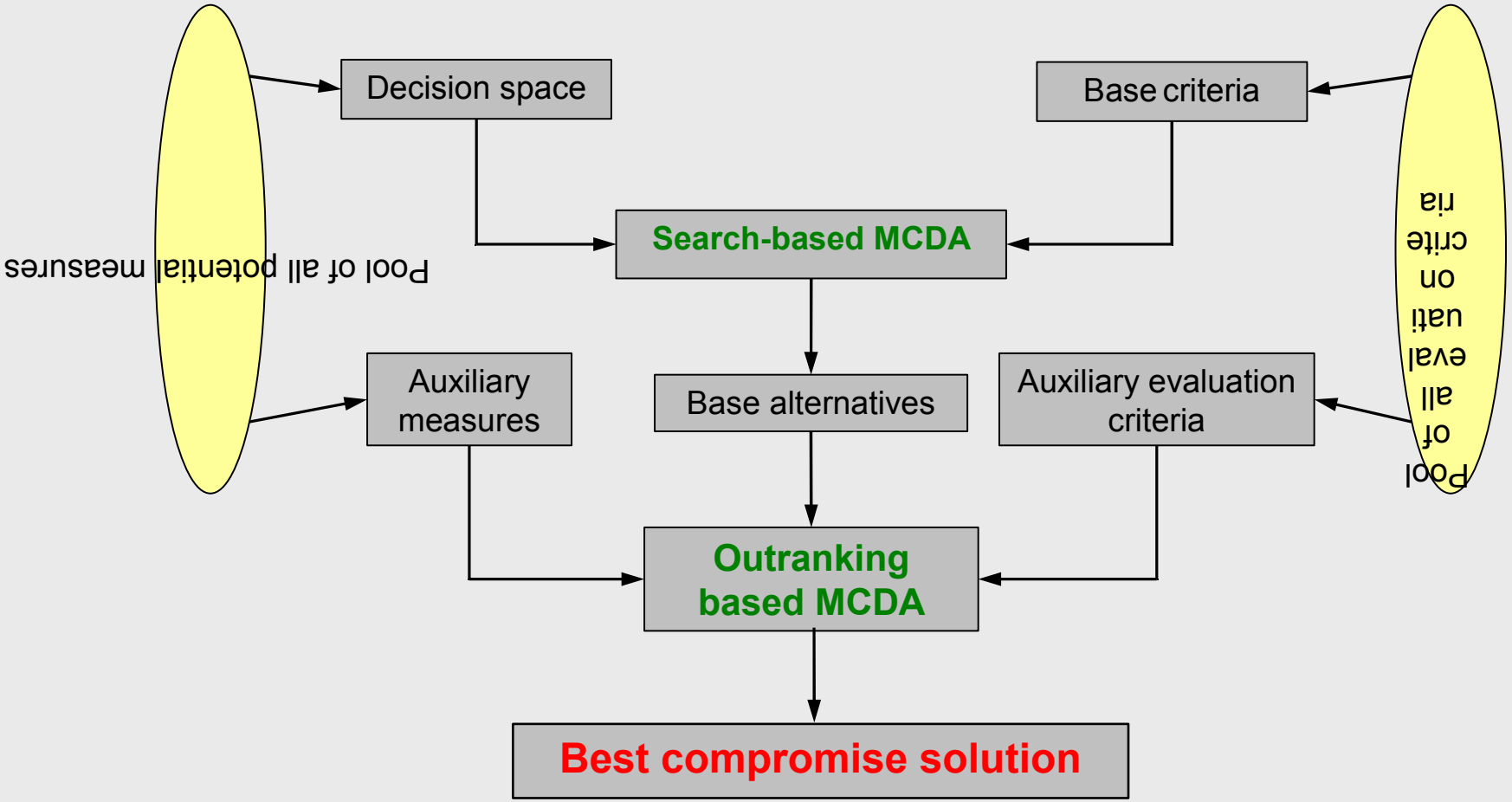
WP3 – ecological & socio-economical modelling

-define indicator sets

using species traits



WP4 – Decision Support System (DSS)



Open questions

- Combination of models
- Use of conditional or physiological models
- Development of more detailed understanding: experimental approach for key processing
- Potential conflicts between nature conservation and ecologic development of the area
- Integration of stakeholders
- Link to other available models and partner projects

Acknowledgements

proVision - **bm:bwk –** Federal Ministry for Education, Science and Culture

bm:vit - Federal Ministry of Transport, Innovation and Technology

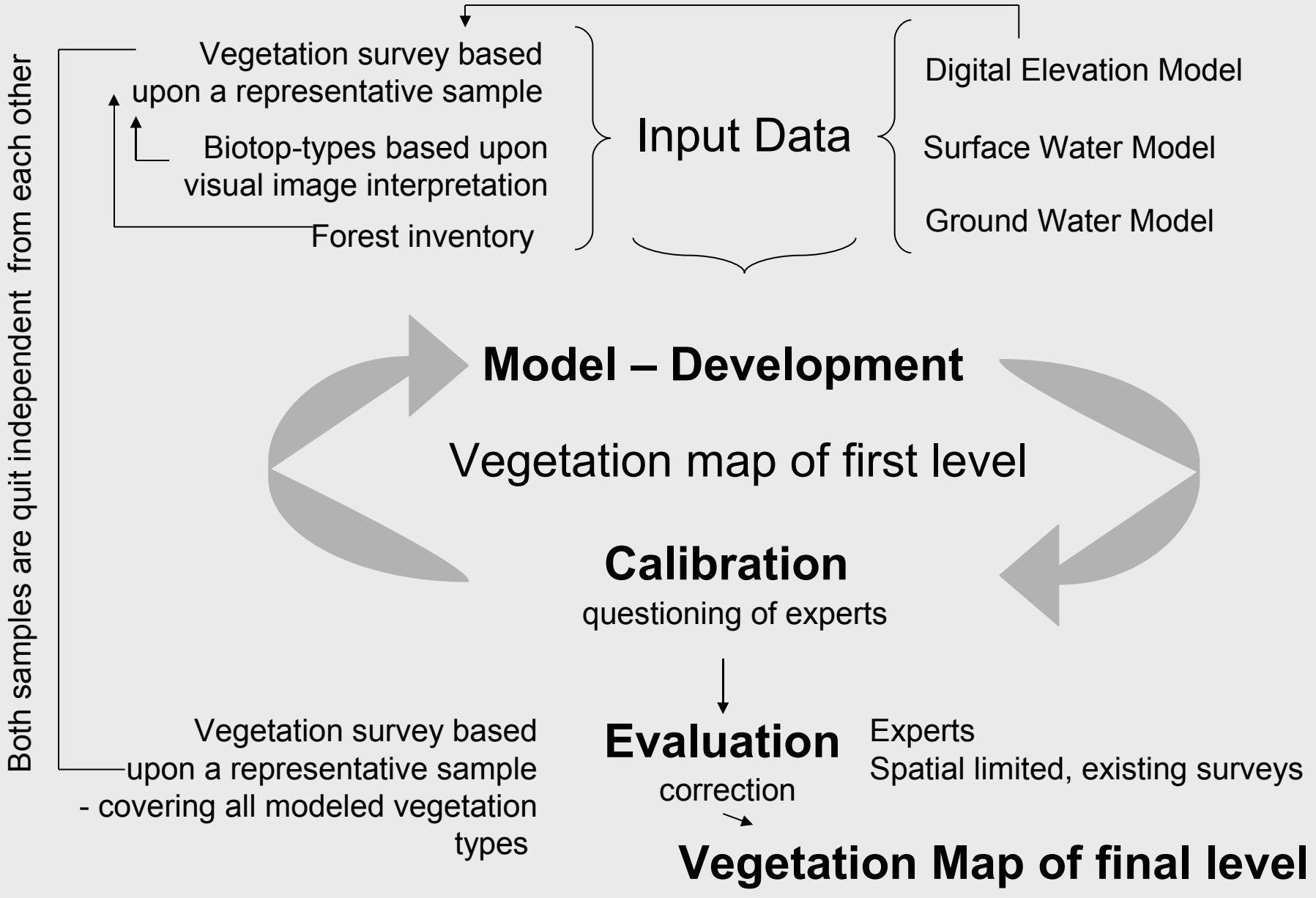
bm:lfuw - Federal Ministry of Agriculture, Forestry, Environment and Water Management

City of Vienna (MA 22, MA 31, MA 45, MA 49)

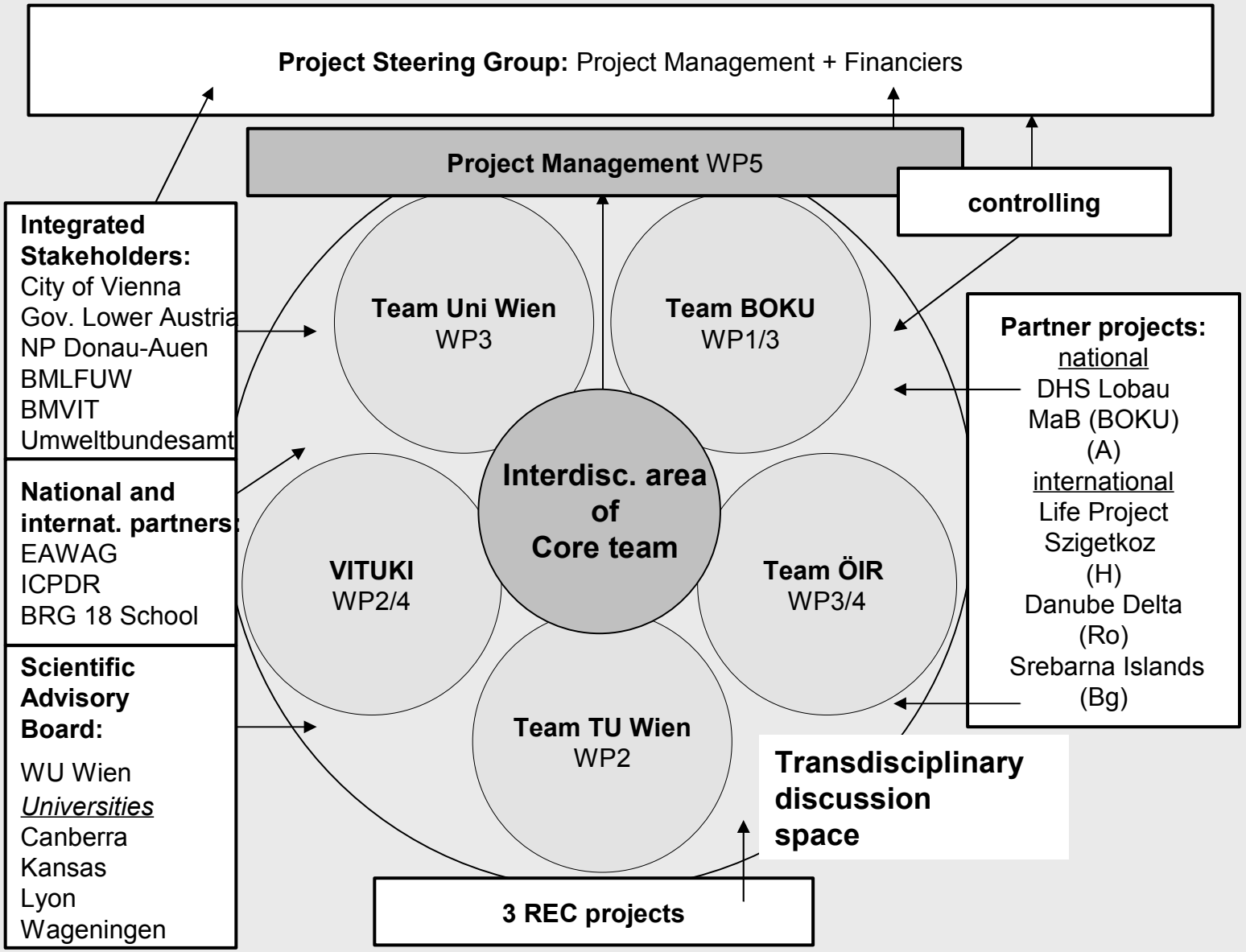
NP authority „Danube flood plain National Park “

Thank you !

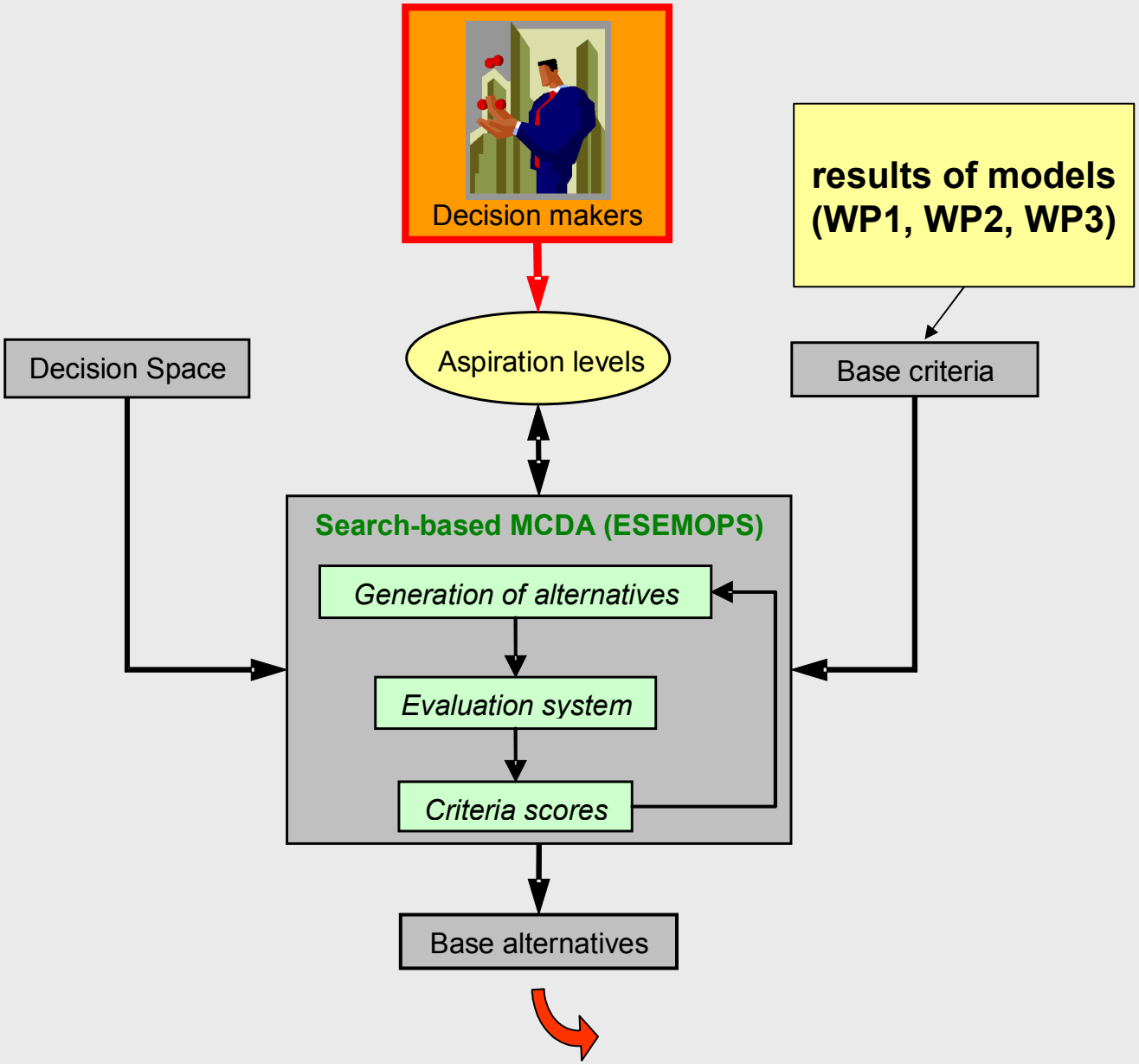
WP3 – example ecological modelling - vegetation



consortium


Project Steering Group: Project Management + Financiers
Project Management WP5
controlling
Integrated Stakeholders:
City of Vienna
Gov. Lower Austria
NP Donau-Auen
BMLFUW
BMVIT
Umweltbundesamt
National and internat. partners:
EAWAG
ICPDR
BRG 18 School
Scientific Advisory Board:
WU Wien
Universities
Canberra
Kansas
Lyon
Wageningen
Team Uni Wien
WP3
Team BOKU
WP1/3
VITUKI
WP2/4
Interdisc. area of Core team
Team ÖIR
WP3/4
Team TU Wien
WP2
Partner projects:
national
DHS Lobau
MaB (BOKU)
(A)
international
Life Project
Szigetkoz
(H)
Danube Delta
(Ro)
Srebarna Islands
(Bg)
Transdisciplinary discussion space
3 REC projects

WP4 – decision support system (DSS)



WP4 – decision support system (DSS)