



Understanding of a coupled groundwater - surface water system as a framework for mitigation of nitrate pollution in an agricultural catchment

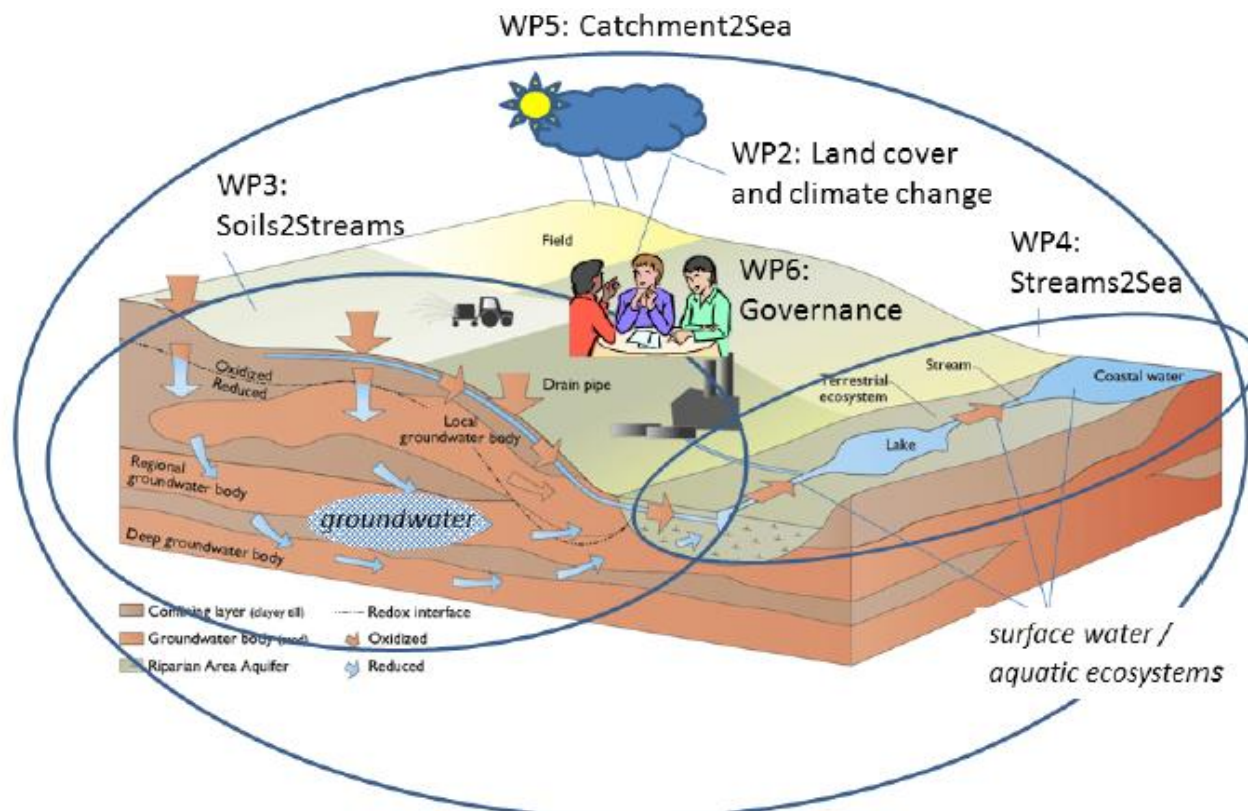
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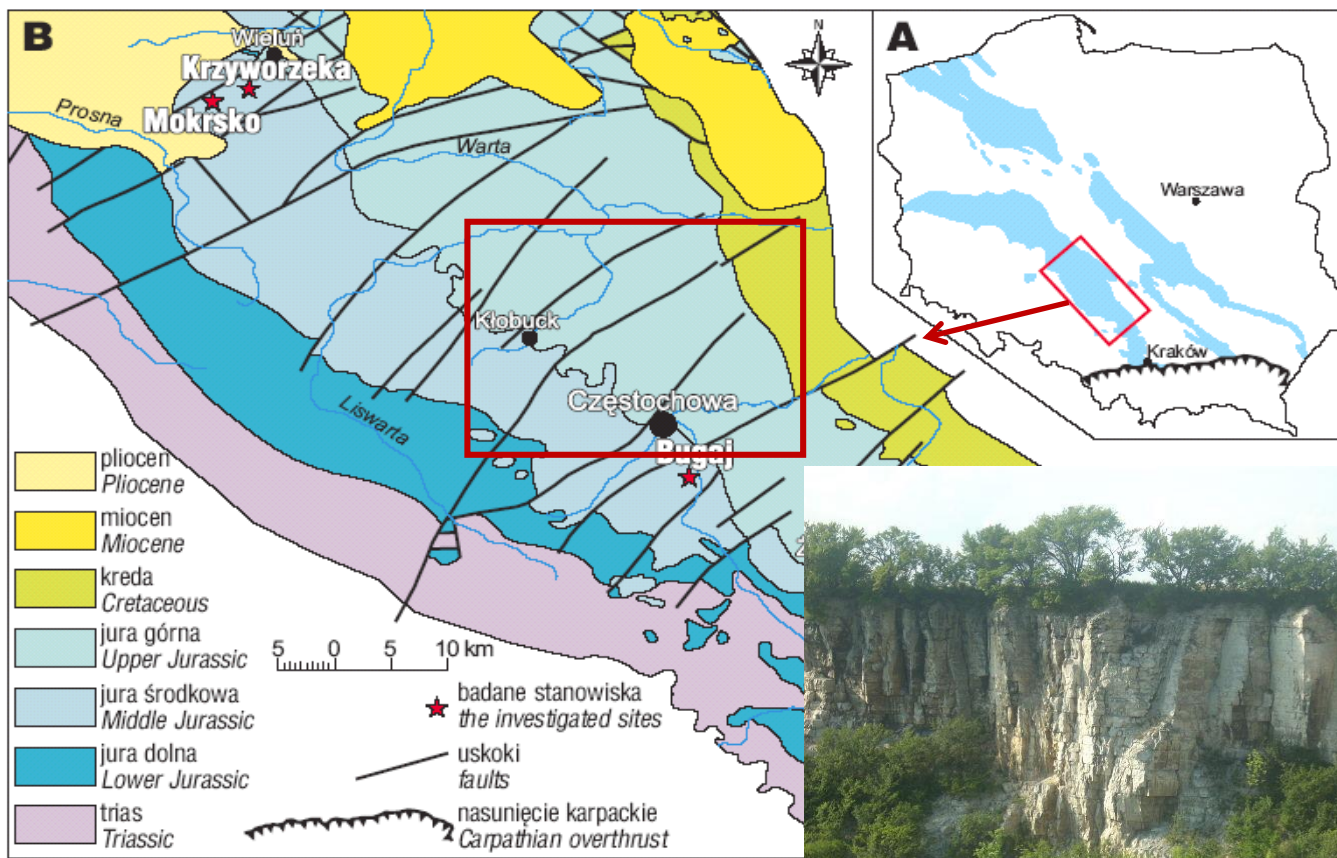
Project BONUS Soils2Sea

Reducing nutrient loadings from agricultural soils to the Baltic Sea via groundwater and streams



CZĘSTOCHOWA AQUIFER - Major Groundwater Basin 326

Phreatic, Jurassic fissured-carbonate (karstic) aquifer with low denitrification potential



WATER SUPPLY AND SANITATION

- Centralized drinking water supply
- Groundwater is a sole source of drinking water for 325 000 inhabitants

Częstochowa Waterworks:

- 92% of population is connected
 - domestic water use in 2015: 11.3 milion m³,
- Several wastewater treatment plants (mostly secondary treatment)
 - Not all households connected to the sewage system (47% of population connected)
 - On-site sanitation: septic tanks
 - Illegal disposal of septic tank waste is not uncommon

GROUNDWATER QUALITY IS THREATENED

- Major threats:
 - diffuse nitrate pollution from agriculture
 - chromium pollution from industrial landfills
 - illegal disposal of sewage to soils and streams
- Measures undertaken:
 - mostly curative (at water intakes): pumping regimes, blending, treatment facilities (e.g. biological denitrification installation)
 - preventive are not effective (WFD, Nitrates Directive)

POLLUTED GROUNDWATER AFFECTS THE ECOLOGICAL STATUS OF SURFACE WATER

Major Groundwater Basin 326

The Kocinka catchment

Water quality in the river is controlled by inflows of the polluted groundwater



Major Groundwater Basin 326

UNDERSTANDING OF THE GROUNDWATER-SURFACE WATER SYSTEM

- Surveys of land use, agricultural practices, fertilization levels, soil properties.
- Observations of chemical and isotopic properties of groundwater and surface water.
- Quantification of nitrate fluxes from the root zone (DAISY, NLES).
- Quantification of nitrate reduction in the subsurface and streams.
- Routing of nitrates through the subsurface with the MODFLOW/MT3D model.
- Model calibration and groundwater dating with environmental tracers.



PREDICTIONS OF NITRATE CONCENTRATIONS AND FLUXES IN RESPONSE TO THE PAST, CURRENT AND FUTURE LOADINGS

STAKEHOLDERS

- Stakeholder involvement is an important component of the BONUS Soils2Sea project.
- Stakeholders provide data, knowledge and opinions collected through surveys, interviews and workshops.
- A film presenting the natural and social landscapes of the study area and project activities is in the final stage of production.



STAKEHOLDERS PERSPECTIVES

- The Water and Sewage Company of Częstochowa

Vitaly interested in protecting groundwater resources

Some inhabitants refuse to connect to the sewage system

Education to change the attitudes



STAKEHOLDERS PERSPECTIVES

- Farmers

Highly value a clean environment

Consider their local environment as being in a good condition

Do not perceive agriculture as a source of pollution

Important role of environmental incentives



STAKEHOLDERS PERSPECTIVES

- Regional Water Management Authority responsible for WFD implementation in the Warta river basin
- Regional Inspectorate of Environmental Protection responsible for monitoring of the surface water and groundwater quality

Both institutions do not recognize the Kocinka catchment and the underlying aquifer as threatened by pollution.

STAKEHOLDERS PERSPECTIVES

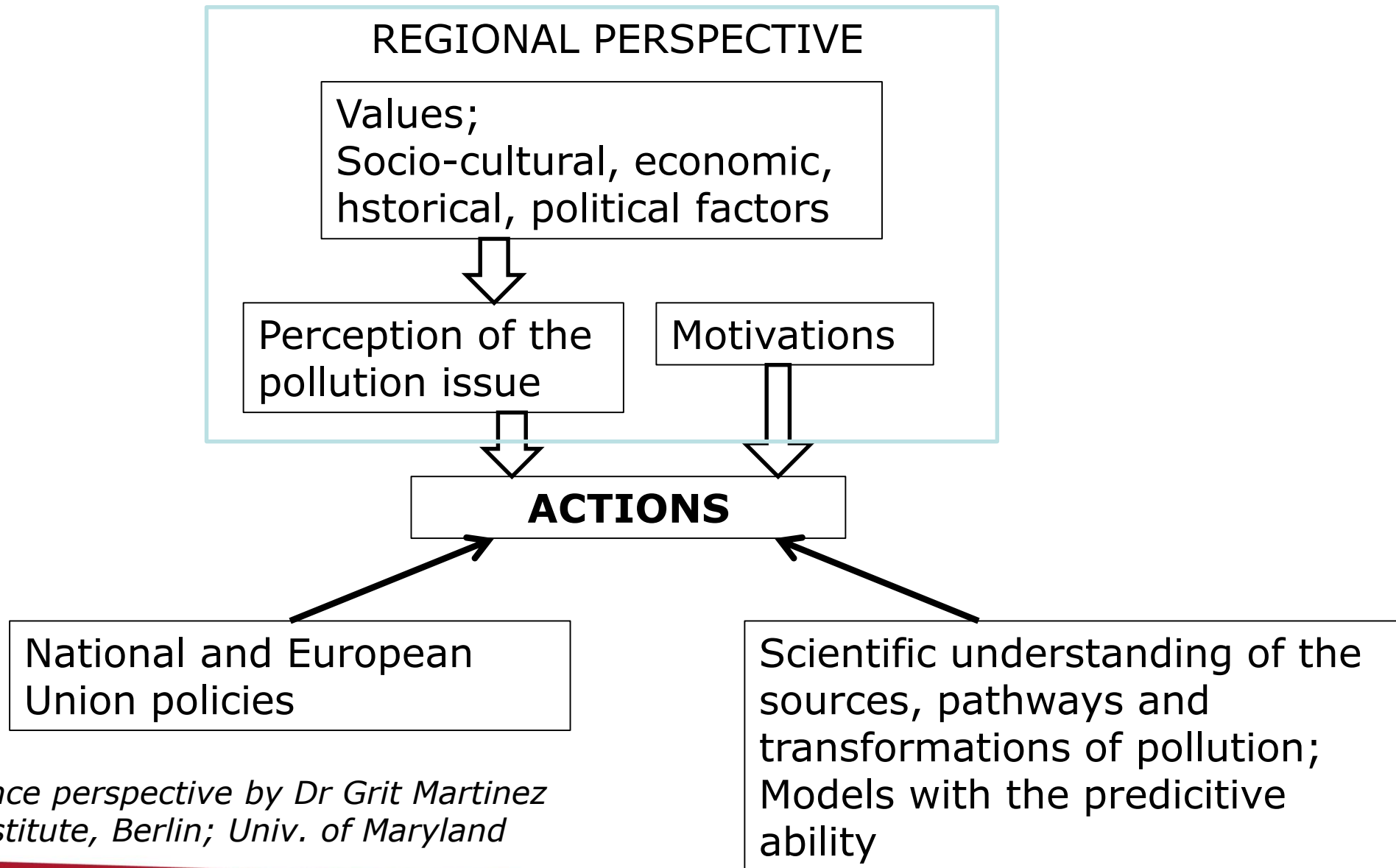
- Anglers: the Kocinka is a trout fishery highly valued by sport anglers.

The anglers perceive the ecological status of the river as deteriorating in recent years and link this to opening of a wastewater treatment plant in the catchment (!)

- Fish farmers: aquaculture is developing in the Kocinka and the neighbouring catchment.

Vitaly interested in the good quality of river water but concerned mostly with the uncontrolled point sources of pollution. Nitrate pollution less relevant to them.

CONCLUSION



*Social Science perspective by Dr Grit Martinez
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