Inventory Analysis of Groundwater in the German Part of the River Basin District Oder

presented by

M. Meinert – *HGN* Hydrogeologie GmbH

with support of the

Environmental and Geological Agency of Saxony

Water Framework Directive

- EU was endeavored to establish a framework for Community action in water policy since 1990
- Directive 2000/60/EC (WFD) was passed in December 2000

Research Project

The Consequences of the WFD for the Execution, Groundwater Monitoring and Reporting in Germany

Objectives

- Analysis of the groundwater related requirements according to the WFD
- Nationwide assessment of the groundwater monitoring networks
- Development of an Application Directive to implement the analysis according Annex II of the WFD
- Application of the developed method on river basins

Results of Testing the Application Directive

1. Implementation of initial characterization with available digital data yield sufficient information

2. *CORINE* land use data are essential for assessing the risk of exposing the groundwater to diffuse sources of pollution (agriculture)

3. Identification of groundwater bodies being at risk can not be derived from groundwater vulnerability assessed by properties of unsaturated zone

4. Identification of groundwater recharge,- transit and –discharge areas on the basis of the horizontal and vertical groundwater flow direction offers additional tool for assessing the risk

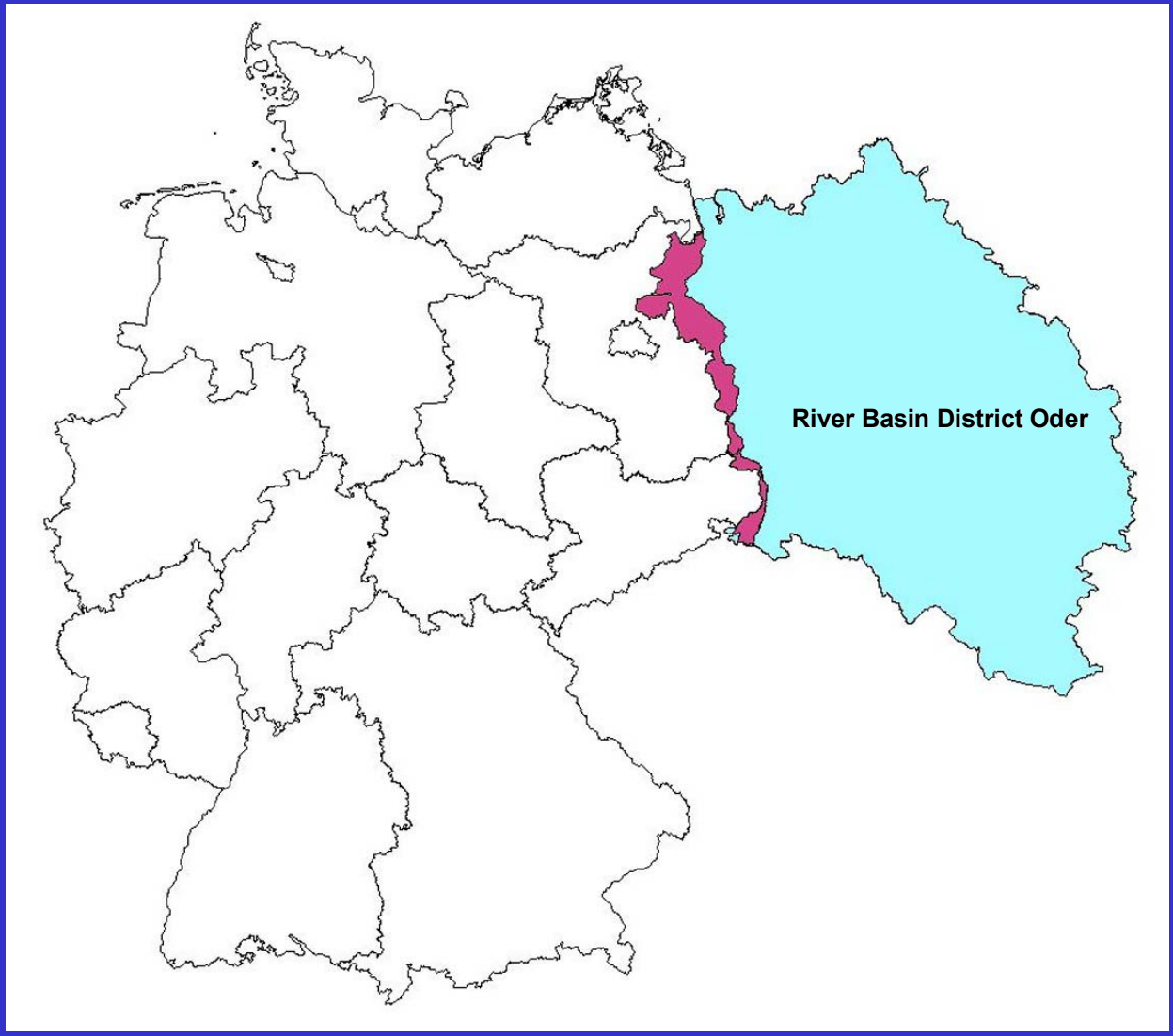
5. Consideration of groundwater recharge is inevitable for maintaining sustainable water management

6. Groundwater dynamics is an indispensable tool for defining boundaries of groundwater bodies and sub-bodies and assessing the chemical quality

7. Further characterization needs supplemental data – therefore consideration of groundwater flow to subdivide groundwater bodies – thus minimize of costs

German Part of the River Basin District Oder

Size: 5,655 km²

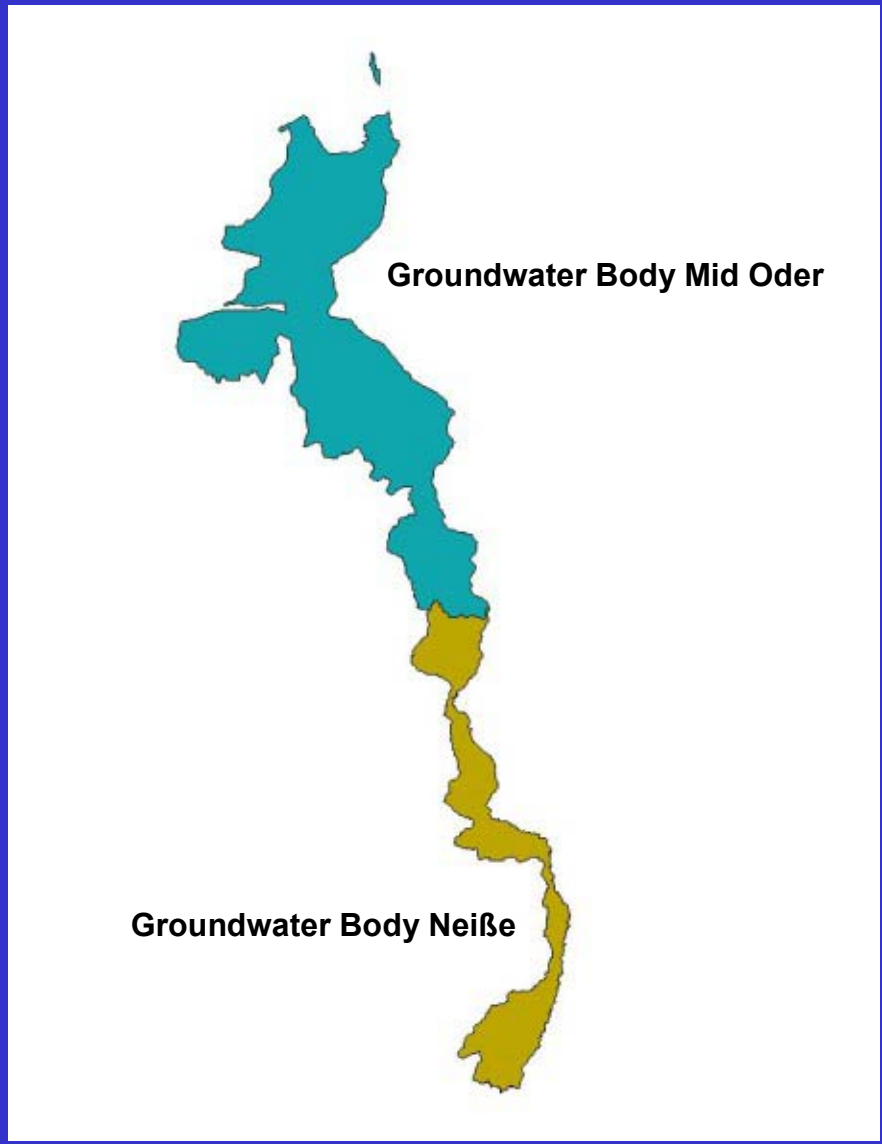


German Part of the River Basin District Oder

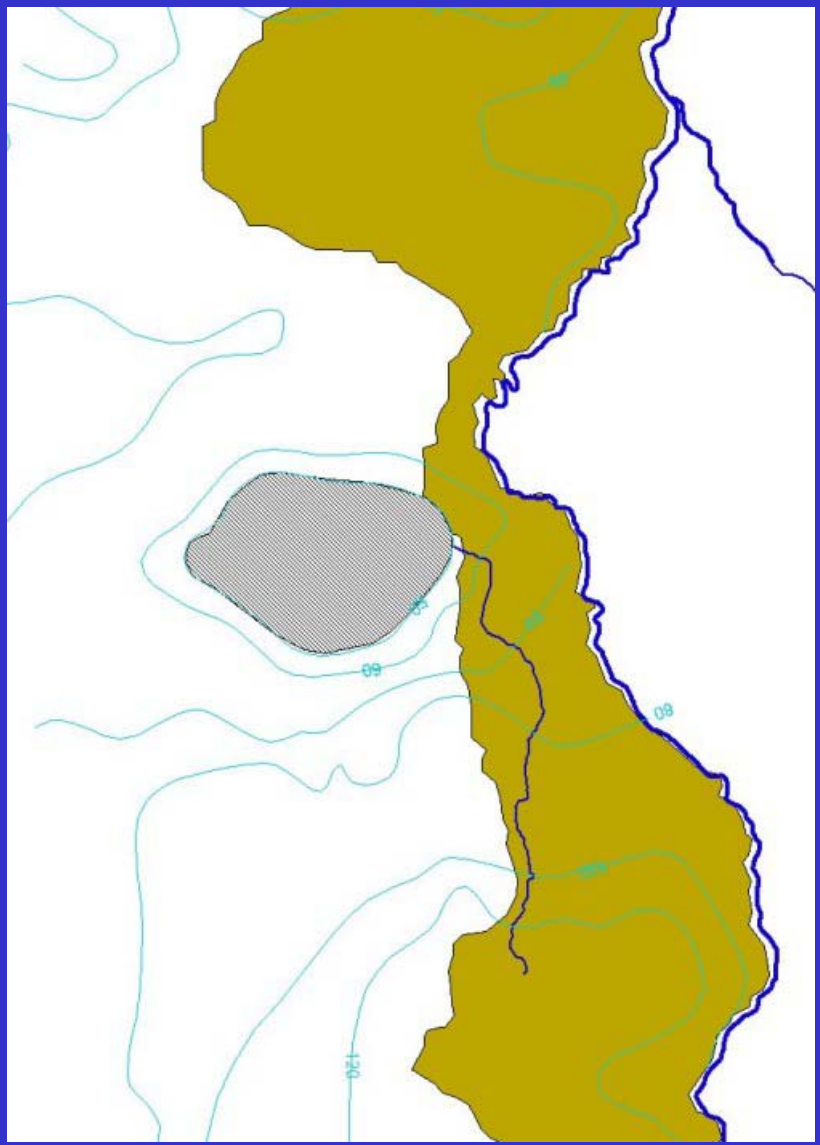
Boundaries of the Groundwater Body

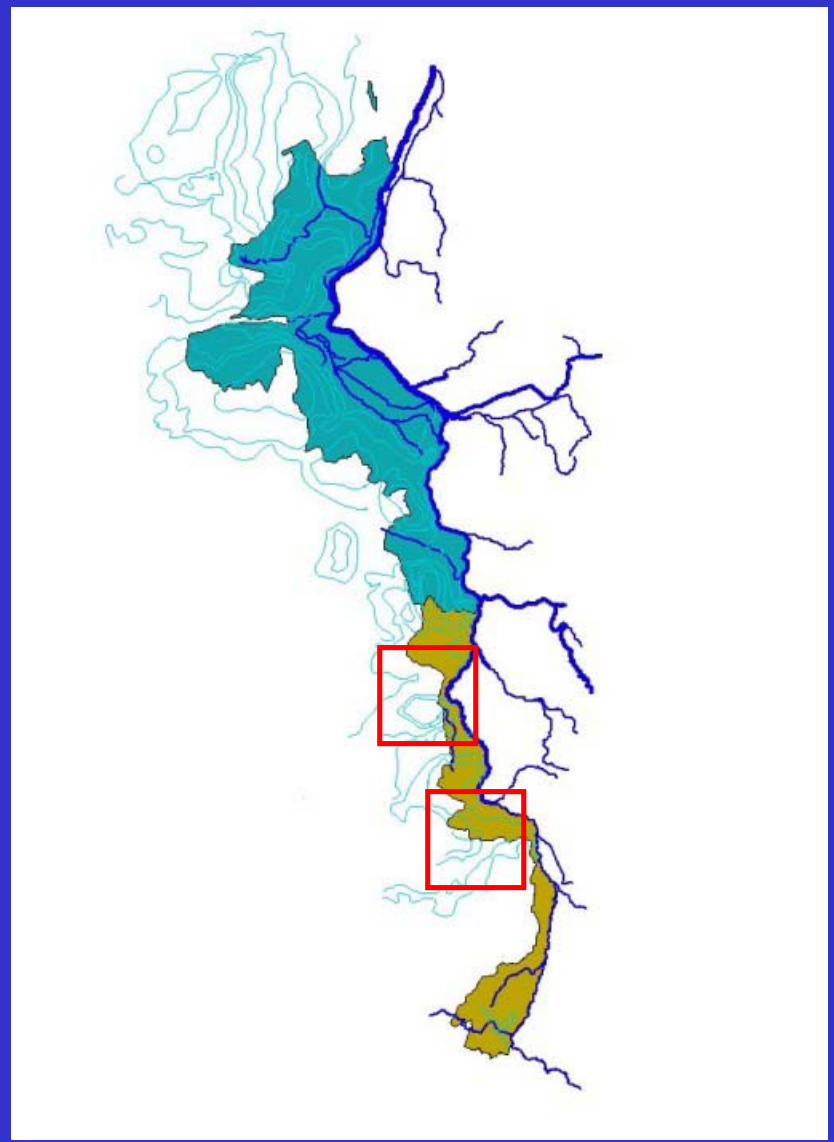
1. First approach, groundwater bodies are congruent to river basins with a size between 1,500 and 5,000 km²

2. Identification of major differences between surface watersheds and groundwater watersheds



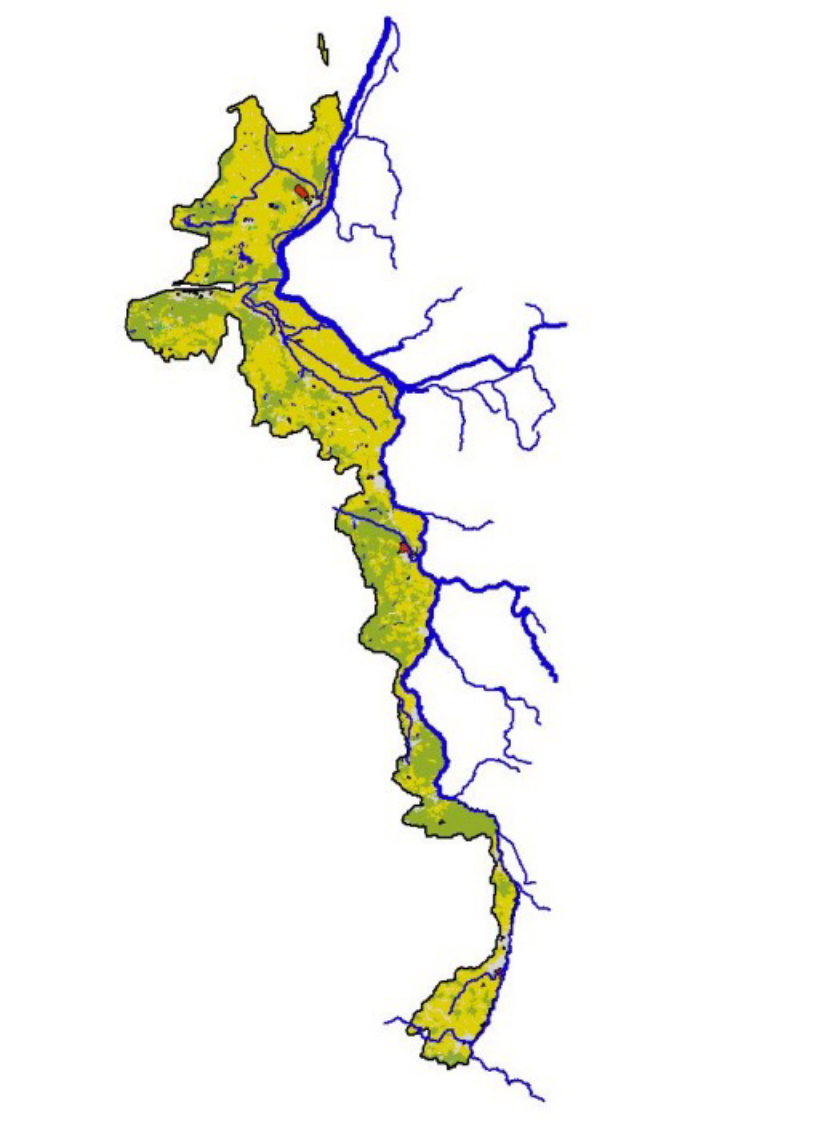
Boundaries of the Groundwater Body





Identification of Diffuse and Point Sources of Pollution

Land Use	Share in %
Artificial surfaces	6,7
Agricultural land use (cultivated land use)	59,4 (52,3)
Forests	32,3
Wetlands	0,2
Water bodies	1,3

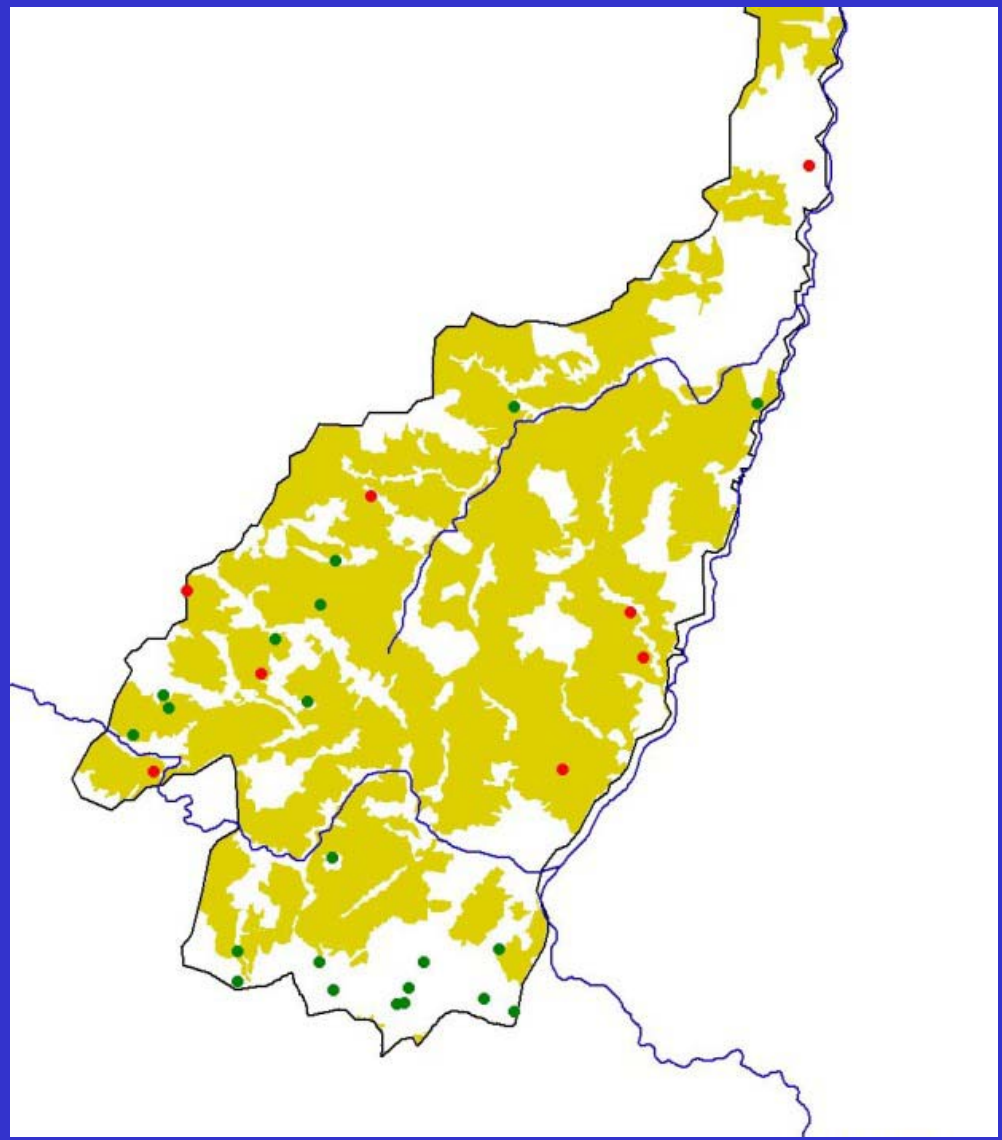


Identification of Diffuse and Point Sources of Pollution

Nitrate

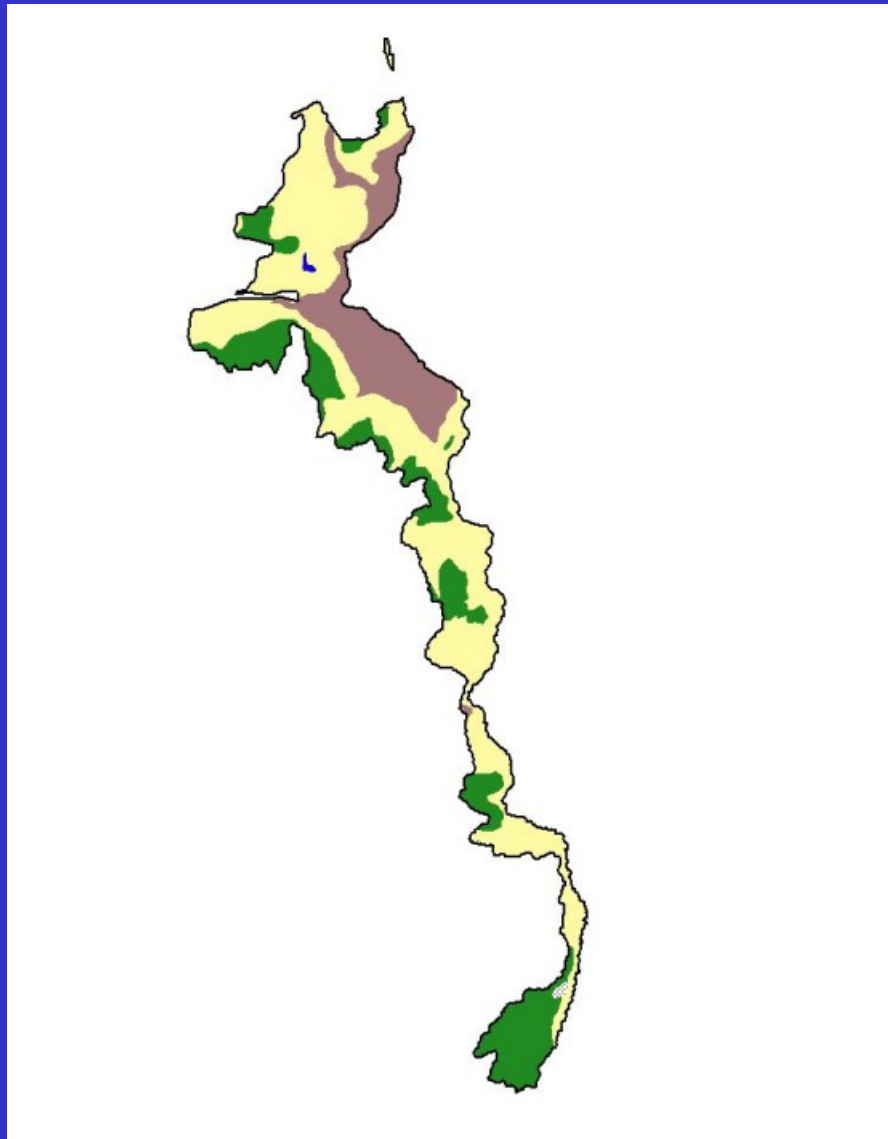
Average concentration in mg/l

- > 25
- < 25

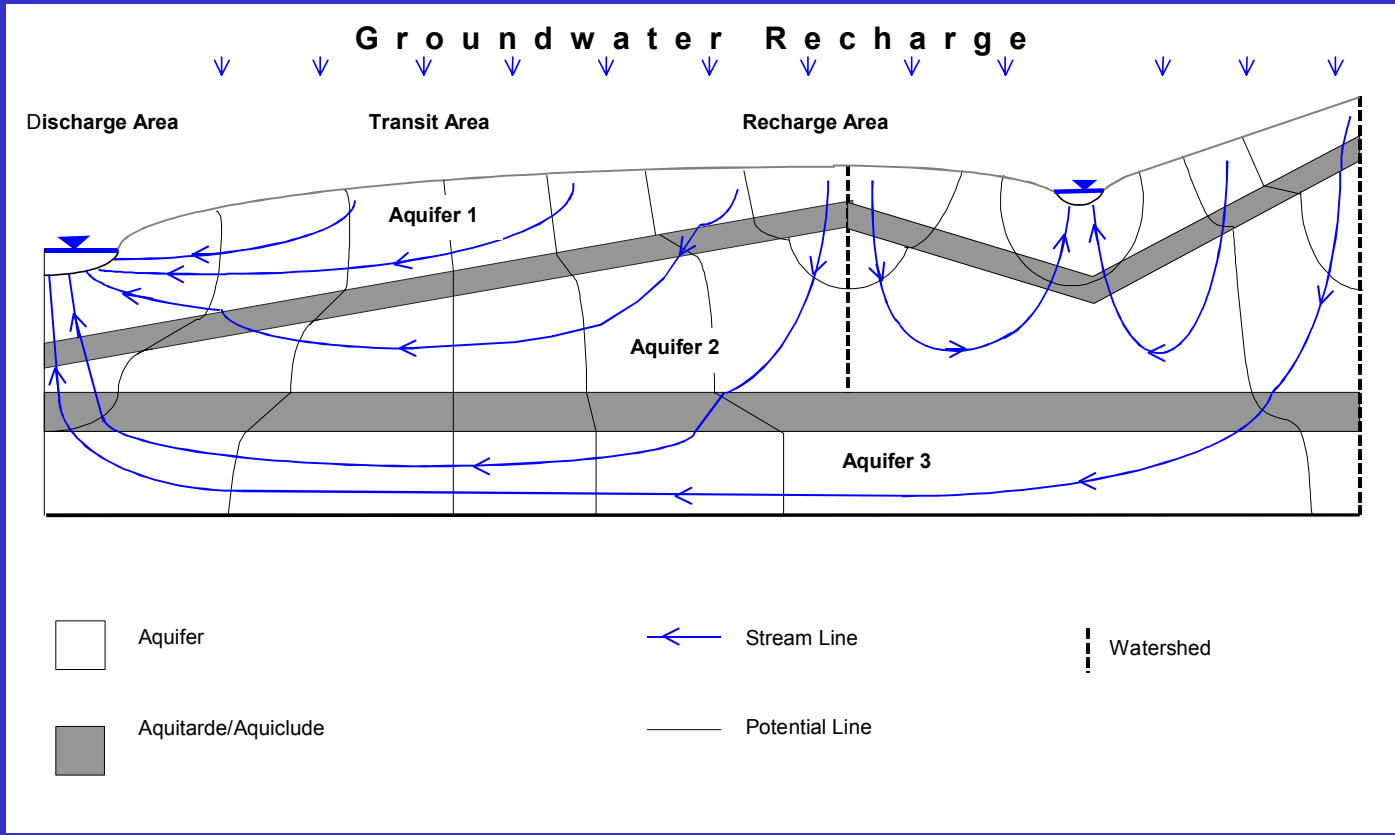


Hydrogeological Area Type

- Risk of failing to meet environmental objectives can't be derived from vulnerability assessed by properties of unsaturated zone
- Identification of groundwater recharge-, transit- and discharge area offers additional tool
- Identification by evaluating horizontal and vertical groundwater flow (database 6,000 boring logs)
- Recharge areas do not necessarily imply high recharge rates
- Recharge areas are especially vulnerable to pollution



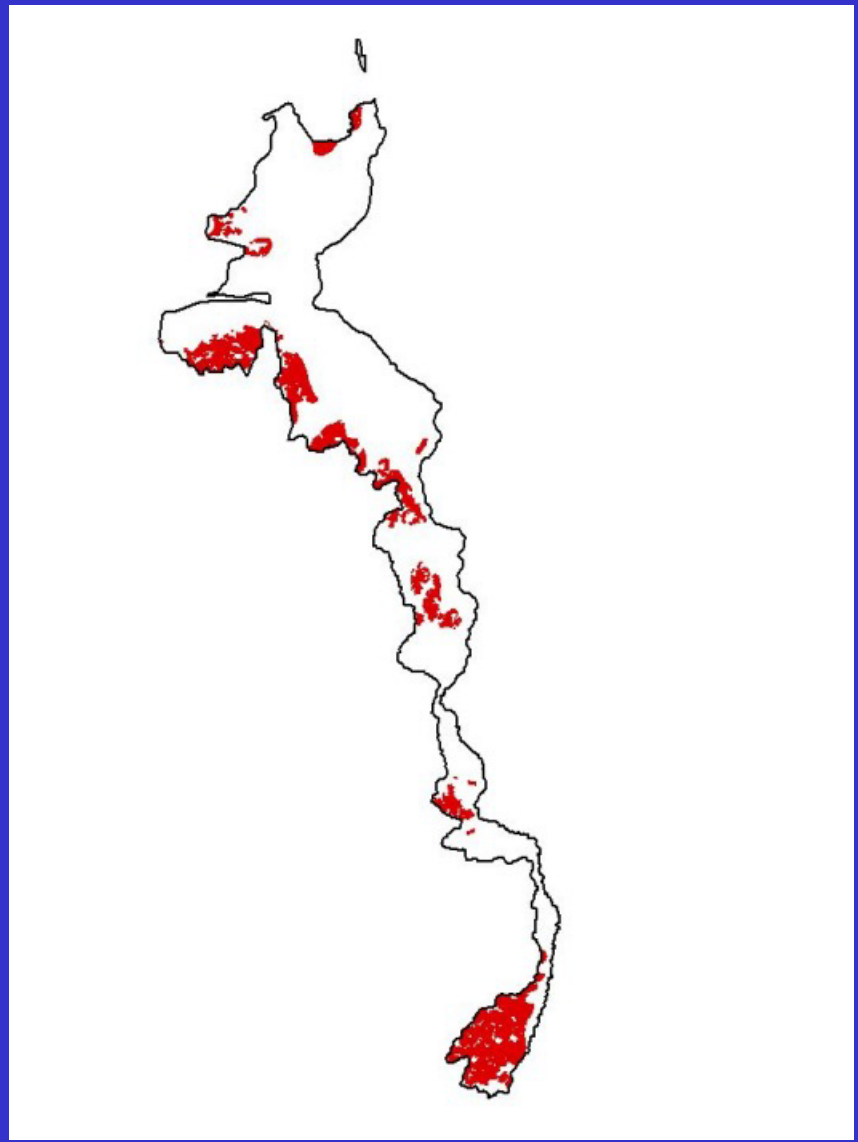
Principle of Hydrogeological Area Type



Recharge areas are characterized by a clearly downward directed groundwater flow!

Most Sensitive Areas for Regional Groundwater Pollution

- Most sensitive areas by intersecting groundwater recharge areas and areas with major human impact (cultivated land use)
- Identified areas should be considerated as groundwater sub-bodies for further characterization
- Areas are very important for sustainable groundwater protection due to regional pollution potential (downward directed groundwater flow!)



Conclusions for Initial Characterization

1. Identification of major differences between river basins and groundwater basins
2. To pay special attention to identified groundwater recharge areas with major human impact (agricultue) – further characterization
3. Areas influenced by dewatering of brown-coal opencast minings need to be included in further characterization as well
4. Groundwater body Neiße needs to be regarded as transboundary groundwater body – conflicts need to be solved by Poland and Germany in cooperation
5. Implementation of initial characterization with available digital data yield sufficient information
6. Groundwater dynamics and groundwater recharge are not required according to WFD for initial characterization
7. The example shows that groundwater flow and groundwater recharge need to be included within the initial characterization to gurantee a sustainable groundwater protection and water management in the future