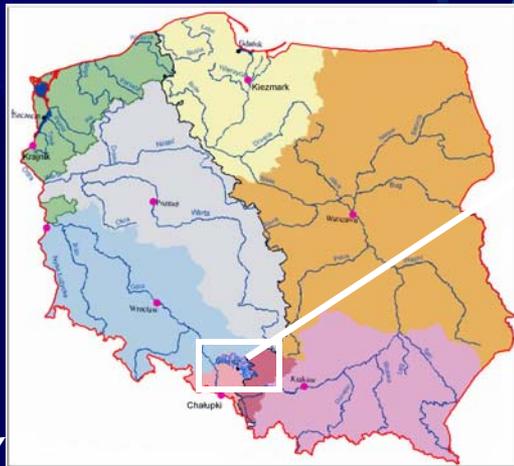
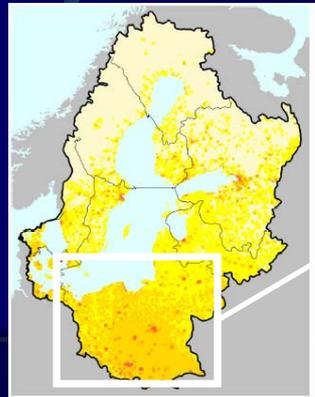


POP's Reduction Strategy in Surface Water of Industrialized Regions, Kłodnica River Case Study

*Janusz Krupanek, Urszula Zielonka,
Monika Działoszyńska-Wawrzekiewicz
Instytut for Ecology of Industrial Areas,
Katowice, Poland*

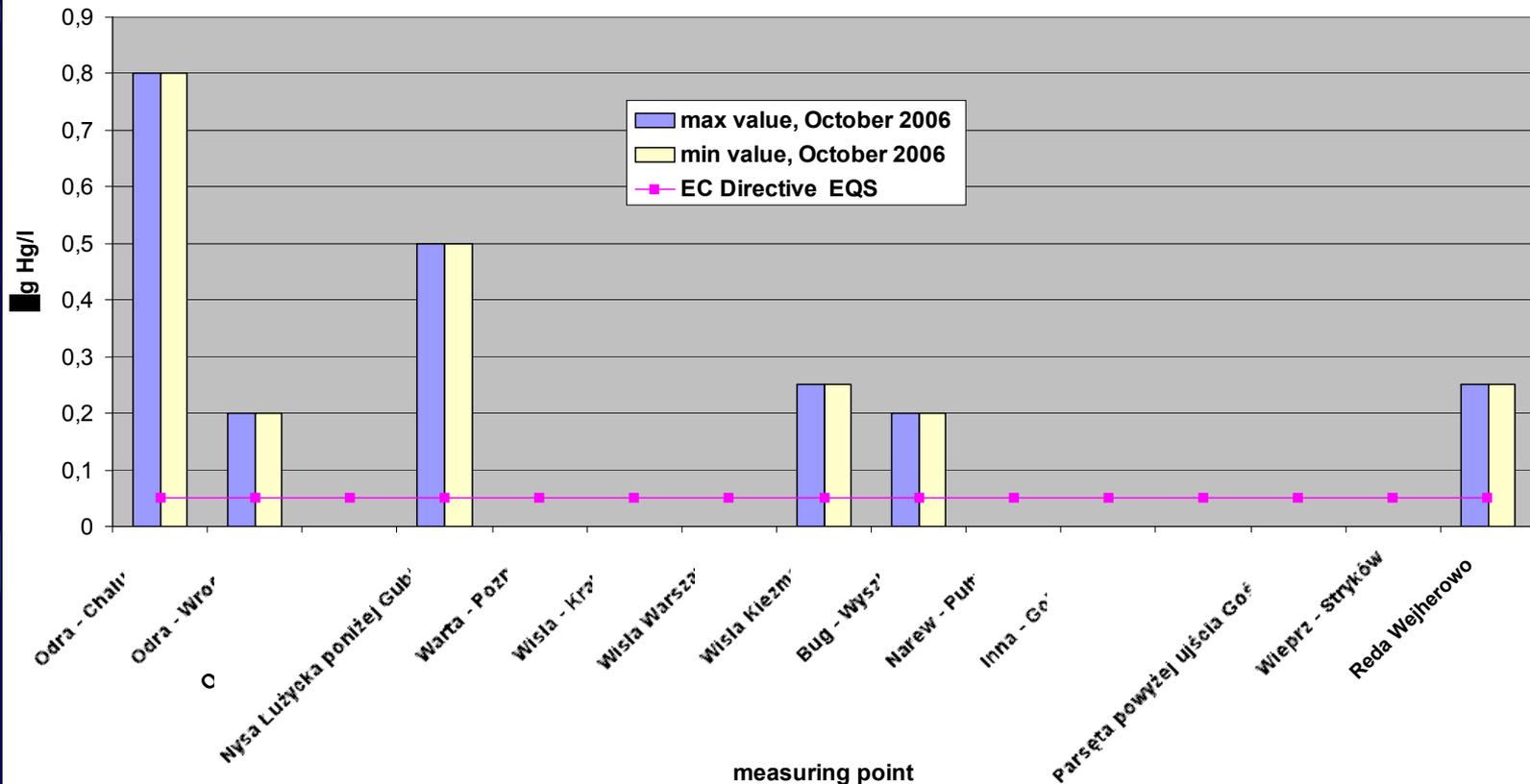
*NATO/CCMS Pilot Study Meeting
Ljubljana, Slovenia, June 17-22, 2007*

Water regions in Poland



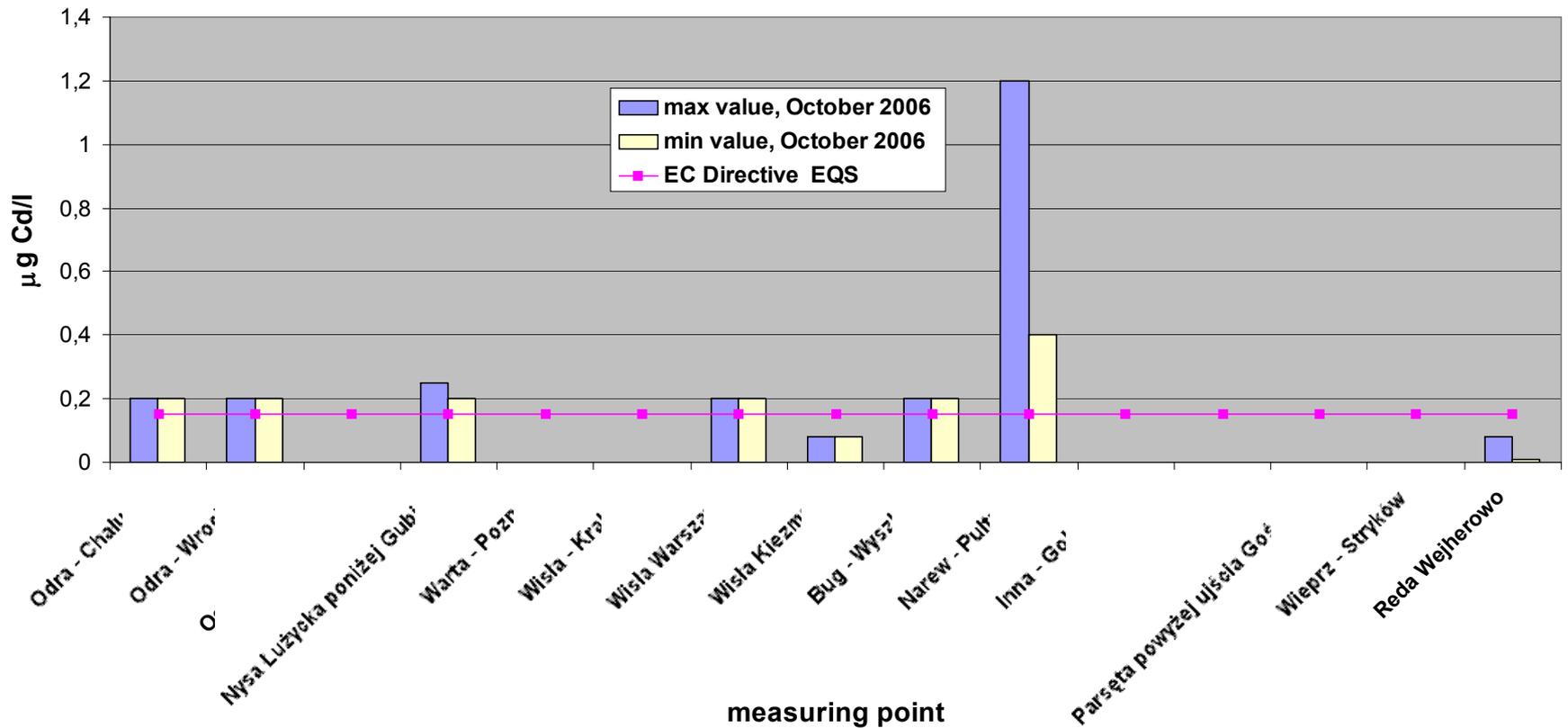
Mercury in Polish rivers

Mercury concentrations in Polish rivers
monthly monitoring - range of values (2-3 samples)



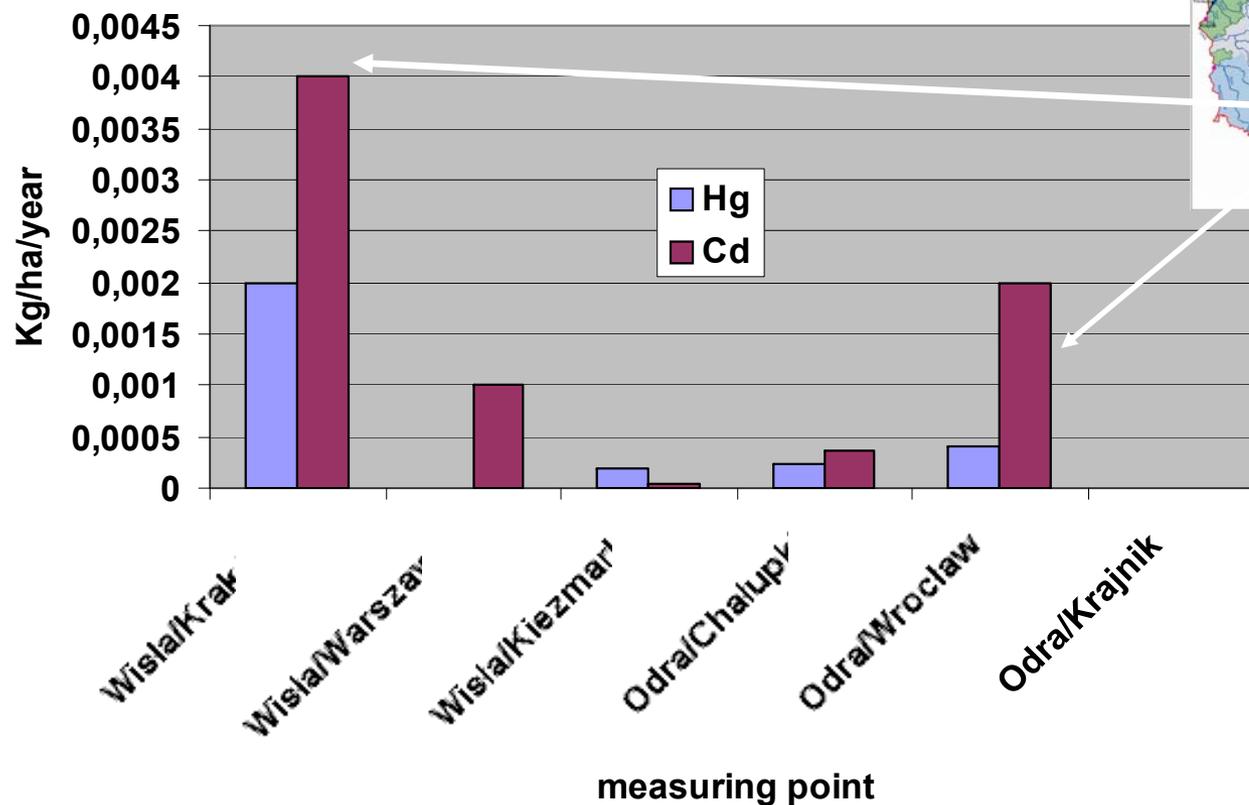
Cadmium in Polish rivers

Cadmium concentrations in Polish rivers
monthly monitoring - range of values (2-3 samples)



Cadmium and Mercury load

Standardised yearly load of Mercury and Cadmium in Odra and Vistula

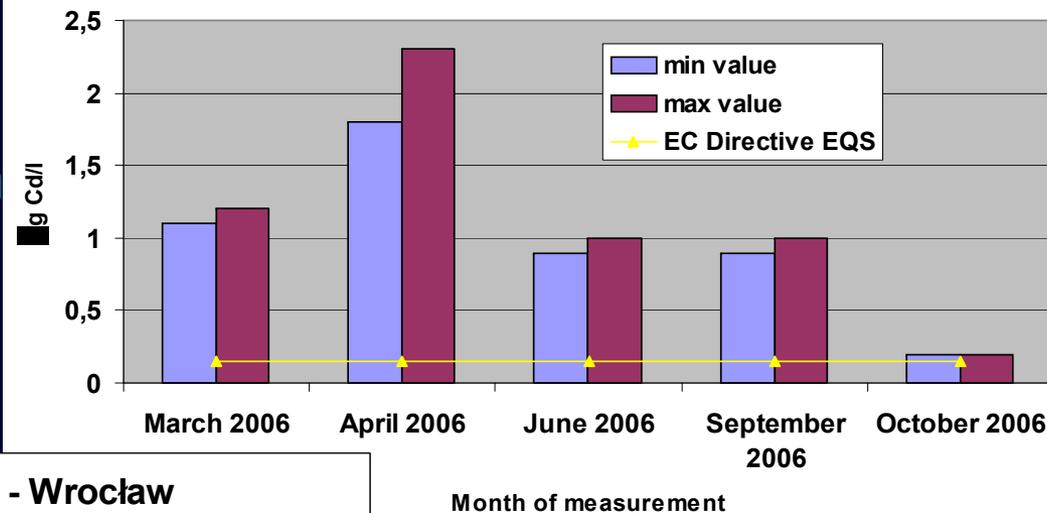


Mercury and Cadmium - Odra



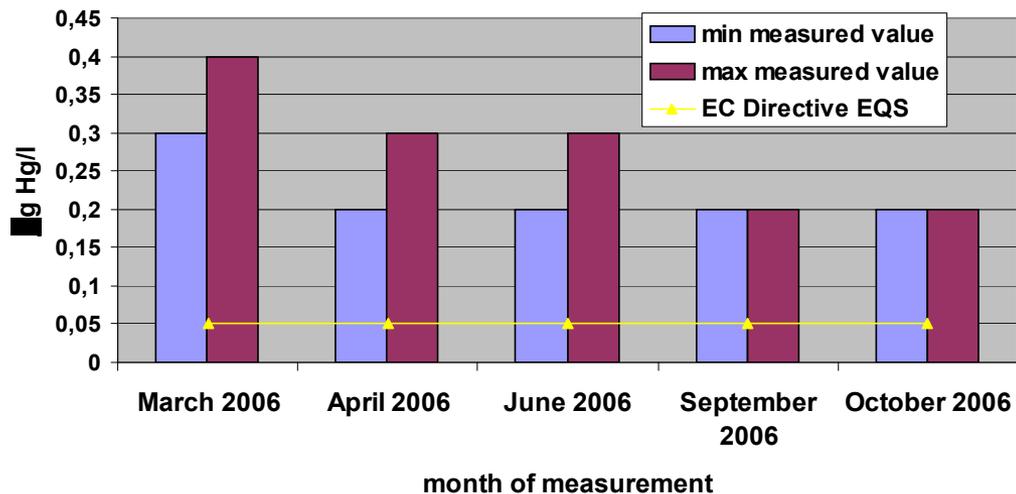
Cadmium concentrations Odra - Wrocław

monthly monitoring - range of values (2-3 samples)

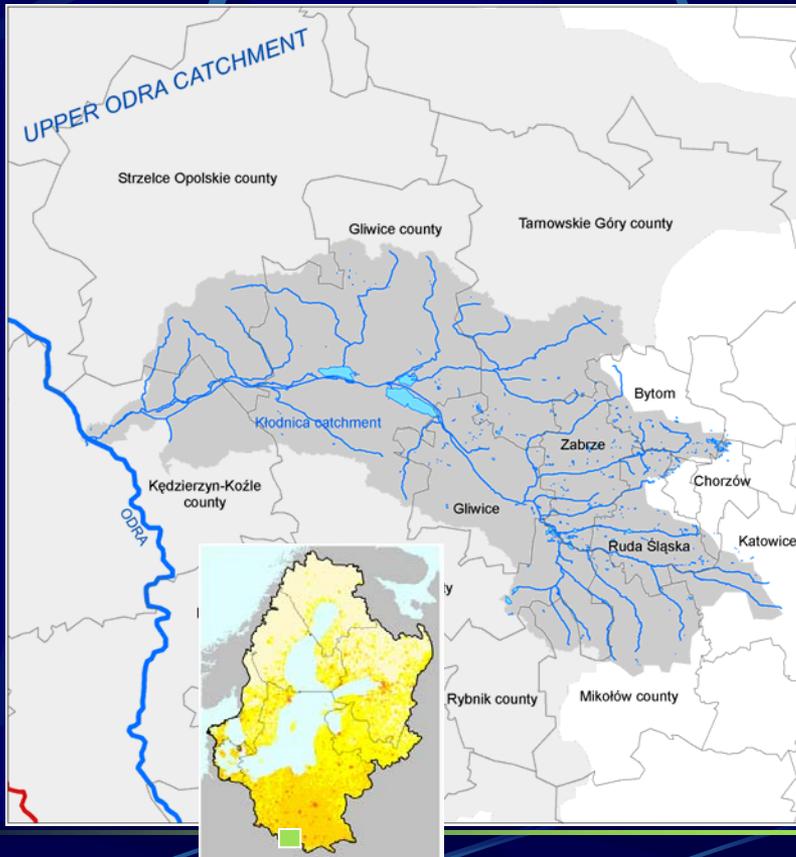


Mercury concentration in Odra - Wrocław

monthly monitoring - range of values (2-3 samples)



Kłodnica - main features



Substances

- Cadmium
- Mercury
- PAH



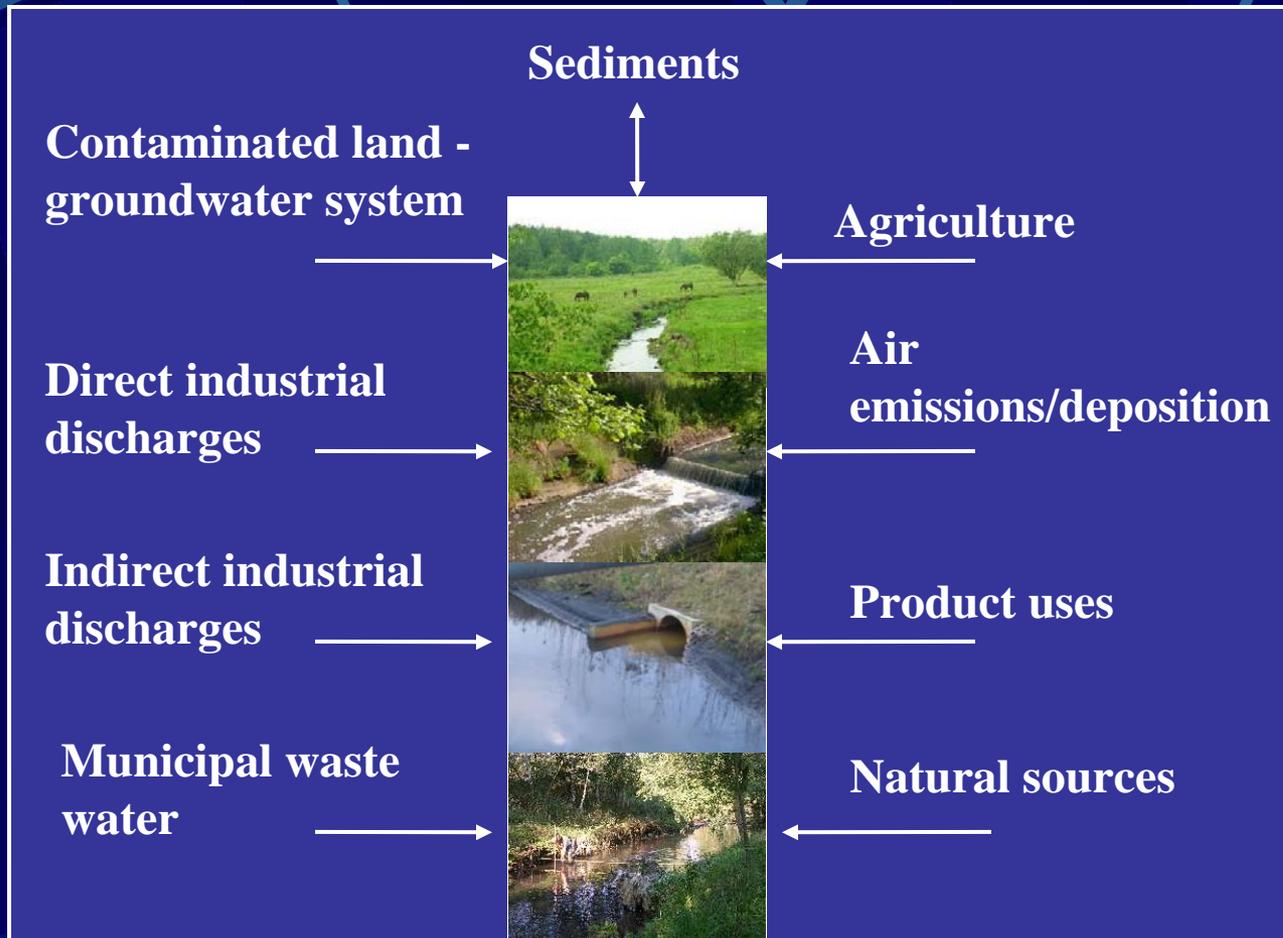
Catchment area 1125,8 km² (Odra river basin)
Population of 1 mln. inhabitants (Upper Silesia region)
Agriculture (40 % cultivated)
Industry (coal mining, energy sector, metallurgy, metal production, mechanical sector, chemical industry)
Functions: receptor for anthropogenic water, water retention, recreation and source of water for industry

Kłodnica river water quality

Priority substances	Kłodnica AA* µg/l	EU Directive AA-EQS µg/l
Cadmium and its compounds	0.2-0.6	0.15(class 4) 0.25 (class 5)
Mercury and its compounds	0.5	0.05
Anthracene	?	0.1
Benzo(a)pyrene	?	0.05
Benzo(b)fluoranthene Benzo(k)fluoranthene	?	Σ = 0.03
Benzo(g,h,i)perylene Indeno(1,2,3-cd) pyrene	?	Σ = 0.002

Expert assessment based on information from Voivodship Inspectorate for Water protection; *AA – annual average

Conceptual model



Main sources of water contamination:

- ! Municipal and industrial wastes**
- ! Diffuse pollution sources**
- ! Sediment deposits**



Stream Czarniawka discharging to Kłodnicy



Bielszowicki stream – Ruda Śląska



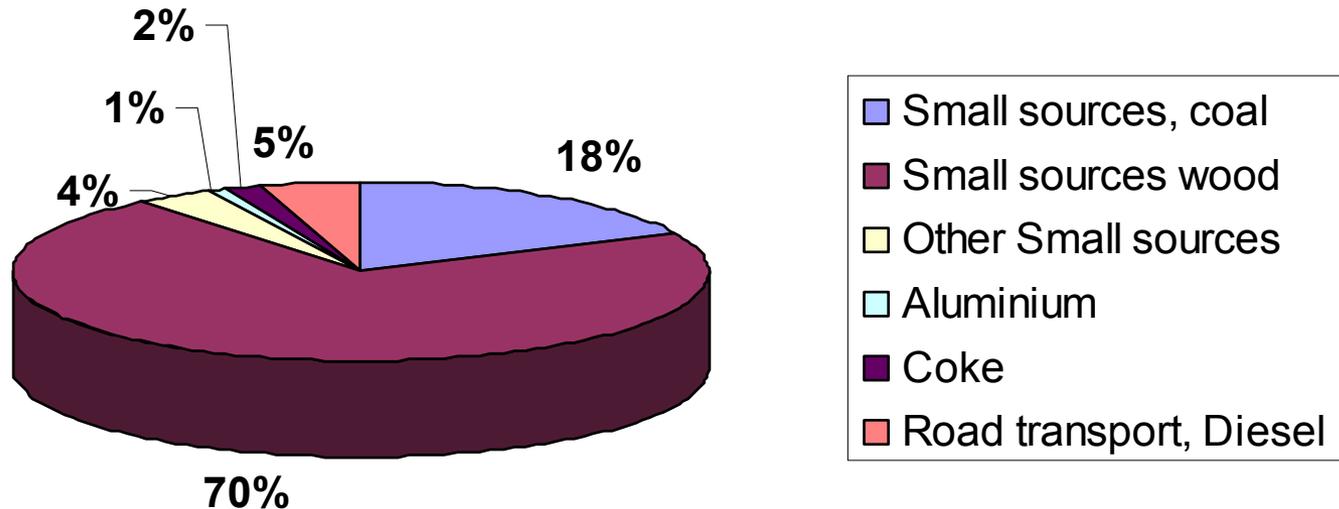
Ruda Śląska Bielszowice

Potential Sources of Hg, Cd, PAH emissions to water

Potential source category	Hg	Cd	PAH
Combustion of fossil fuels	high	low	high
Manufacturing processes	high	high	medium
Atmospheric deposition	high	high	high
Domestic Waste disposal – waste water treatment plants	medium	high	low
Base metal mining and dressing	low	low	low
Primary non-ferrous metal production	low	high	high
Iron and steel production	low	low	low
Mineral oil and gas refineries	medium	none	medium
Basic organic chemicals	low	none	low
Major uses	low	low	low
Road transport and Other mobile sources and machinery	very low	very low	low
Agriculture related sources	very low	very low	low
Sediment re-suspension	low	low	low

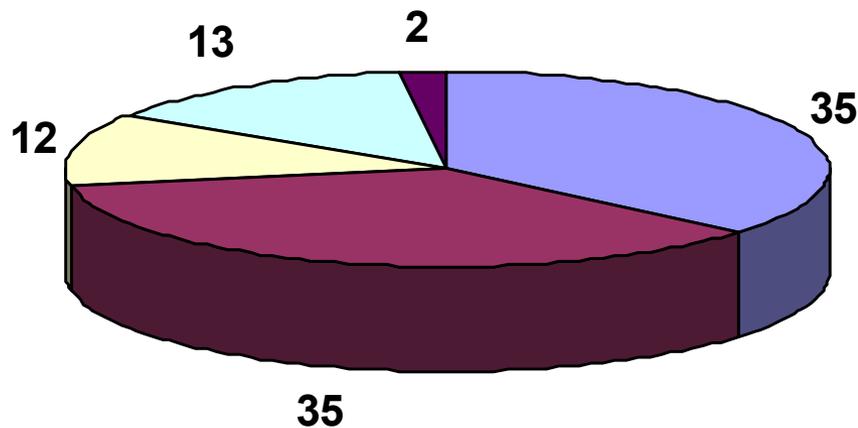
Benzo(a)Pyrene emissions to air

B(a)P emissions in Europe - prognosis 2010 [Mg]



PAH emissions to water - IPPC

IPPC installations PAH emissions to water
[%]



- Combustion of fossil fuels
- Metal industry
- Mineral oil and gas refineries
- plants for pre-treatment of fibres or textiles
- Basic organic chemical

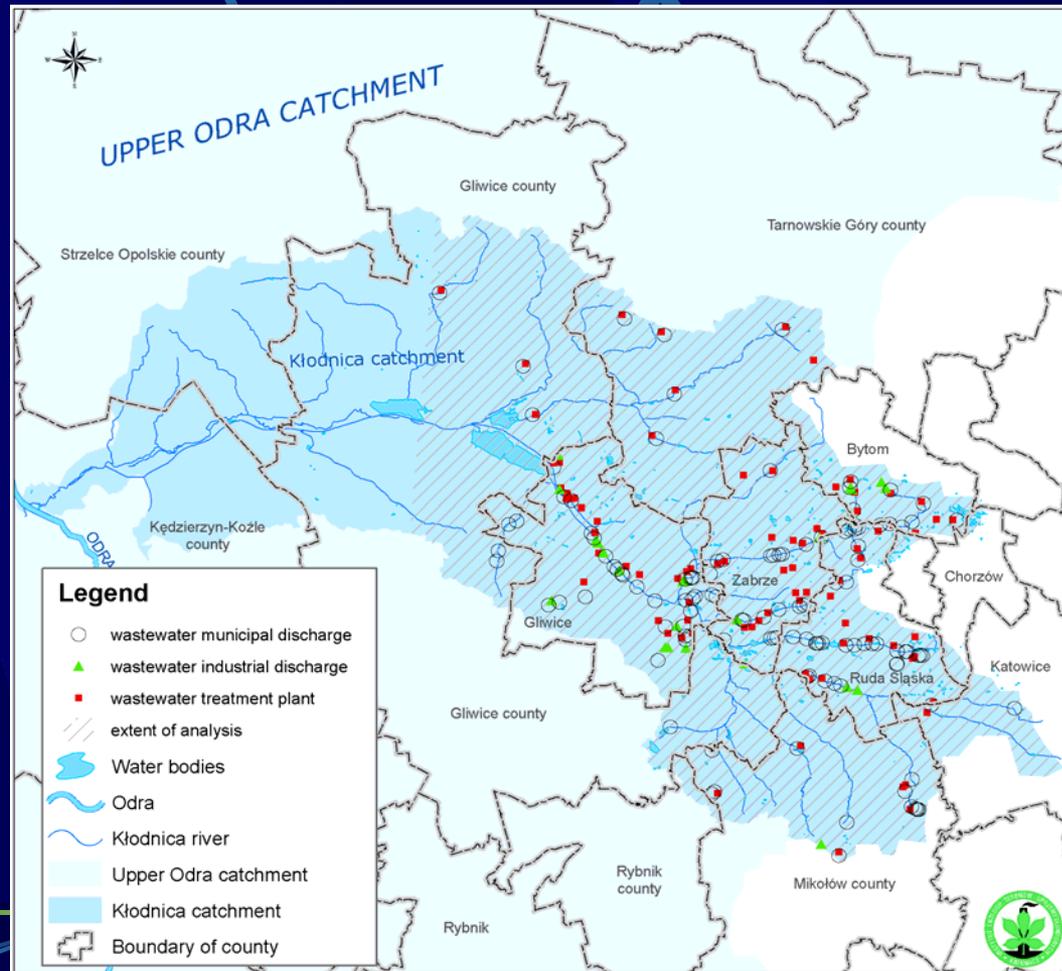
PAH emissions trends in Europe

● Decrease of PAH emissions between 1990-2003

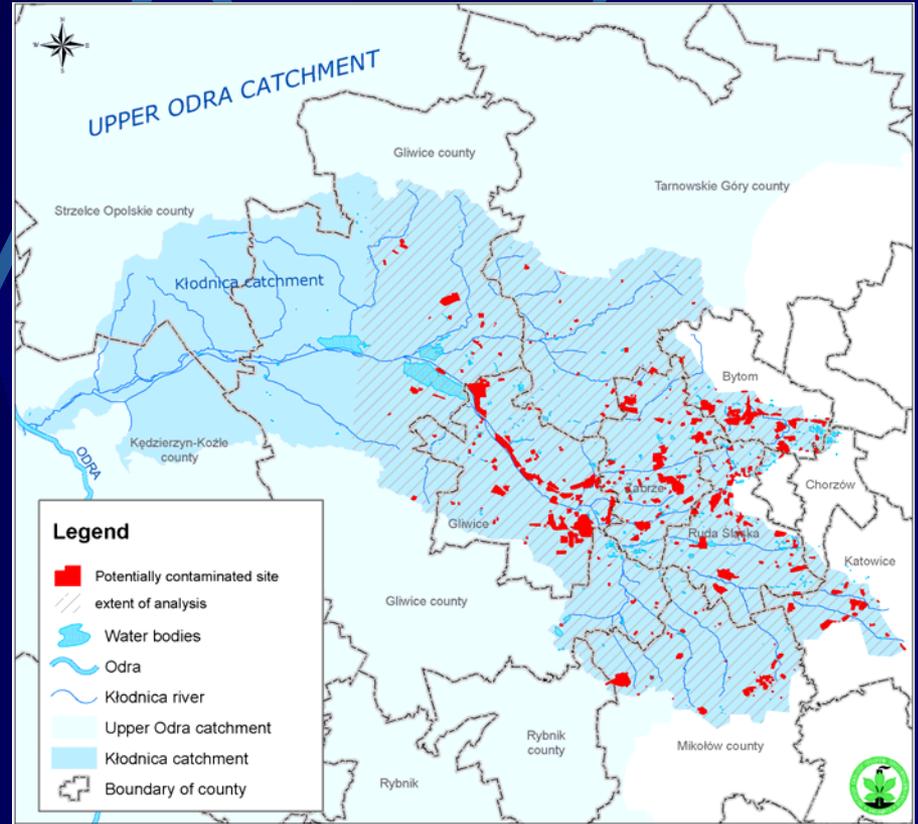
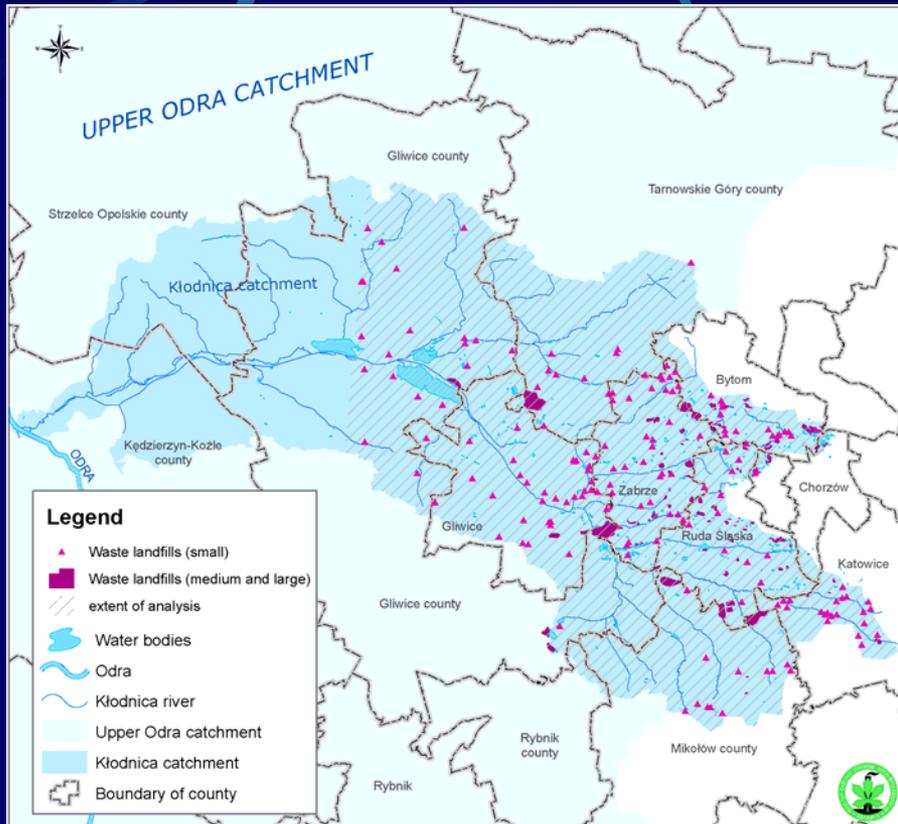
- Benzo(a)pyrene 30%
- Benzo(b)fluoranthene 28%
- Benzo(k)fluoranthene 33%
- Indeno(1,2,3-cd)pyrene 18%

A. Gysev, E. Mantseva, O Rozovskaya, V. Shatalov V., B. Strukov, N. Vulykh, W. Aas, K. Breivik, Persistent Organic Pollutants in the Environment, Status report 3/2005 June 2005, EMEP, Convention on Long-Range Transboundary Air Pollution, Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe.. Meteorological Synthesizing Centre- East, Chemical Coordinating Centre

Wastewater discharges and treatment plants



Landfills and industrial sites



Further investigation

- Revision of the point sources environmental performance (incl IPPC)
- Identification and assessment of the diffuse sources including rain water run off
- Investigation and assessment of contaminated land
- Studies on the river sediments – analyses and modeling
- Verification of the flow model of Kłodnica river for mercury, cadmium and PAH
- Determination of the contaminants balance in the catchment

Management activities

- Water Catchment Management Plan prepared by Regional Water Management Board
- Development of infrastructure including wastewater treatment plants
- Industry technological changes
- Regional initiatives e.g. „Przyjazna Kłodnica”

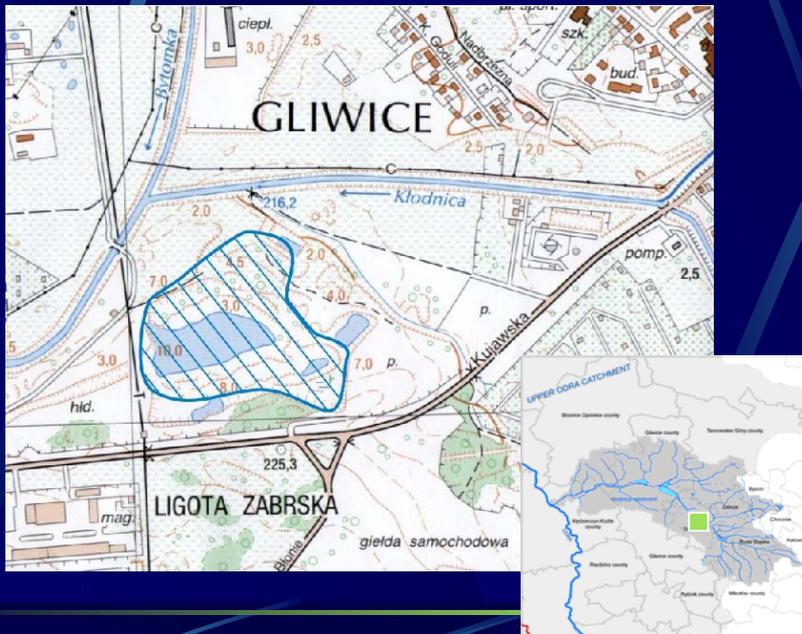


Source control measures

- Improved technologies: BAT required by the IPPC Directive
- Industry profile changes and product substitutions
- Wastewater management – improvement in the drainage system and wastewater treatment
- Improvement in industrial and municipal waste management
- Implementation of measures for diffuse sources including contaminated soil and rain water run-off

Example

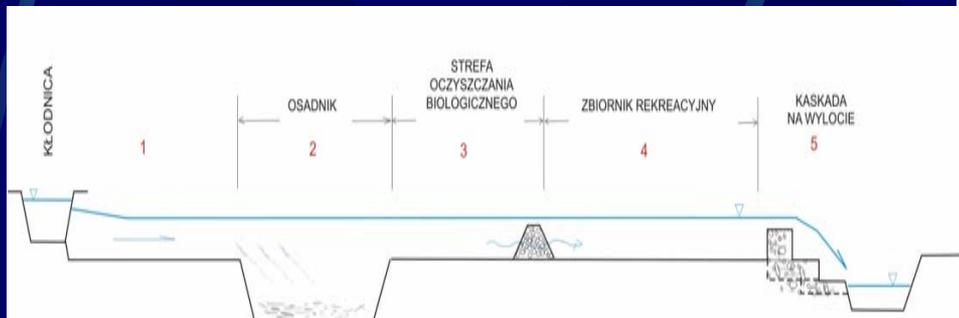
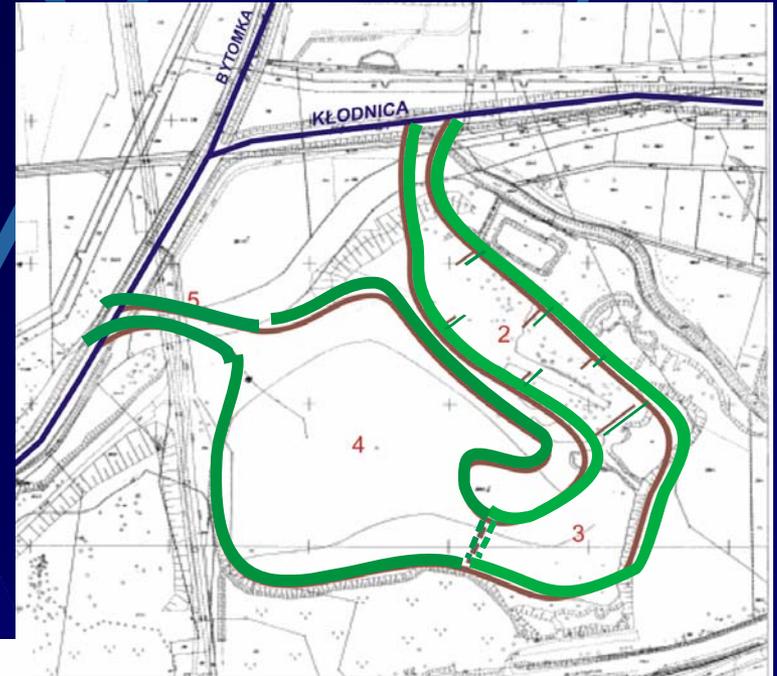
- ✓ sedimentation pond to be constructed on the base of existing pond



- ✓ Reduction of suspended matter as to achieve clarity
- ✓ Reduction of organic matter, BOD and COD 30 – 50%;
- ✓ Reduction of Nitrogen and Phosphorous compounds

Engineering concept for the proposed sedimentation pond

- 1 –inflow
- 2- sedimentation
- 3- biological treatment (plants)
- 4-central part (recreation)
- 5- outflow



Strategic approach

- Improved understanding of the water system
- Revision of the results of current management
- Identification, assessment and targeting potential sources which are not covered by the current management



**Thank you for your
attention**