Risk assessment in risk-based management of European river basins

Outcome of the MODELKEY/RISKBASE conference/workshop 12-15 November 2007 in Leipzig

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• Coordination Action on Risk Based Management of River Basins (FP6, contract 036938-GOCE)
• Coordinated by Jos Brils, TNO
• 9 partners from 6 countries
• Aim: to develop integrated, risk assessment-based management approaches enabling the prevention and/or reduction of negative impacts caused by human activities on that system
• www.riskbase.info
• Deliverables:
  - overarching concept, generic approach and guiding principles to integrated risk based management of EU river basins
  - recommendations towards evolution and implementation of risk based management in policies and in management
  - proposal for the European research agenda related to risk based management

• WP 4: Risk Assessment & Harmonisation
Objectives

- share and discuss scientific ideas/results from projects with scientific community and end-users
- link and integrate EU projects on risk assessment in river basins
- formulate science-based recommendations for policy makers based on scientific results of EU projects
- create a basis for RISKBASE dissemination (book chapter, journal special issue, short papers for Brussels, water managers…..)
Knowledge basis was created by overview presentations by

- stakeholders and
- scientists from major European projects like

MODELKEY, FLOODsite, Flood-ERA, GLOWA Elbe, MEDROPLAN, Watersketch, Eurolimpacs, REBECCA, ALARM, NoMiracle, AQUATERRA, NORMAN

Proceedings (extended abstracts)

Risk Assessment in European River Basins - State of the Art and Future Challenges

12 - 14 November 2007
Leipzig, Germany

⇒ for download see www.riskbase.info
Ecosystem goods and services as risk receptors

- human health
- groundwater ecosystem
- drinking water supply
- biodiversity

- groundwater status monitoring
- threshold values for "risk substances"
- sustainable water protection and management
Acidification

Pathogens

Weirs

Air Pollution

Deposition

Weirs

Floods

Nutrients

Pesticides

H^+

H^+

H^+

Pesticides

Climate Change

Chemicals

Invaders

soil

sediment

water

Acidification

stressors
Stressors

Water regulation
- floods
- droughts
- climate change impacts

⇒ distribution of risk reducing effects
⇒ preventive measures vs. crisis management
⇒ flow regimes and water availability
Stressors

Hydromorphological changes and risks to biodiversity

- water level regulation
- ecological functioning of catchment
- community degradation

⇒ environmental impacts on flora & fauna
⇒ effects of restoration measures
⇒ physical-biological coupling
Stressors

Eutrophication risks to biodiversity
• loss of functional groups
• impacts of climate change

⇒ species richness assessment
⇒ temperature and flow regime effects
Stressors

Invasive species

• assessment of biopollution
• assessment of socio-economic impacts

⇒ prevention, control
⇒ likelihood, perception, costs
Stressors

Environmental pollutants and their impacts on ecosystem and human health
• protection, probabilities and uncertainties
• polluted sediments & prioritisation
• pollutant fluxes
• bioavailability
• effects-directed identification of unknown toxicants
• assessment concepts for mixtures of contaminants
• community-level effects
• estrogenic effects
Integrated risk assessment at basin scale
• challenges for management
• pollution control
• resilience of ecosystems (incl. responses of structures and functions)

• toxicant exposure evaluation by diagnostic modelling
• prioritisation of measures

⇒ monitoring
gain
cause-effect relationships
gain
environment as a whole (system-oriented)
gain
stressor-specific indicators
Chemical status

Last decades: Focus on distinct hazardous substances + Best Available Technology ⇒

⇒ significant reduction of excess contamination

⇒ based on the experience:
33/41 priority pollutants → chemical status

⇒ powerful management tool for phasing out certain chemicals
but does not reflect toxic hazards!!
Chemical status – Recommendations:

- Focus on river basin/stretch-specific toxicants
- Regular update of priority lists with focus on emerging toxicants
- Reduce monitoring efforts for compounds no longer in use where appropriate
- Consider state-of-the-art mixture toxicity concepts and bioavailability to link chemical and ecological status
- Add a short list of priority effects and develop EQS for these effects
Ecological status

- Important step towards holistic river basin management
- However: Needs to be based on understanding of ecosystem functioning
- On a European scale improvement of hydromorphology and eutrophication crucial
- On a local and regional scale multiple pressures. Contaminants may be quite important
Ecological status

Major challenges:

- Multiple pressures
- Stressor-specific metrics
- Linking causes and effects (bioassays, biomarkers, EDA, bioavailability)
- Understanding ecosystem dynamics rather than focusing on reference conditions (hardly available in Europe)
- Understand ecology of recovery
Holistic approach required

Ecosystems are dynamic and interconnected
⇒ Required: Integrated Monitoring and management of the whole water-, sediment-, groundwater-, soil-system including landuse in terrestrial ecosystems adjacent to the river

When major stressor is tackled often another one becomes apparent
⇒ Required: Multi-solution for multiple stressors

Borchardt et al. 2005
Common recommendations paper for IEAM:

Towards a holistic and risk-based management of European river basins

(19 authors from science and policy making)
THANKS FOR YOUR ATTENTION!