



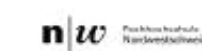
Managed Aquifer Recharge as Tool for an Integrated Water Resource Management – Research Needs from the European Perspective

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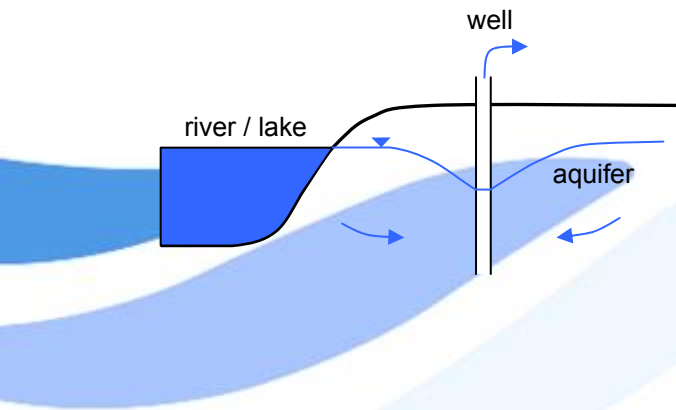
WssTP Members



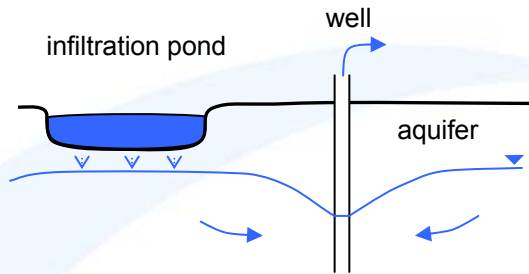
The European Water Platform

Background MAR

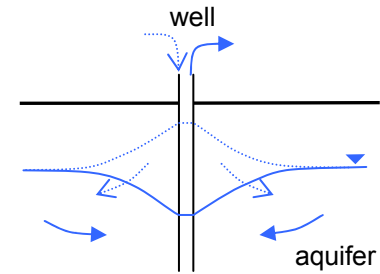
Bank filtration (BF)



Aquifer recharge via infiltration ponds (AR)



Aquifer storage and recovery (ASR) 



- 60 % of Berlin's drinking water (120 Mio m³/year)
- along the river Rhine bank filtrate serves 15 Mio. people (e.g. Düsseldorf, Cologne)
- Budapest and Belgrade rely on BF from the Danube
- drinking water in France: up to 50 % BF
- dune filtration supplying 16 % of NL's drinking water



History of MAR

Qualitative issues

insufficient surface water quality in the 19th century (without technical treatment)

⇒ pathogen removal



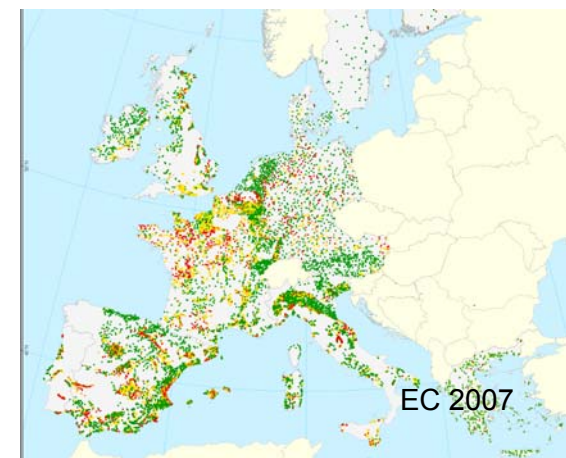
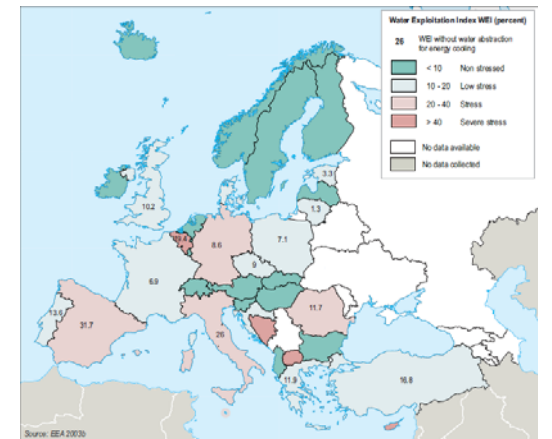
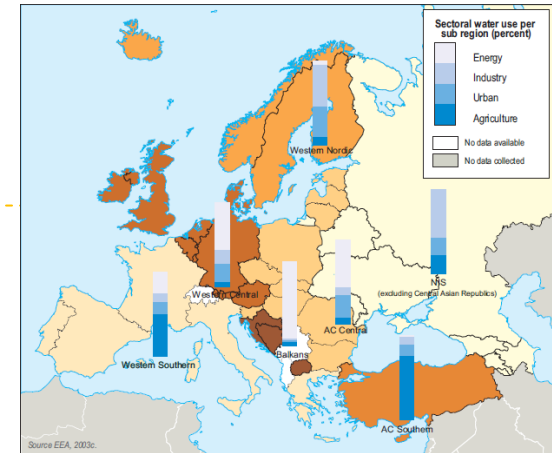
Quantitative issues

insufficient groundwater recharge

⇒ wells were drilled close to surface waters

Future Challenges

- demand (esp. for agriculture) likely to increase
- need to cope with highly varying demands
- water stress indicated not only for Southern Europe (Spain, Italy, Romania, Cyprus, Malta), also for Central Europe (Belgium, Denmark, Germany)
- in Southern Europe likely to increase with climate change
- sea water intrusion due to rising sea level
- degraded aquifers (depletion, nitrate)



Identified Research Needs

Legislation

- different authorizational approaches in EU member states
- supportive frame (especially within re-use schemes) necessary

Health related risks

- pathogens, persistent trace organics & transformation products
- development of “best management practices”

Sustainability

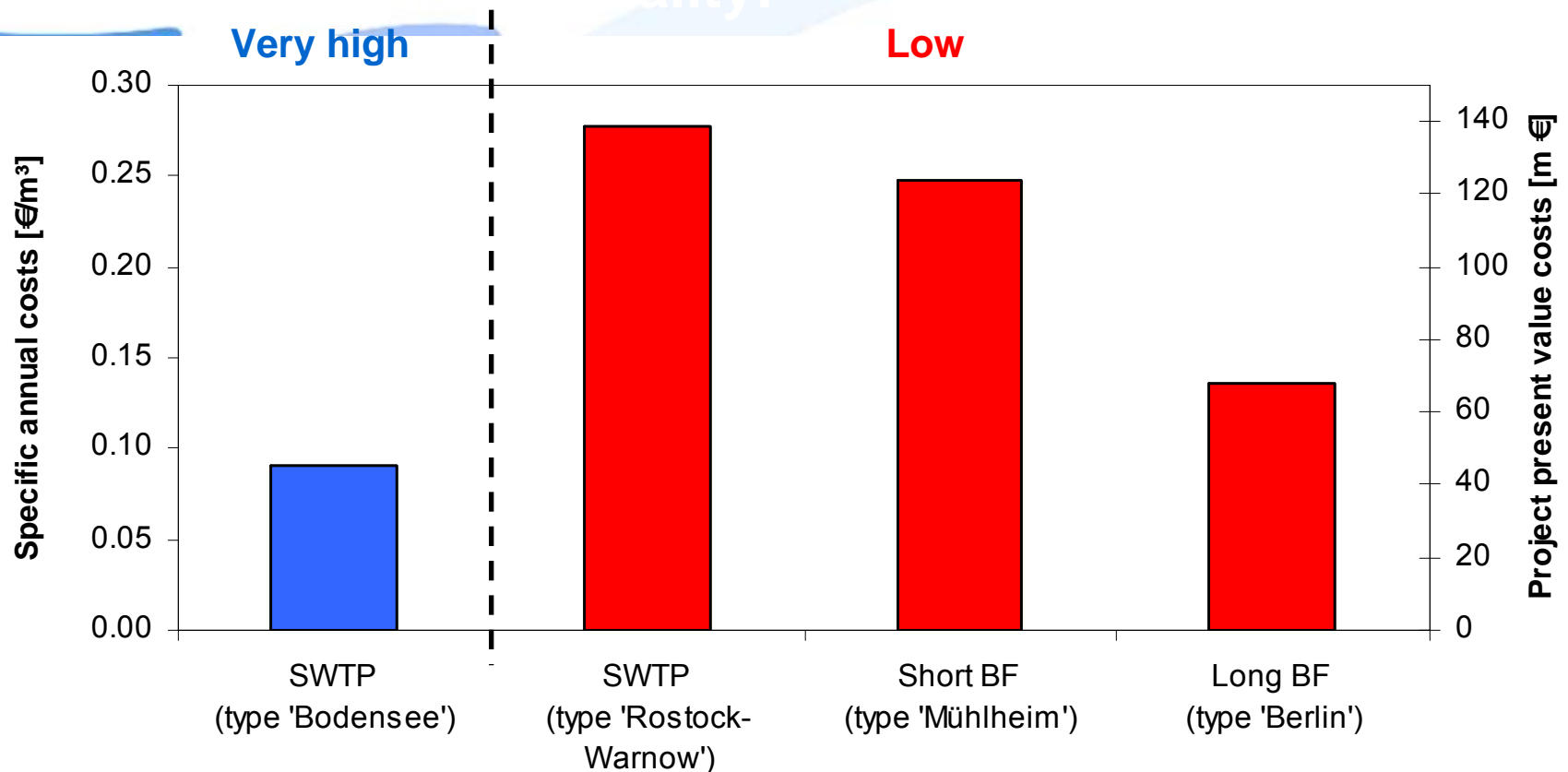
- quality of infiltrated water to avoid irreversible impact on subsurface systems
- long-term stability
- life cycle assessment

Technical and financial risks

- limited predictability, high investment costs
- definition of limiting conditions



Example: Bank Filtration vs. Direct Surface Water Treatment in Germany



Summary & Conclusions

- MAR should be regarded as management tool within an integrated water resource management
- Wider uptake of MAR in Europe and world-wide is impeded by uncertainty regarding
 - quantification of benefits and costs
 - potential environmental impacts
 - policies to ensure its integration into IWRM
- Scientific basis needed for regulation taking into account benefits and potential environmental impacts



Management of Water in a Changing World: Lessons Learnt and Innovative Perspectives

12 – 13 October 2011
Dresden, Germany



13th October, 14:00 – 15:30, Room 3: Session C-4 (MAR)

Managed Aquifer Recharge as tool for the implementation of an Integrated Water Resource Management

Conveners:

*Berlin Centre of Competence for Water,
Germany*

*Water Supply and Sanitation Technology
Platform, Brussels, Belgium*



Co-Conveners:

*International Association of Hydrogeologists –
Commission on Management of Aquifer
Recharge (IAH-MAR)*



DHI-WASY GmbH (Berlin, Germany)



Management of Water in a Changing World: Lessons Learnt and Innovative Perspectives

12 – 13 October 2011
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- 14:00** Managed Aquifer Recharge as Tool for an Integrated Water Resource Management – Research Needs from the European Perspective
Gruetzmacher, G. | Kneppers, A. | Kazner, C. | Zojer, H. (*Water Supply and Sanitation Technology Platform: Task Force MAR, Brussels*)
- 14:05** Riverbank filtration as an ecosystem service for human health in India
Sandhu, C. | Grischek, T. (*University of Applied Sciences Dresden, Germany*)
- 14:00** TECHNEAU: Perspectives for bank filtration as natural drinking water treatment in India
Sprenger, C. | Lorenzen, G. | Pekdeger, A. (*Freie Universität Berlin, Germany*) | Grützmacher, G. | Rustler, M. (*Berlin Centre of Competence for Water, Germany*)
- 14:35** Integrated analyses of MAR techniques in Shandong, China
Monninkhoff, B. | Kaden, S. (*DHI-WASY GmbH, Germany*)
- 14:50** Infiltration wells as elements in managed aquifer recharge and groundwater treatment
Ahrens, J. | Großer, R. | Grischek, T. (*University of Applied Sciences Dresden, Germany*)
- 15:05** Questions, answers and discussion



Thank you!

Bertram Monninkhoff (DHI-WASY, Germany), Jose Antonio de la Orden (IGME, Spain), Gloria Teijon and Lucila Candela (UPC, Spain), Hans Jørgen Henriksen and Bjørn Kaare Jensen (GEUS, Denmark), Niels Hartog (Deltares, The Netherlands), Haim Cikurel (Mekorot, Israel), Kloppmann Wolfram (BRGM, France), Emmanuel Soyeux (Veolia, France), Peter Dillon (CSIRO, Australia), Joana Tobella (Cetaqua, Spain), Jorge Molinero (amphos21, Spain), Marzena Boron (Bydgoszcz, Poland)

