



International Summit WATER AND CLIMATE: Meeting of the Great Rivers of the World
Session 2: Water Resources and aquatic ecosystems management in a changing climate
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Groundwater contribution for environmental needs at global scale: experiences from EU

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Why groundwater is important?

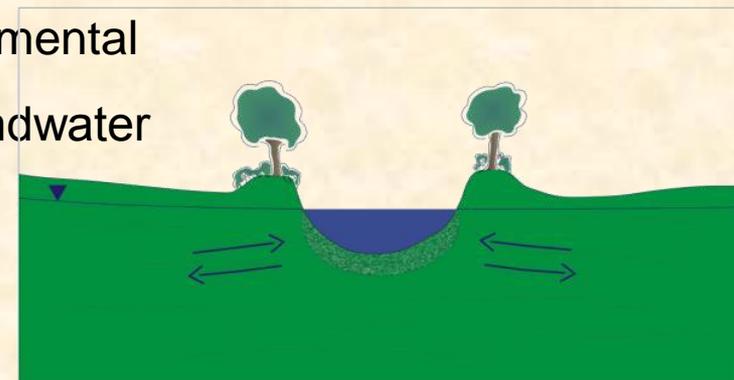
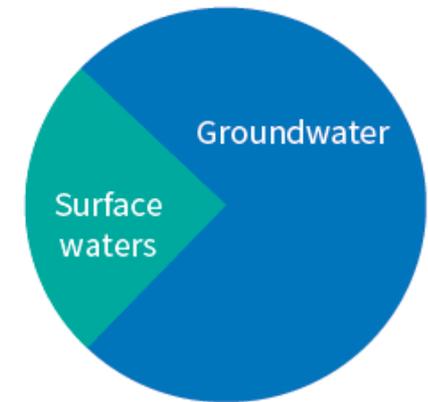
Relevance of Groundwater in water policy and water management, both at local and basin scale, is frequently underestimated

Groundwater is the hidden part of the hydrological cycle, but:

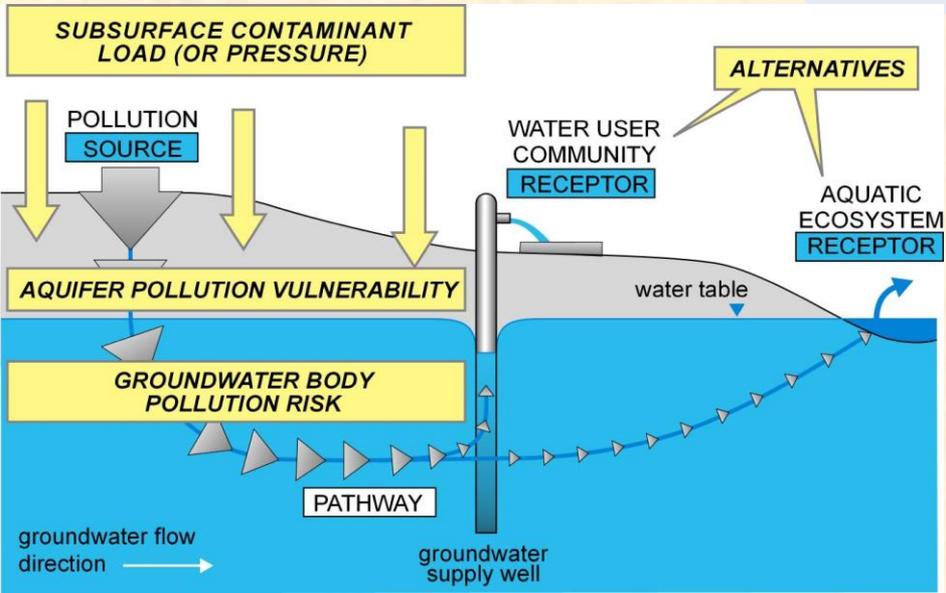
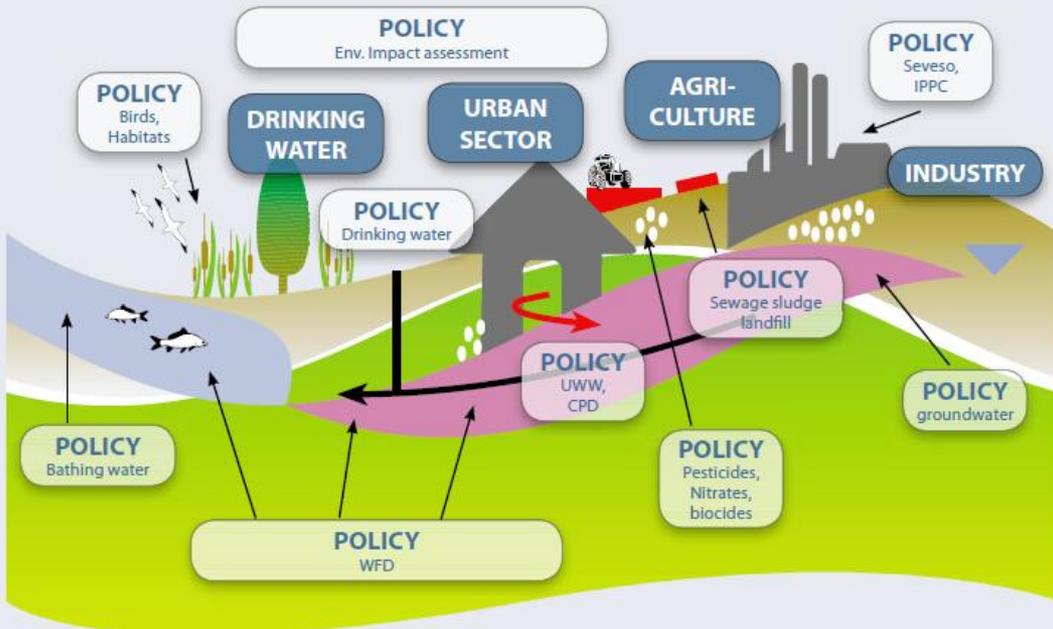
- it provides the majority of water resources for drinking uses
- it contributes to the agricultural & industrial needs
- it is fundamental for sustaining the river discharge during drought periods, by the „base flow“
- it supports, influences and guarantees the environmental and ecological functionality by the concept of „groundwater dependent ecosystems“

Need to make groundwater visible!

Drinking water supply of European Union residents
SOURCE: Groundwater Protection in Europe, EC, 2008



Graphical conceptual model for groundwater issues: a cross-cutting topic for management & policy
(water-food-energy nexus)



Source: European Commission (2008), Groundwater Protection in Europe

Groundwater Pollution Risk Assessment: different sources (diffuse vs point), different receptors (Human: drinking water, Environment: ecosystems).

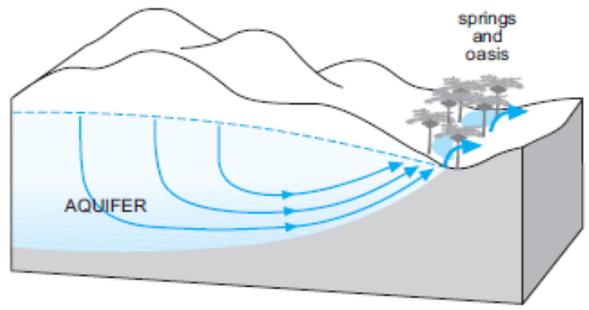
Contribution from IAH: International Association of Hydrogeologists

www.iah.org

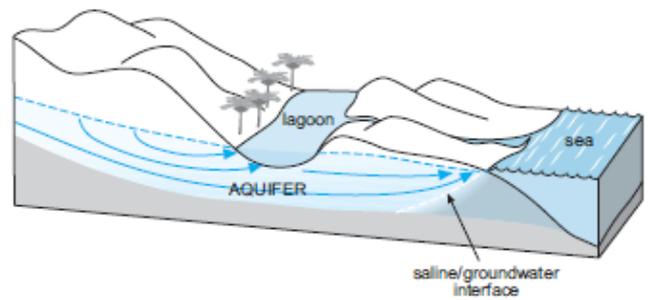
See also Kreamer et al, 2015, Groundwater 205-230

International Association of Hydrogeologists
Strategic Overview Series
ECOSYSTEM CONSERVATION & GROUNDWATER

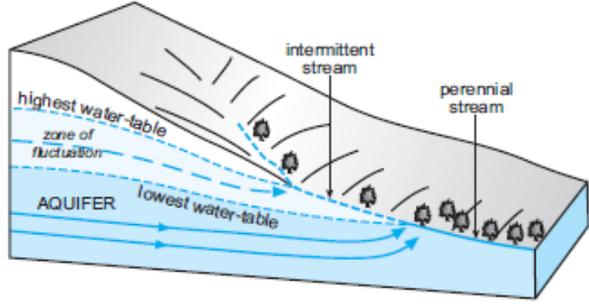
WETLAND ECOSYSTEM IN ARID REGION WITH ONLY LIMITED CONTEMPORARY GROUNDWATER REPLENISHMENT AND FOSSIL AQUIFER FLOW



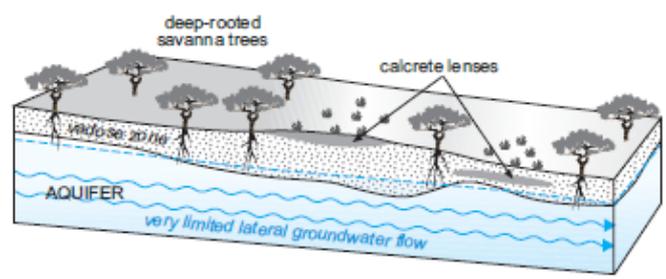
COASTAL LAGOON ECOSYSTEM DEPENDENT UPON SLIGHTLY BRACKISH WATER GENERATED BY MIXING OF FRESH GROUNDWATER AND LIMITED SEAWATER INCURSION



AQUATIC STREAMBED ECOSYSTEM IN HUMID REGION ALONG UPPER REACHES OF RIVER FED BY PERENNIAL AND INTERMITTENT GROUNDWATER DISCHARGES



TERRESTRIAL SAVANNA ECOSYSTEM DEPENDENT UPON EXCEPTIONALLY DEEP-ROOTED TREES AND BUSHES TAPPING THE WATER TABLE IN ARID REGION

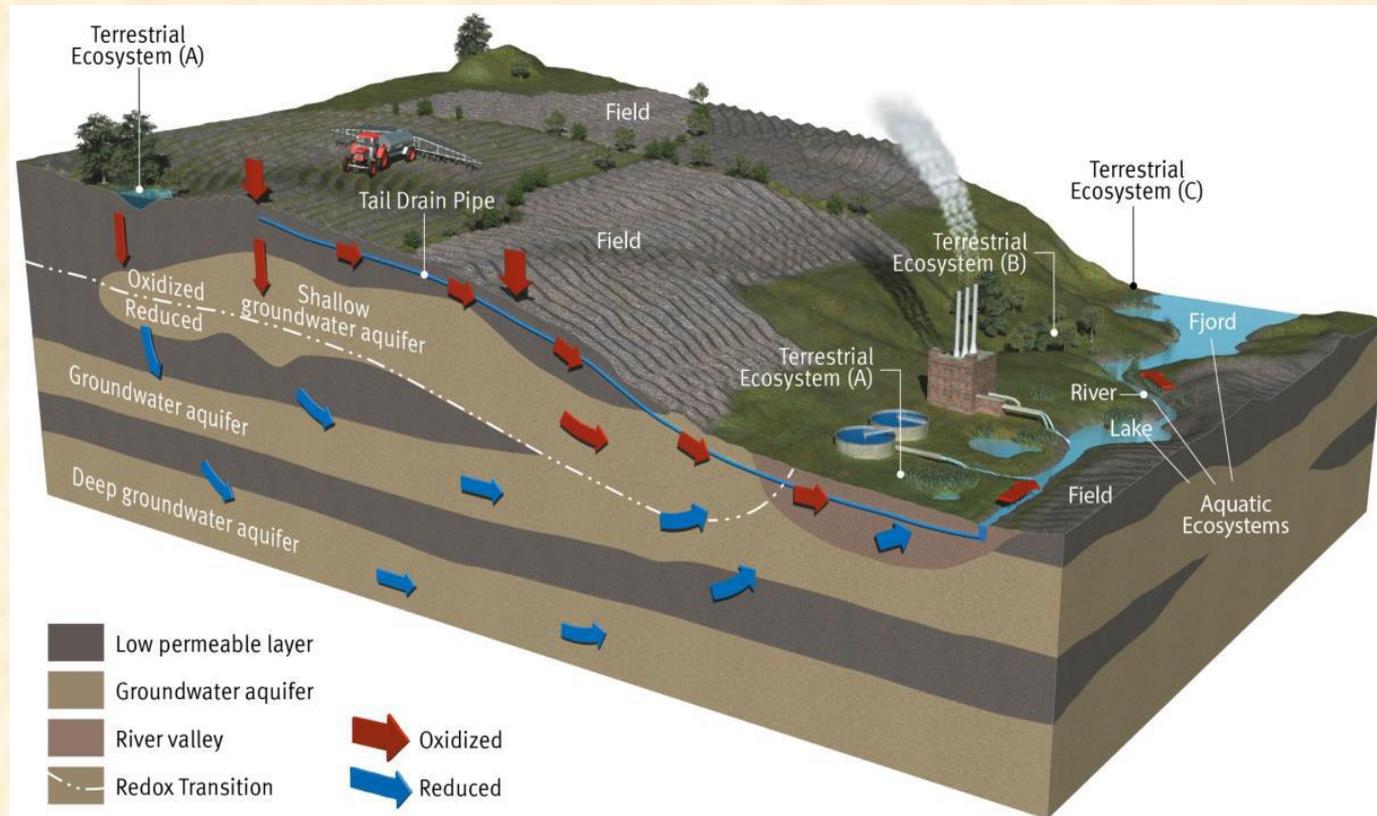


Contribution from EU: Working Group Groundwater for the Common Implementation Strategy of Water Directives

Identification of Terrestrial and Aquatic Ecosystems

E-flow and ecological status of surface waters strongly depends on groundwater status, pressures and impacts!

Groundwater cycle is very slow respect with surface waters one: advantages and disadvantages for protecting environmental values & ecosystem services



Technical Report on Groundwater Associated Aquatic Ecosystems, CIS for Water Framework Directive, Tech. Rep. n° 9, 2015

See also Klove et al., 2011, *Environmental Science & Policy* 14: 770-793

Take-home messages

- ✓ Pressures affecting water cycle caused quantitative shortage and qualitative worsening, quickly evident in surface waters
- ✓ Groundwater represents a resilient system, providing fundamental contribution for aquatic ecosystems functionality
- ✓ Monitoring both GW and SW status, adopting also ecological indicators, is necessary for highlighting trends and changes, also due to natural or human-induced causes
- ✓ Preserving groundwater quantity and quality is a natural-key for facing challenges due to climate change

