

Global Hydropolitics and Hydroeconomics

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Interdisciplinary Perspectives on
Global Environmental Changes

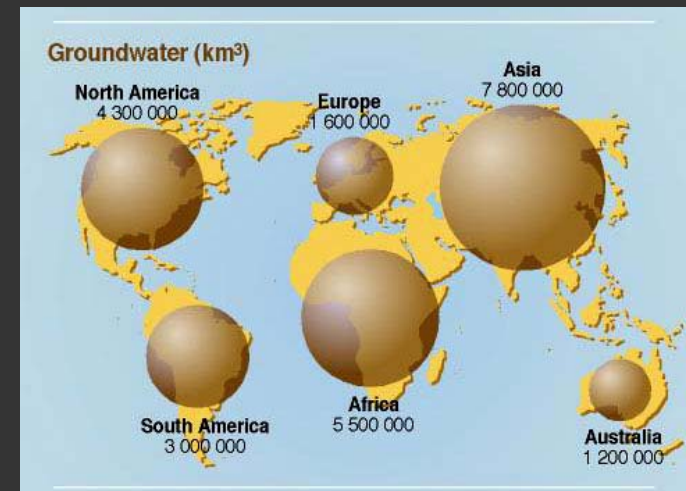
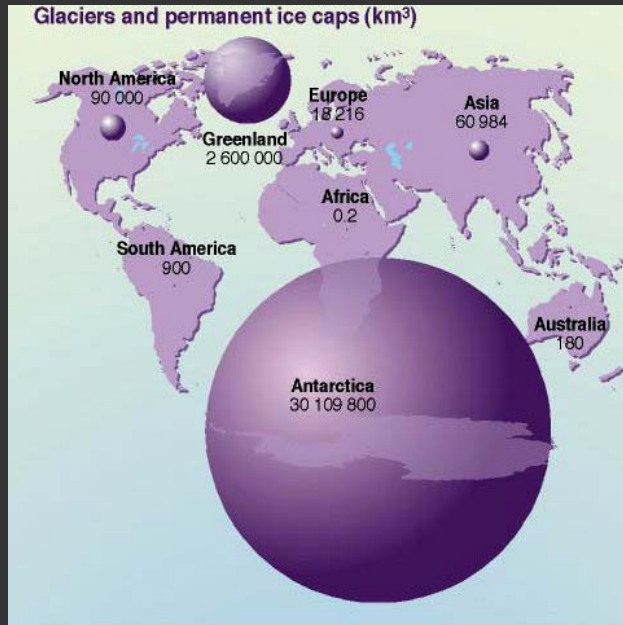
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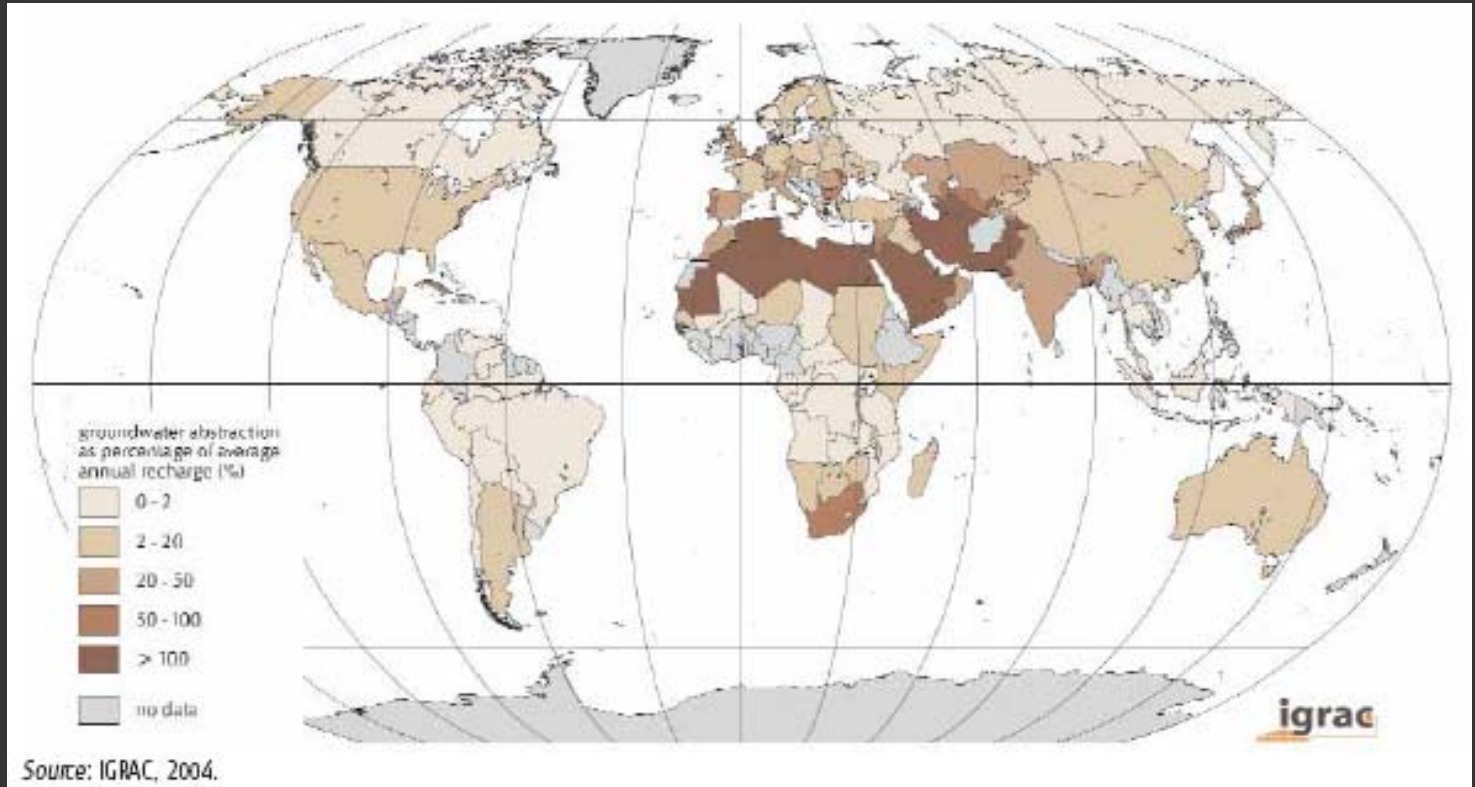
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Global freshwater: in ice caps, rivers & aquifers

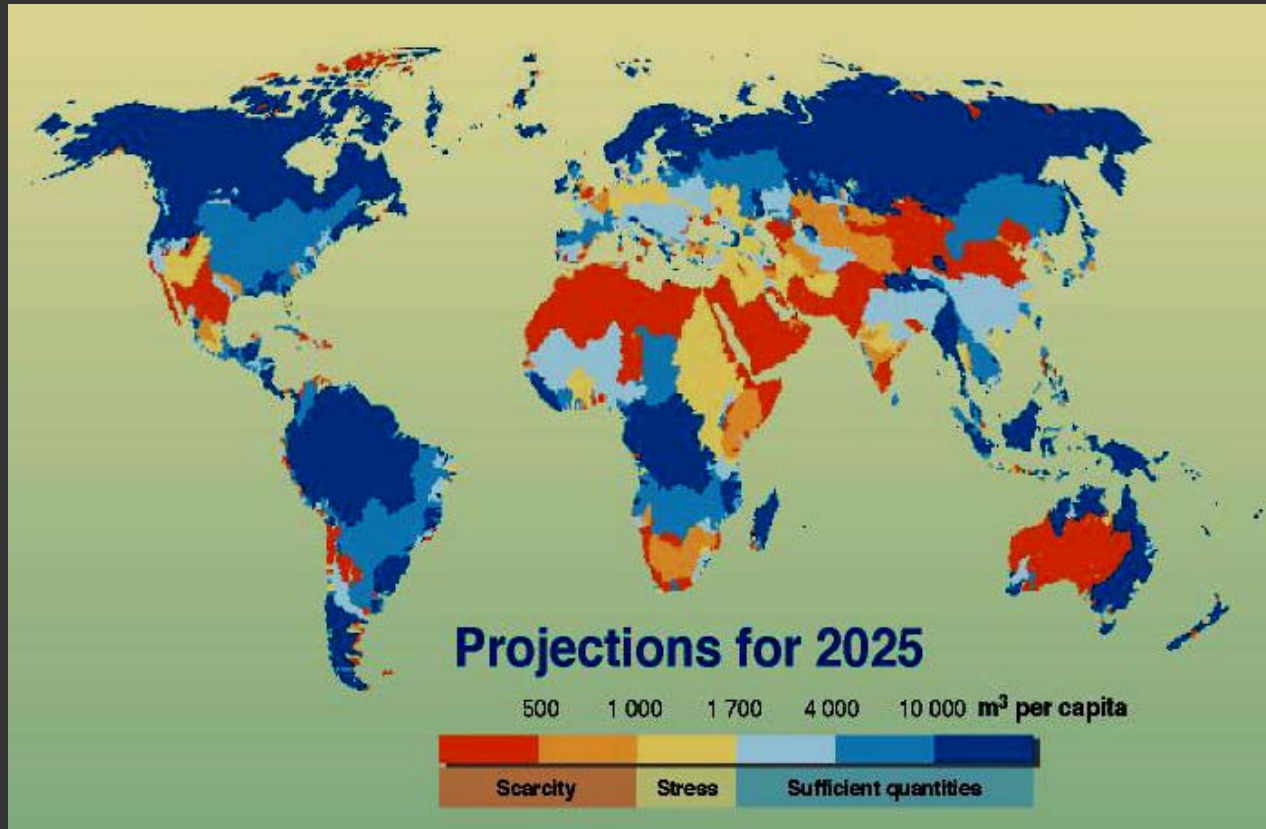


Groundwater abstraction rate as a percentage of mean recharge



- Low percentages indicate underdeveloped groundwater resources
- High percentages point to development stress or eventually overexploitation

Per capita renewable supplies

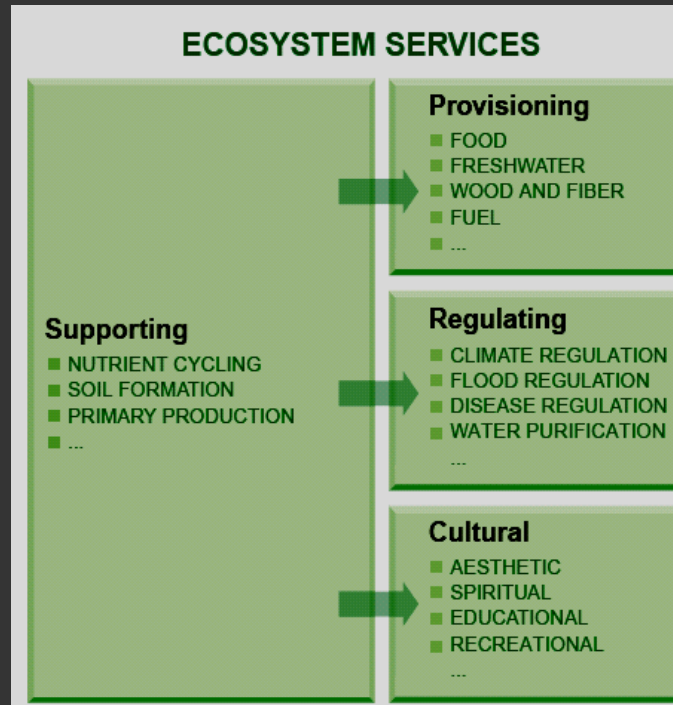


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By connecting Water to EcoSystems



Integrity of the aquifer system

- Refers to
 - aquifer rock matrix
 - hydrostatic conditions of the water within matrix
 - hydrochemistry of water
- At *risk* when any of the following have been over stressed
 - recharge process that ensures adequate replenishment,
 - discharge process that ensures baseflow to streams and coastal areas
 - hydrostatic relationship throughout the rock matrix that determines flow and hydrochemical process that determines water quality



Resilience

- Ecosystem resilience is
 - capacity of an ecosystem to cope with change and perturbation, such as storms, drought and pollution.
 - loss of resilience leads to more vulnerable systems,
 - and to possible ecosystem shifts to undesired states that provide fewer ecosystem goods (like fish and crops) and services (like food control and water purification).



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Integrated Water Resources Management

- “a process which promotes the coordinated development and management of water, land and related resources to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.”



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Integrated Water Resources Management

- Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.

Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.

Women play a central part in the provision, management and safeguarding of water.

- Water has an economic value in all its competing uses and should be recognised as an economic good.



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Problems

Information Exchanges

Political Will

Stakeholder participation



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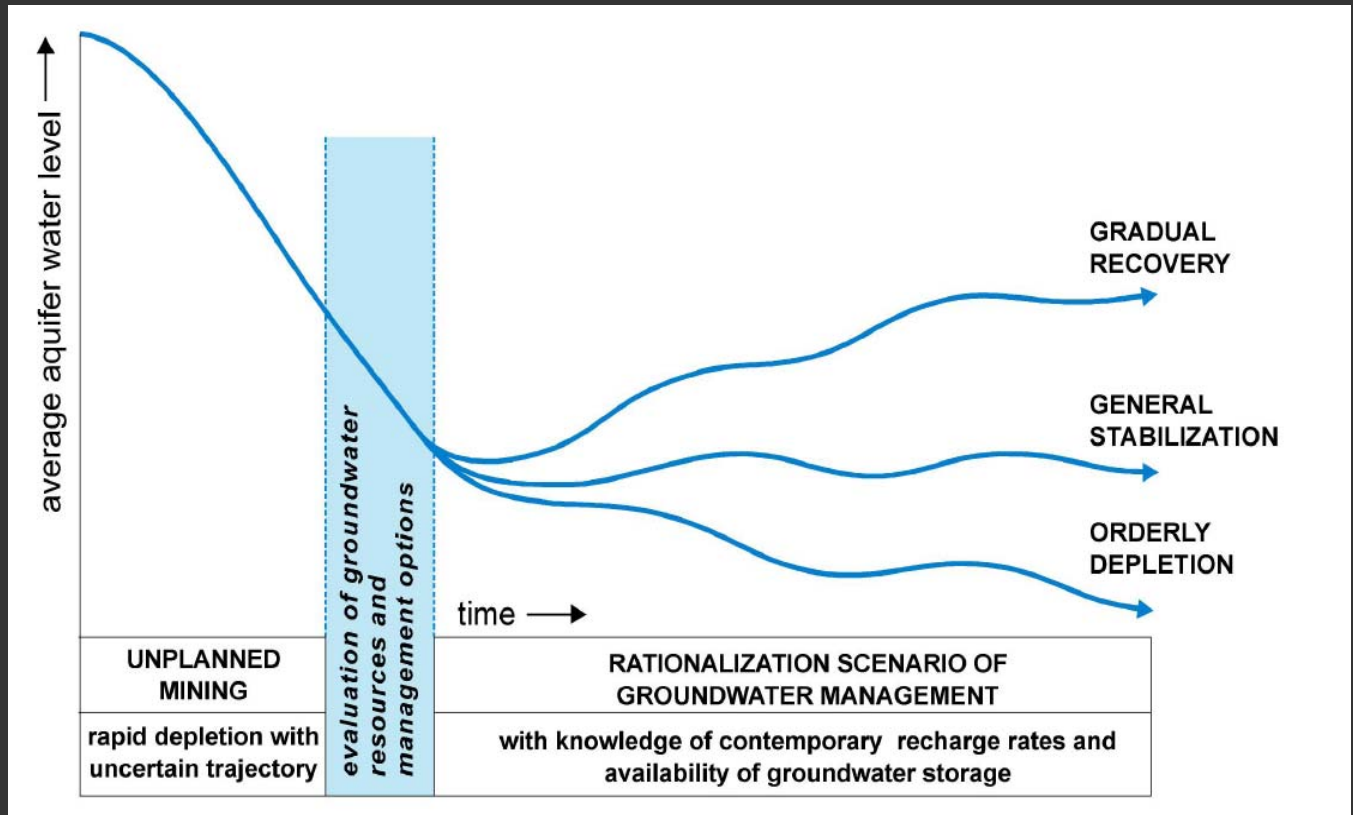
Aquifer exploitation strategies

- Groundwater resources exploitation occurred during
 - 1950-1975 in the industrialized nations
 - 1970-1990 in the developing countries
- Uncontrolled expansion in groundwater generated
 - social economical development
 - but now it is encountering sustainability problems
- Abstraction rates of groundwater encountered in some part of the world are
 - not sustainable in the long term
 - and overexploitation of groundwater resources lead to various degrees of aquifer degradation and ecological impacts



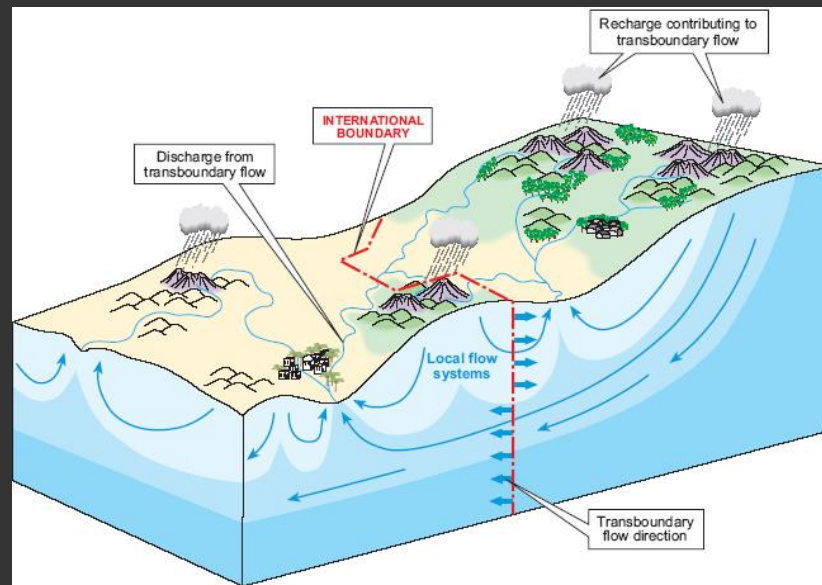
Groundwater Resources Management

“rationalization scenarios for unplanned situations”



Shared groundwater resources

- Transboundary aquifers key features
 - a natural subsurface path of groundwater flow, intersected by an international boundary
 - aquifer recharge mostly on one side, and discharge mostly on the another side.



Impacts

- Intensive groundwater abstraction = depletion of groundwater levels
- Groundwater recharge quantity or quality = changes in water level and quality



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Water rights and allocations management

- Transboundary water resources
- Key issues to management are:
 - the total extraction,
 - the measures needed to protect the aquifer (decision process and enforcement)
 - decision-making, and institutional structure implementation



Governance of water use in society

- Institutional structure exists:
 - to govern and enforce the property rights
 - to adjudicate in case of disagreements
 - to ensure that water is used according to sustainable yield constraint.
- No such institutions exist at the international level
- However, the UN International Law Commission has adopted in 2006 a set of draft articles on the law of transboundary aquifers



Examples of problems requiring some cooperation

- Aquifer contamination and/or depletion
- Crises
- Inefficient water use and water supply



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Risk Quantification in Aquifer Resources Management

- Reduction of technical, economic, environmental and social risks in order to achieve 4 main objectives:
 - Technical reliability,
 - Economic effectiveness,
 - Environmental safety,
 - Social equity.



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Hydrodiplomacy

“Fierce competition for fresh water may well become a source of conflict and wars in the future.”

Kofi Annan, March 2001



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Is Water Scarcity the Cause of Conflict?

Swedish Water House found three challenges to this notion:

- “Cornucopians” - natural resources are abundant and can be traded, substituted through technological innovation, recycled, or rationed through market mechanisms
- “Curse of resources” - resource abundance is more important than resource scarcity in creating conflict.
- “Liberal institutionalists” – more cooperative treaties than of conflicts over water.
- Various causes and types of conflicts



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Hydrodiplomacy

- Based on drafts of Institute of International Law (IIL), International Law Association (ILA) and International Law Commission (ICL)
- Legal approaches can be reinforced by flexible mechanisms



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Water Sharing Indicators

- Quantitative and qualitative indicators
 - measure the performance of shared water resources systems
 - monitor the process of equitable sharing
 - and provide the monitoring mechanisms



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