

**International Roundtable**  
**“Integrated Management of Shared Groundwater in**  
**South Eastern Europe”**

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**Groundwater for life and social**  
**and economic development**

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# Groundwater for live and economic and social development

- Groundwater has to be seen as a significant component of the hydrological cycle and aquifers as a important hydrological unit of watersheds and river basins.
- Groundwater should be integrated within the context of broader economy and social and environmental dimensions.
- In nature, groundwater is a key element in many geological and hydrochemical processes, geotechnical factor conditioning soil and rock behaviour and component of ecological system which sustains spring discharge, river baseflow, lakes and wetlands.
- Use of groundwater significantly increased in the last decades due to its widespread occurrence, mostly good quality, high reliability, advances in drilling and pumping technology and modest development cost.

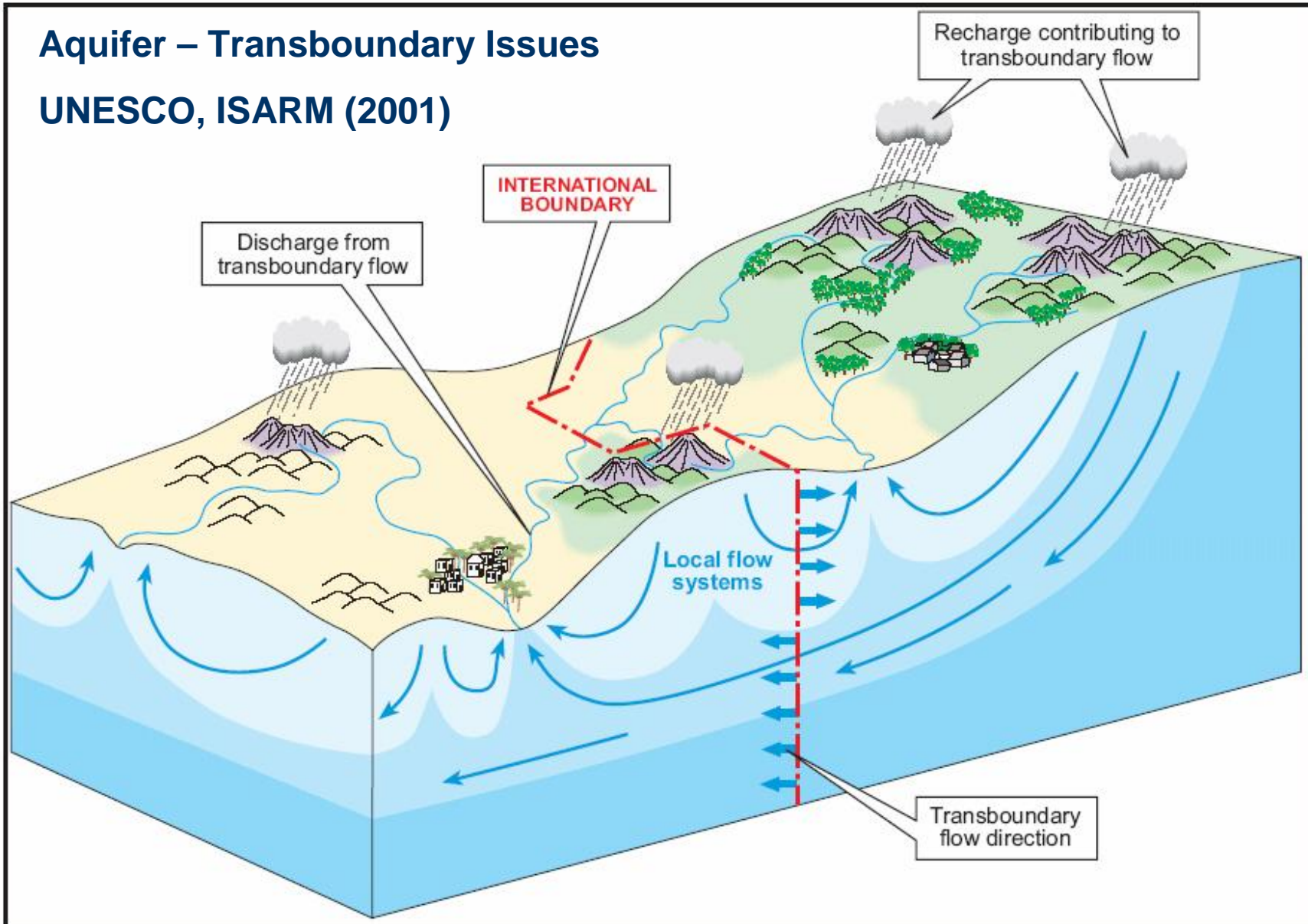
## Prevail type of aquifers in SEE region

- 51 transboundary aquifers recorded in the region are mainly of two types:
- **Karstic aquifers** in carbonate rocks with groundwater flow in conduits, large open fissures and openings; typically with high groundwater flow velocities (hundreds m/per day) ; springs are important phenomena of groundwater karstic regime.
- **Shallow water-table aquifers** in fluvial deposits characterized by porous permeability and interface with surface water.
- Both aquifers are often interconnected and **highly vulnerable to human impacts: pollution and depletion.**

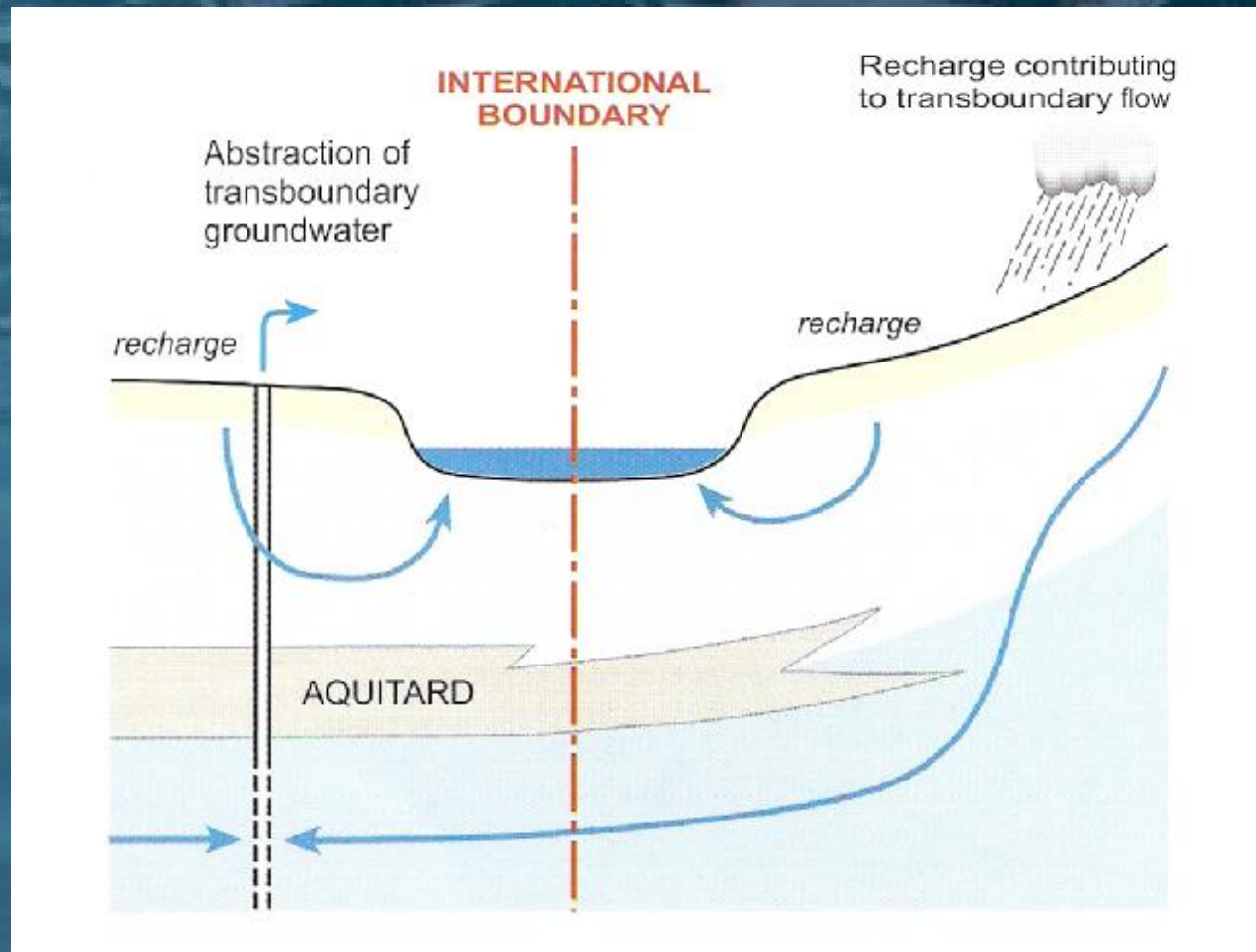
## **Importance of groundwater for social and economic development in SEE region (ECE 2007)**

- **Karstic aquifers provide 60 –80% of total water usage in their respective areas, and some of the Dinaric karstic groundwaters in Serbia, Croatia, Montenegro, Bosnia and Herzegovina and Albania as much as 90 – 100%.**
- **Aquifers in fluvial deposits provide 15 – 25% of total water usage however, e.g. in Pannonian Basin up to 70% in Serbia and Croatia.**
- **Groundwater (mainly karstic aquifers) portion on total drinking water supplies is often more than 50 %.**
- **Groundwater portion on irrigated agriculture is from 25% to 50%, exceptionally up to 90% (Svilengrad fluvial aquifer).**
- **Groundwater usage by industry is usually less than 25% of the total.**
- **Groundwater usage by tourism and recreation is growing.**

## Aquifer – Transboundary Issues UNESCO, ISARM (2001)



**Transboundary aquifers management has to be based on evaluation of groundwater recharge, flow movement direction, boundary conditions, quantity (storage), quality and discharge**



# **Integrated Water Resources Management of transboundary aquifers should be**

- **based on holistic and ecosystem approach,**
- **reflects the social and economic value of surface water and groundwater and the integrity of terrestrial and aquatic ecosystems,**
- **includes both quantitative and qualitative attributes of water resources,**
- **is linked to the catchment land use planning and management,**
- **attentive to ethical, cultural and historical traditions of the the society, and**
- **based on participatory management , involving planners, policy and decision makers, water stakeholders, local communities and general public.**

# **Integrated Water Resources Management (IWRM) implementation**

**IWRM vary in different socio-economic conditions and local requirements, however, its basic principles of equity, efficiency and water and environmental sustainability are invariable.**

**Lack of:**

**appropriate governance,**

**coordination of water resources management procedures based on social consensus ,**

**cost-effectiveness in water investments,**

**and public and local community involvement,**

**are the main obstacles in IWRM implementation**

# Multidisciplinary approach to the joint management of transboundary aquifers

<b>Scientific, Socio – Economic, legal and Institutional, Components</b>			
<b>Scientific – Hydrogeological and Risk Assessment Attributes</b>	<b>Social Equity and Economic Efficiency Attributes</b>	<b>Countries Legal and Regulatory Framework</b>	<b>Competent Central Governmental and River Basin Authorities</b>
<b>Environmental Sustainability and Ecological Attributes</b>	<b>Public Involvement, Information and Education</b>	<b>EU Directives UNECE Water Convention UN Convention (Int. Watercourses)</b>	<b>International River Basin Commissions</b>
<b>Common Monitoring Programmes and Regulatory and Control Mechanisms</b>	<b>Building of Confidence between Countries based on Religious, Ethical and Historical Traditions of the Society</b>	<b>Multi and /or Bilateral International Treaties and Agreements</b>	<b>Local Communities cooperation</b>

# **Water Resources Governance**

**(modified after WWDR I and II, 2003, 2006)**

- **Importance of governance aspects is recognized as the key to more efficient resource management in different social, economic, and environmental situations.**
- **Governance systems are intrinsically linked to political processes and power.**
- **Water resources governance has to include the society as a whole (government, policy and decision makers, managers, water stakeholders and civil society agencies).**
- **Delegation of responsibilities from central to local governments and empower the communities to self manage the installation and operation of water supply and sanitation systems are important attributes in water governance particularly in emergency situations**
- **Water governance can be effective when there is applied socially equitable, environmentally sustainable and efficient use of water resources.**

# Water social and economic valuation

- Water has an economic value in all its competing uses and should be recognized as an **economic good** (Dublin Statement, 1992).
- It is vital to recognize the basic right of all human beings to have access to clean water at an **affordable cost** (UN 1992).
- Promoting schemes for rational water use through levying of **water tariffs and other economic instruments**, including the need for evaluation / testing of charging options that reflect true costs and ability to pay (Agenda 21).
- Water is not a commercial product but, rather, a heritage which must be protected, defended and treated as such (WFD 2000 / 60 EC).
- Member States shall ensure by 2010 that **water-pricing policies** provide adequate incentives for users to use water resources efficiently (WFD 2000 / 60 EC).
- Economic water valuation to fulfil society needs (drinking water supply, food security, environmental needs) is an efficient tool for its sustainable use and management

# Water pricing policy

- Water services need to be priced at full cost for all users however, basic water requirements have to be affordable to all.
- The user pays principle is not applied in some countries, because social acceptance of paying for water is low (traditionally water is providing at a minimal charge) and water prices are subsidized.
- Water services are variable and have to be valued differently.
- Methods of water prices (water tariff ) calculation differ between countries and depends how conceptual and institutional instruments are applied.
- Drinking water prices are often uniform across the whole country despite the fact that water origin, development, treatment and distribution vary between country regions.
- The polluter pays principle has to be adopted with the objective to value financially the impact on groundwater quality and its treatment.
- Assessment of Resource and Environmental Costs in the WFD (Drafting Group EC02, Common Implementation Strategy WG 2B, 2004)

# Valuing water and ecosystem functions

- The water policy and management should always consider how much water is needed for conservation of the terrestrial and aquatic ecosystems on the watershed and/or aquifer scale.
- Improvement of knowledge and understanding of ecosystem functions and processes and valuation of the services that ecosystems provide both have to be part of integrated water resources management.
- Sustainable and integrated land and water resources management and protection policy on the river basin / aquifer scale enhanced conservation of good ecological status of aquatic ecosystems.
- Protection of recharge areas, conservation of river base-flow, control of aquifer discharge through springs, rivers, lakes and wetlands, establishment of protection zones, development of relevant vulnerability indicators, all are of critical importance for conservation of biodiversity and ecosystems dependent on groundwater.
- Water services needed for ecosystems conservation are of critical importance, however difficult to value in a price (environmental costs: non-use values refer to values attached to environment and natural resource conservation and preservation for future generation).
- Detection of the potential impact of climate change on aquatic ecosystems has to be carefully monitored and studied.

# Pressure factors on transboundary aquifers with social and environmental consequences

- Uncontrolled leakages from point pollution sources from industrial, mining and military facilities and uncontrolled waste disposal sites located closely the country borders.
- Discharge of untreated wastewater from urban and rural areas into the surface water and its infiltration into the connected shallow aquifers.
- Transboundary transport of diffuse pollution (nitrates and pesticides) produced by agricultural activities into the shallow, water table, vulnerable aquifers.
- Unsustainable aquifer exploitation producing transboundary groundwater level and pressure depletion and quality degradation with the impact on groundwater dependent ecosystems, river base-flow, spring discharge, well yields reduction and sea water intrusion.
- Impact of hydraulic structures on groundwater system and regime (e.g. dams, irrigation facilities, river banks regulation).
- Economic growth, unsustainable land use management.
- Demographic growth, population concentration in urban areas .

# Agricultural activities that affect groundwater and their improvements

- Historically, agriculture formed closed, environmentally sound and sustainable system. However, methods of contemporary agriculture have change and impact on the soil and water environments is registered in many parts of the world.
- Groundwater diffuse pollution by nitrates and pesticides through extensive use of fertilizers and agro-chemicals and site effects of irrigation(water losses or return flows) and drainage practices producing groundwater salinization are typical impacts of agricultural activities on groundwater quality.
- Groundwater from shallow aquifers in fluvial deposits plays significant role for development and/or intensification of agricultural production, often substitute inequitable surface water services. However, often groundwater pumping is out of administration and payment control.
- Groundwater abstraction licensing for agricultural usage is needed.
- In vulnerable areas and protection zones of aquifers crop farming has to be controlled (crop rotation, selection of suitable fertilizers and pesticides and determination of doses, time, modes and techniques of their application) and water use productivity and efficiency of irrigation schemes and drainage systems must be improved.
- Management of transboundary groundwaters and agricultural activities has to be part of IWRM, Countries Water Master Plans and land use management.

## Examples of mitigation of human impacts on transboundary groundwater resources expressed in tangible costs

- **Tangible costs can be calculated eg. in relation to the**
- remediation of polluted groundwater with respect to the volume of water treated (m<sup>3</sup>), amount of pollutants recuperated (kg) and cost needed on pollutants removal from environment (currency unit / kg),
- evaluation of the effects of groundwater stress reduction measures with respect to the designated groundwater quality status and costs needed to achieve drinking water standards (costs needed on treatment of 1 m<sup>3</sup> water),
- regulation or change in crop farming practices in groundwater protection zones and calculation of related loss of income to compensate or contribute to the agricultural production fall to the farmers (tons/ha/year),
- groundwater level decline with respect to the increasing costs on groundwater pumping energy (energy costs / 1m gw level decline),
- establishment of early warning groundwater monitoring system to observe potential transboundary pollution transport and depletion impact (cost on 1 m well drilling and construction multiply by total number of wells and drilled metres).

## Examples of capacity building improvements in transboundary aquifers management expressed in un-tangible costs

- **Efforts focused on capacity building improvements:**
- Establish or improve operation of existing governmental and river basin authorities with the mandate to adopt and implement sustainable transboundary groundwater resources joint policy and management.
- Formulate precisely legal provisions on development, use, protection and management of groundwater resources.
- Establish and implement joint regulatory and control mechanisms based on water quality standards, on consumer and polluter pays principles, and repressive and stimulating instruments.
- Harmonize groundwater resources management principles across shared aquifers and sectors in countries involved.
- Integrate land and groundwater resources management.
- Establish common scheme for public participation and modes of communication between different target groups in transboundary groundwater resources management.

## **Group 2: Proposed topics to the discussion**

- **Water pricing policy in SEE countries: Full price or subsidize price of water – Different water pricing policy in different sectors – Price of water as a instrument for water sustainable and efficient use.**
- **Change or regulation of farming practices in groundwater protection zones could lead to the loss of farmer income. What is the present status of funding mechanism in SEE countries to compensate (or contribute) in protection zones agricultural production fall to the farmers.**
- **Present status of institutional and scientific capacities responsible for joint integrated management of transboundary aquifers and water resources governance in SEE Region.**