



Transboundary water resources management and cooperation

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+ In the 21st century



Destruction of ecological balance
(Global environmental problems)

Globalization of the economy
(economic crisis, market forces , economy of the “few”)

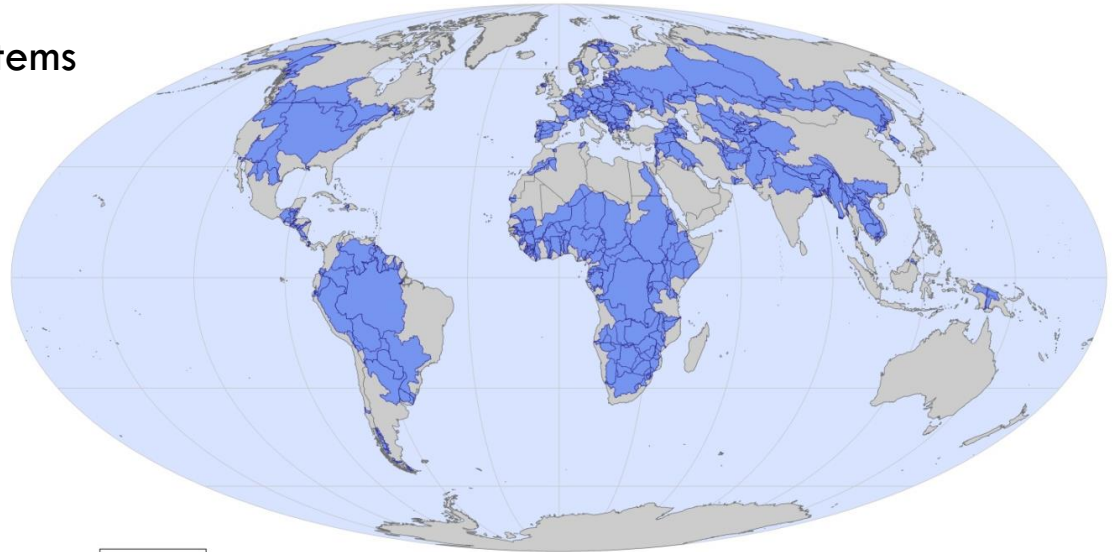


Solution: INTERNATIONAL COOPERATION



Transboundary River Basins

- ❑ **276** transboundary river basins
- ❑ **300** transboundary aquifer systems
- ❑ **40%** of the world's population
- ❑ **75%** of all countries
- ✓ International cooperation
- ✓ Effective water diplomacy
- ✓ Effective institutional legal framework



Transboundary Freshwater Dispute Database
Oregon State University, 2010

International Legislation

- International Legislation for the Non Navigational Uses of International Watercourses (1911)
- Helsinki Convention (1966, 1992 revised)
- EU WFD (2000/60/EC)

The Competition for Water

- Use vs. Use
- Present vs. Future
- Region vs. Region
- Quantity vs. Quality
- Water vs. Other Natural Resources
- Water vs. Other Social Priorities

Potential Water Conflicts Arise:

- Out of scarcity (permanent and temporary)
- Out of differences of goals and objectives
- Out of complex social and historical factors (such as pre-existing antagonisms)
- Out of misunderstandings or ignorance
- Out of skewed power between localities, regions, or nations
- Out of significant data gaps or question of validity and reliability
- Out of particular hydropolitical issues at stake (e.g. dam construction)

A. INTERDEPENDENCY “INDEX”

[Interconnectedness and Interaction]

- Surface/groundwater
- Dependency on inflow from other basins
- Operational/administrative capacity
- Overall water availability
[water stress-scarcity-poverty]
- Sectoral use of water
- DPSIR interaction

B. COOPERATION/CONFLICT “INDEX”

[direct and indirect]

- Mechanisms for water allocation (within)
- Friendship/hostility indicators
- “Conflict resolution” capabilities
- Number of treaties, conventions, etc.
- [cooperative events re: rivers]
- Forms of territorial conflict resolution
- [geographic focus]
- Unilateral projects
- Existence of law for judicious water distribution

C. VULNERABILITY “INDEX”

- Volatility or degree of rivalries and contestation
- territorial disputes, unstable governments
- Lack of social resilience (non-robust social system)
- Lack of preparedness, capacity to deal with conflict constructively
- “Water regimes”/ basins at risk, fraction of water originating outside the basin
- Unaccounted for water, esp. in urban areas
- Diminishing water quality

D. SUSTAINABILITY/DEVELOPMENT “INDEX”

- Conservation measures
- Redistribution mechanisms
- Degree of social cohesion
- Cultural conceptions of the environment
[eco-centric vs. anthropocentric]
- Cost recovery
- Social competence for dealing with conflict
peacefully

Trans-Boundary Watershed Management

Important issues related to climate change:

- The increase in future water variability
- Changing social, economic and climate conditions which may alter current hydro-political balances, in terms of potential inability of states to meet their treaty commitments. (where treaties exist)
- Water scarcity as effect of climate change will have impact on international conflict and security.
- An effective international legal framework addressing future challenges of climate change is required.

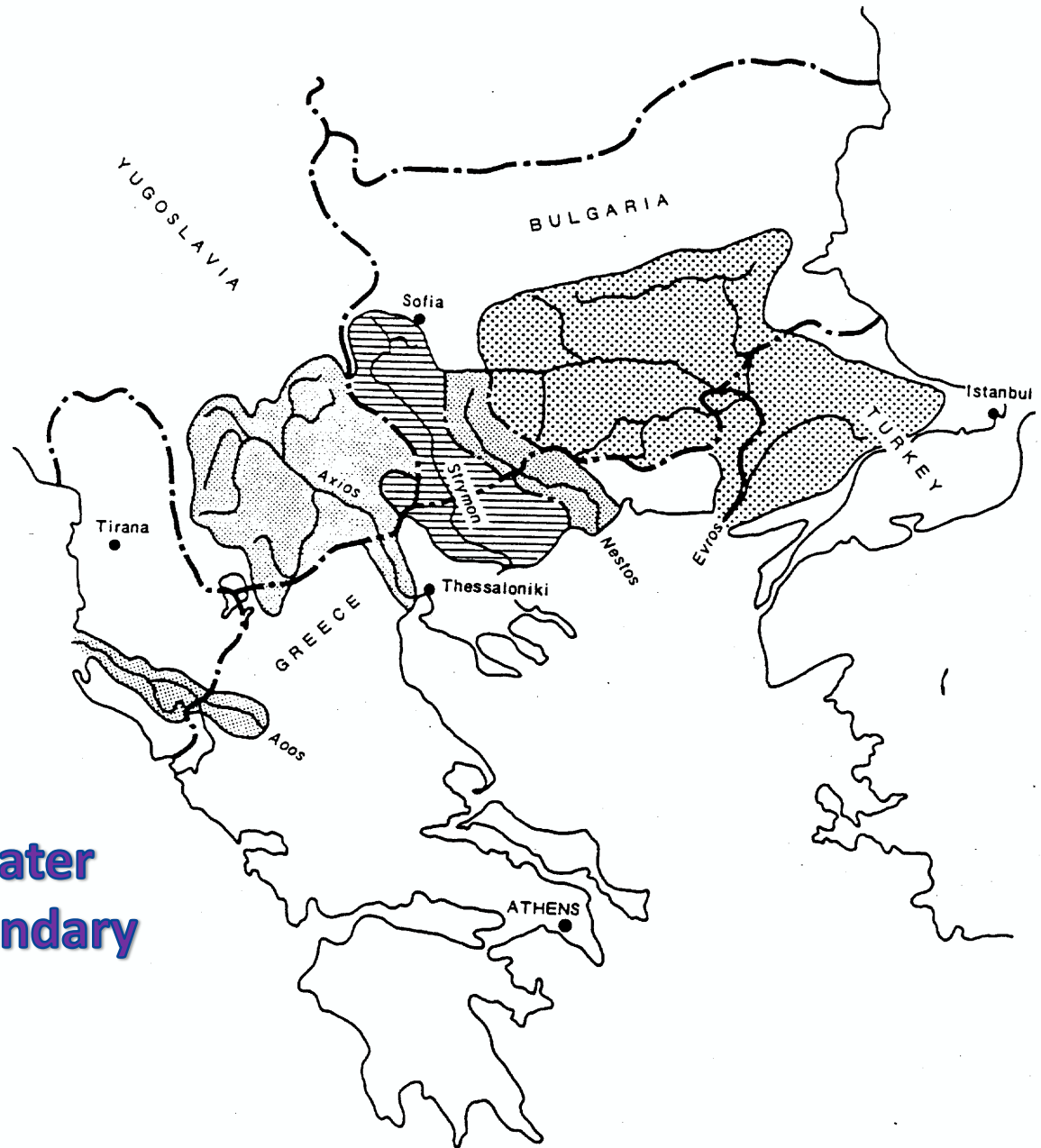
International cooperation

Challenges

Opportunities

| | Challenges | Opportunities |
|---|---|---|
| <p>Increasing benefits <i>“to the river”</i></p> <p>THE ECOLOGICAL RIVER</p> | <p>Limited water reserves, degraded ecosystems, quality issues .</p> | <p>Healthy water system: improvement of water quality, flow characteristics, biodiversity</p> |
| <p>Increasing benefits <i>“from the river”</i></p> <p>THE ECONOMICAL RIVER</p> | <p>Not optimal use of water for the different activities</p> | <p>Joint water planning Effective management, better water allocation, flood management, development</p> |
| <p>Decreasing the cost <i>Because of the river</i></p> <p>THE POLITICAL RIVER</p> | <p>Conflicts in regional / national / international level / political tension</p> | <p>International cooperation, peace, security. Minimize the risk of war</p> |
| <p>Increasing benefits <i>“beyond the river”</i></p> <p>THE CATALYTIC RIVER</p> <p>Sadoff et al. 2002</p> | <p>Fragmented management / inefficient administrative schemes</p> | <p>Integrated planning, development of joint projects, contributory, benefit sharing</p> |

International river basins in Greece



25% of N. Greece water comes from transboundary river basins

The Area Under Study

- Balkan Peninsula (fYROM upstream - Greece downstream)
- **25,000 km²** (82.59% fYROM - 12.25% Greece)
- Total length **380 km** (74km Greece)
- Total population **1,960,000 inh.** (1,800,000 fYROM – 158,000 Greece)



http://kpe-kastor.kas.sch.gr/biodiversity_site/b23/deltaaxiou.htm

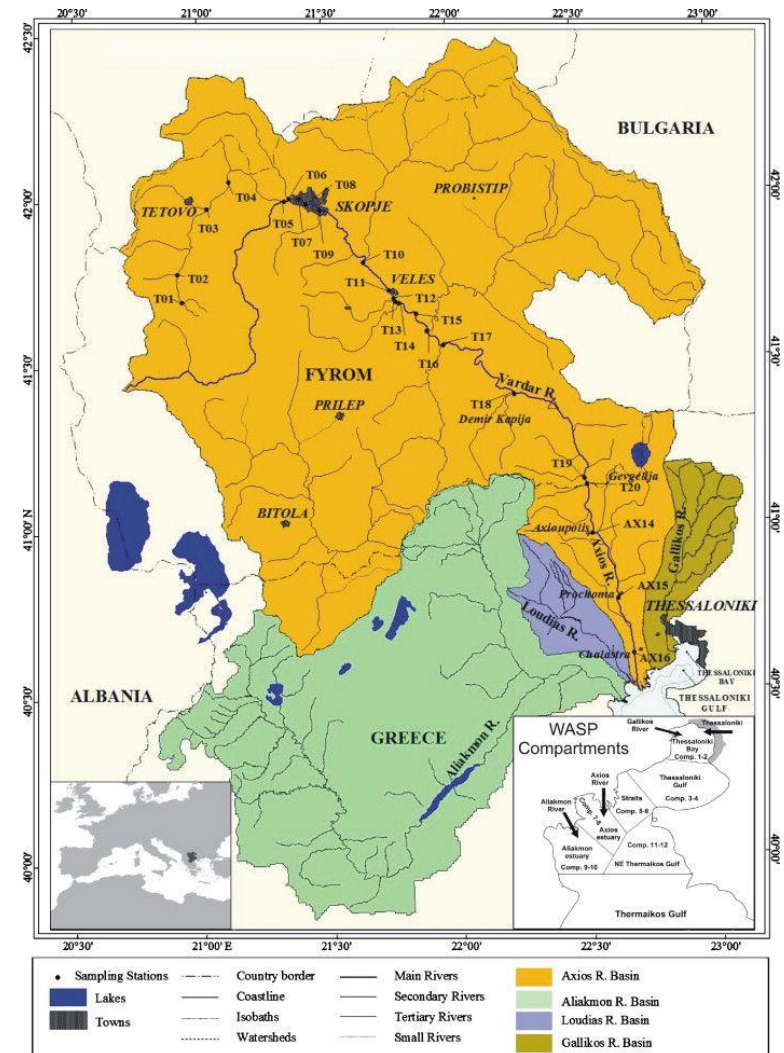
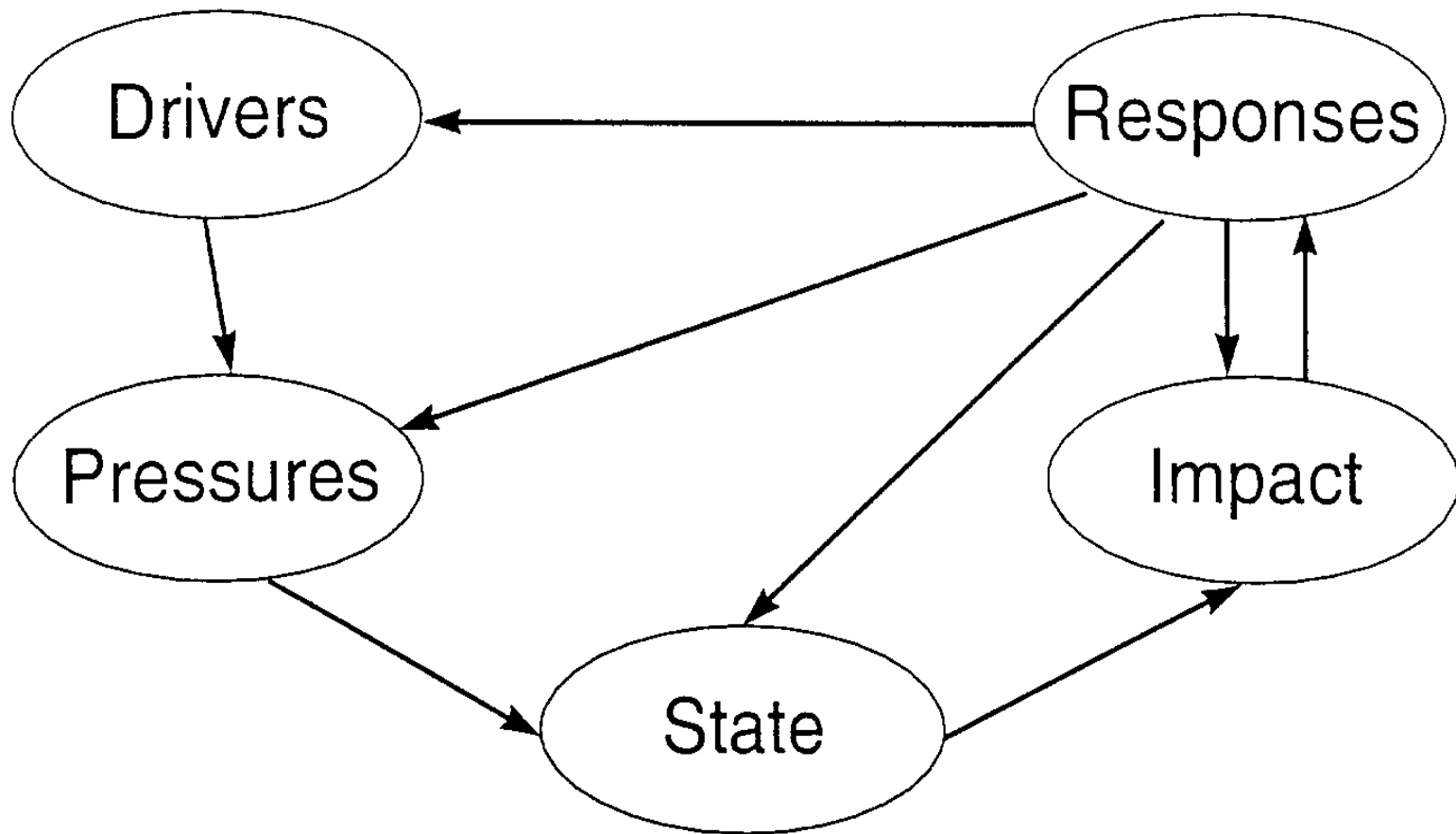


Figure 1: The DPSIR Framework for Reporting on Environmental Issues



The DPSIR methodology

- Describe the various cause-effect relationships that can be developed by the interdependency between
- **drivers and pressures of the economy** which define
 - **the state of the environment and the main impact in it** and
 - form the **response of the system** in the sense of policies applied to tackle with the situation.

Drivers

Vardar river has a significant role for **national economy**. Almost all of the economic activities depend on the river. A significant number of development and infrastructure projects such as irrigation, water and sewage networks, wastewater treatment plants and waste management programs have already been scheduled for the near future.

Moreover, in an effort to expand economic development, in terms of energy production, FYROM has developed new projects that will generate hydropower.

DPSIR Analysis for the Transboundary Axios RB

Drivers

fYROM

- Largest river body in fYROM (RB covers the 86.9% of the country)
- National Economy
- Development & infrastructure projects scheduled for the near future
- Runs through the biggest cities of the country (Skopje (pop. 530,258), Veles (pop. 55,108), Negotino (19,212) & Gevgelija (15,685))
- Energy production – hydropower
- 79% of total water demand
- Water management plan according to EU WFD guidelines

Greece

- Regional development
- 85% of shellfish production of the country
- Estuary of unique value (NATURA 2000) **Serious obstacle: Veto raised by Greece** (Paris & Bern treaty –

DPSIR Analysis for the Transboundary Axios RB

Agriculture

| | Pressure | State | Impact | Response |
|-------|--|-------|--|---|
| FYROM | <ul style="list-style-type: none"> •Demand: 731,732,000 m³/yr – 99,918 ha •75% of irrigation - reservoirs – 25% -wells & rivers •Uncontrolled use of pesticides & fertilizers | | <ul style="list-style-type: none"> •High concentrations of total P & nitrites | <ul style="list-style-type: none"> •Perspective of a common water management plan •Monitoring programs •Orientation of patterns on both sides •Optimization of water resources •Joint research projects / international campaigns and training of farmers through seminars |
| | <ul style="list-style-type: none"> •Major water consumer •Demand: 654,490,000 m³/yr – 144,943 ha •Rice cultivation (60% of total production) •Intensive use of pesticides & fertilizers | | | |

(National Water Resources Management Plan of the River Basins of Central Macedonia, 2013)

DPSIR Analysis for the Transboundary Axios RB

Urban Use

| | Pressure | State | Impact | Response |
|--------|--|---|---|--|
| fYROM | <ul style="list-style-type: none"> •60% of population in large cities •Absence of WWTP <ul style="list-style-type: none"> - 6% of total wastewater is treated prior to discharge - Skopje, Bitola, Prilep, Tetovo, Gostivar, Veles & Stip, have no wastewater treatment plants | <ul style="list-style-type: none"> •High values of: <ul style="list-style-type: none"> -BOD₅ -Ammonium Inorganic nitrogen & phosphorous con. are increased after big cities | <ul style="list-style-type: none"> •Water quality degradation •Threat for sensitive ecosystems & biodiversity | <ul style="list-style-type: none"> ✓Perspective of a common water management plan GR ✓Provide expertise, know-how & investments for the construction of projects for the improvement of water quality (WWTP, sewage networks) |
| Greece | <ul style="list-style-type: none"> •Abstractions for drinking water: 63,030,000 m³/yr (96% groundwater) •7 WWTP - Effective reduction of pollution loads | <ul style="list-style-type: none"> •BOD₅ con.: 147 tn/yr •Total N con.: 92.2 tn/yr •Total P con.: 24.4 tn/yr | | |

DPSIR Analysis for the Transboundary Axios RB

Cattle Breeding/Shellfish & Mussels Production

| | Pressure | State | Impact | Response |
|--------|---|--|--|---|
| fyROM | <ul style="list-style-type: none"> •Wastewater discharges (nutrient and microbiological loads) from large farms •Production of organic manure: 3,000,000 tn/yr | <ul style="list-style-type: none"> •Poor quality surface water •Threat of nitrate pollution | <ul style="list-style-type: none"> •Threat: - Pasture areas - Groundwaters - Biodiversity | <ul style="list-style-type: none"> ✓Perspective of a common water management plan GR ✓Provide expertise, know-how & investments for the construction of projects for the improvement of water quality (WWTP, sewage networks) |
| Greece | <ul style="list-style-type: none"> •Shellfish & mussels production in Axios estuary -85% of the total Greek production •Production: 30,000 tn/yr (70-80% is exported) | <ul style="list-style-type: none"> •Dense arrangement of cultures in shallow waters – Algae Blooms •Accumulation of solid waste at seafloor | <ul style="list-style-type: none"> •Threat: -Monoculture of shellfish & mussels (Algae blooms) -Sensitive estuary's ecosystem | |

DPSIR Analysis for the Transboundary Axios RB

River Accumulations/Alterations – Energy Production

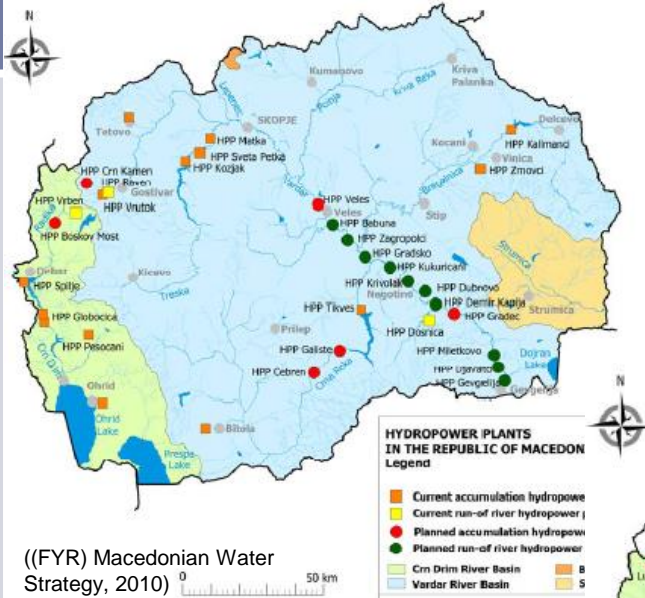
Pressure

fYROM

- Present accumulations
 - 17 multifunctional large dams – total capacity 1.7 billion m³
 - > 100 small dams
- Future projects
 - 15 new medium & large HPP (10 run-off river, 5 multifunctional with reservoirs – total capacity > 1.4 billion m³) – Vardar Valley Project
 - Numerous small HPP
 - Enrichment of Lake Doirani by Axios resources at Gevgeliya

Greece

- Present accumulations
 - Ellis multifunctional dam – Abstraction for irrigation: 16,542,000 m³/yr
 - Eleousa's small HPP
 - Arzan reservoir – Irrigated area: 11,332 ha



((FYR) Macedonian Water Strategy, 2010)

Response

Quantity
Natural flow
The
Axios

Sensitive ecosystems protected Axios risk



((FYR) Macedonian Water Strategy, 2010)

Priority Issues

- ✓ Absence of bilateral agreement
- ✓ Transboundary Cooperation only in epistemic community
- ✓ Quantity & quality issues
- ✓ Greece (downstream country) faces danger of potential “**pollution accident**”
 - Axios estuary & Thermaikos Gulf **at risk**
- ✓ Axios is used for the:
 - ❖ 85% shellfish & mussel production of Greece
 - ❖ Cultivation of significant amounts of rice
- ✓ Total absence of crisis management in the whole RB

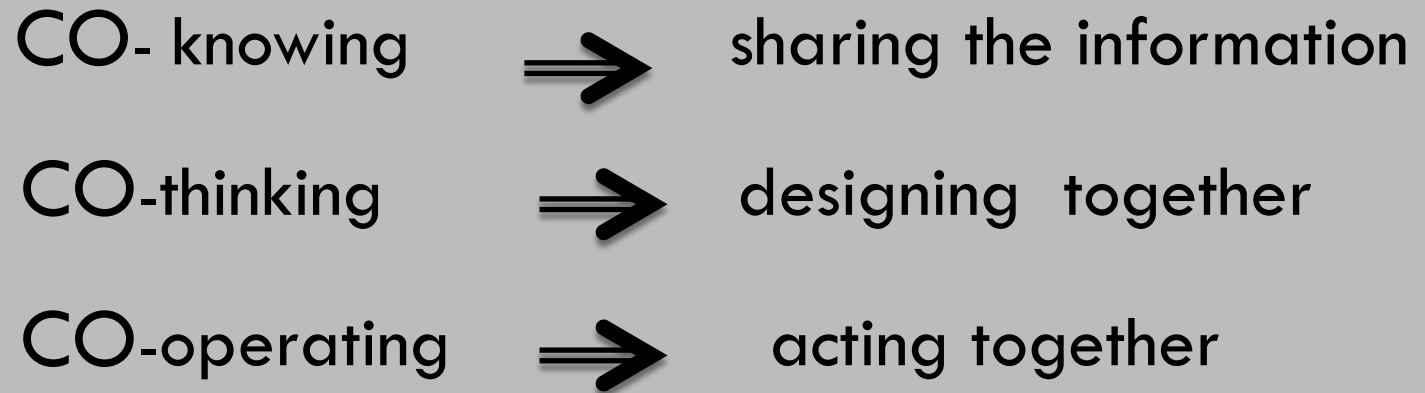
Issues for Transnational Consultation

- ✓ Implementation of the European Directive 2000/60/EC & corresponding adjustments
- ✓ Joint agreement regarding water management in the international Axios River Basin
- ✓ Developing new & improving existing joint monitoring networks of environmental parameters
- ✓ Coordination to achieve the objectives of the Directive in Axios River Basin in the next program period (2015-2021)
- ✓ Joint River Basin management plan in program period 2021 - 2027
- ✓ Crisis Management: Joint action plan for emergency situations (e.g. industrial accidents, extreme droughts, floods)
- ✓ Promoting of common development philosophy for the entire region
- ✓ Consultation on high priority projects

Cooperation or conflict?

- The political tension between the two countries
- The different development goals
- Different socio-economic conditions
- Lack of bilateral agreement
- Lack of data
- Maintain security and peace
- Promote a common vision of the whole region
- Promote joint research projects
- Promote development

Sustainable transboundary water management



How and through what kind of processes water in transboundary river basins may unify rather than divide sharing nations?

How stakeholders in international water catchments may increase their benefits without causing losses to others?



A step forward

- Develop an approach towards the equitable allocation not of the water but the **benefits** deriving from it.
- Therefore, a shift is needed from a dialogue mostly focused on the **rights** a country feels it is entitled, to the **needs** - namely what is actually required to achieve its goals.
- Effective transboundary cooperation demands “parts” that want to “work” with their opponents, show good faith, introduce solutions and facilitate negotiations.

Conclusion

- International agreement is extremely difficult



Key Elements for Success

- ✓ Political will
- ✓ Joint decision making
- ✓ Enactment

Rivers are political systems....

- Management of rivers is political; management of international rivers is very political...
- Rivals... dwellers on opposite banks of a river
- The Chinese got it right long ago:





John Schaar

“The future is not result of choices among alternative paths offered by the present, but a place that is created” ---

- created first in mind and will,
- created next in activity.

- The future is not some place we are going to, but one we are creating.
- The paths to it are not found but made, and this activity of making them changes both **the maker** and **the destination.**”