IW:Science

Findings of the GEF IW:Science Project

A Synopsis and Analysis of Science behind 20 years of IW Projects and Priorities/Challenges of the Future

UNEP

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UNITED NATIONS UNIVERSITY

UNU-INWEH

Findings of the GEF IW:Science Project

Part 1.

Overview of the core findings and key messages of the IW:Science project.

- Synopsis and Analysis reports from each of the IW WG
- the Synthesis reports

Findings of the GEF IW:Science Project

Part 2.

Discussions on how to ensure a sustained uptake of the IW:Science project findings with key audiences

- Governments , IAs and Stakeholders
- GEF STAP
- IW:LEARN, IW Portfolio, CoPs
- The GEF Secretariat, providing input to the TDA and tracking tool development

Part 1

An IW Learning Project

- To conduct a science review, synopsis, analysis and finally a synthesis process of 20 years of IW.
- Transboundary water systems types: River Basins, Lakes, Groundwater, the Coastal Zone/Land-based Pollution, and LME & the Open Ocean.
- Global team of ca. 80 scientific experts, key GEF project scientists and project partners the IW portfolio underwent a systematic process to;

Methodology

- Gather GEF IW project information – IW:Science KMS.
- Prepare a Synopsis - extract and assimilate the scientific underpinnings.
- Conduct an Analysis
  - critical emerging science issues & research needs for targeted intervention,
  - the application of science for adaptive management and the development and use of indicators to support IW projects.

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Two Synthesis Reports from 20 Years of GEF IW Activities on:

1. Critical Emerging Science Issues in the IW Focal Area
2. Science for Adaptive Management & Development and Use of Indicators to support IW Projects

3.Synthesis

2. Analysis

1. Synopsis

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SYNOPSIS REPORT
RIVER BASINS
A global Synopsis of River Basins science and transboundary management
ANALYSIS REPORT
RIVER BASINS
A global Analysis of River Basins science and transboundary management
GEF IW:Science Project
GEF IW:Science Project


IW:Science
SYNOPSIS REPORT
LAKES
A global Synopsis of Lakes science and transboundary management
ANALYSIS REPORT
LAKES
A global Analysis of Lakes science and transboundary management
GEF IW:Science Project
GEF IW:Science Project


IW:Science
SYNOPSIS REPORT
GROUNDWATER
A global Synopsis of Groundwater science and transboundary management
ANALYSIS REPORT
GROUNDWATER
A global Analysis of Groundwater science and transboundary management
GEF IW:Science Project
GEF IW:Science Project


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SYNOPSIS REPORT
LAND-BASED POLLUTION SOURCES
A global Synopsis of Land-based Pollution Sources science and transboundary management
ANALYSIS REPORT
LAND-BASED POLLUTION SOURCES
A global Analysis of Land-based Pollution Sources science and transboundary management
GEF IW:Science Project
GEF IW:Science Project


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ANALYSIS REPORT
LARGE MARINE ECOSYSTEMS AND THE OPEN OCEAN
A global Analysis of Large Marine Ecosystems and the Open Ocean science and transboundary management
SYNOPSIS REPORT
LARGE MARINE ECOSYSTEMS AND THE OPEN OCEAN
A global Synopsis of Large Marine Ecosystems and the Open Ocean science and transboundary management
GEF IW:Science Project
GEF IW:Science Project

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SCOTTISH ASSOCIATION for MARINE SCIENCE

UNESCO

UNEP

LOICZ

ELME European Lifestyles Marine Ecosystems

UNITED NATIONS UNIVERSITY UNU-EHS Institute for Environment and Human Security

CANADIAN WATER NETWORK RÉSEAU CANADIEN DE L'EAU

The University of Plymouth

UNITED NATIONS UNIVERSITY UNW-DPC

UN WATER UN-Water Decade Programme on Capacity Development

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Synthesis – Across IW

Synthesis of the IW system type findings to provide:

- a portfolio-wide IW picture, and
- information to assist GEF IW with future prioritization, planning and implementation.

In the areas of

1. ‘Critical Emerging Science Issues and Research Needs for Targeted Intervention in the IW Focal Area’

2. ‘Application of Science for Adaptive Management & Development and use of Indicators to support IW Projects’

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Synthesis Findings - GEF:

- Experiential learning from IW projects needs to be converted to a "transferable" synthesis, benefiting ongoing and new projects
- To ensure that IW projects are based on contemporary science (not 15-20 year old science)
- GEF needs to identify the gaps in existing water science pertinent to IW projects, and help address them
- Results based management for the IW portfolio needs to be based on contemporary/cutting edge science

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Findings

Each Working Group:

- River Basins & Lakes
- Groundwater
- the Coastal Zone/Land-based Pollution
- LME & the Open Ocean

Rivers and Lakes

Summary of Findings & Recommendations

Rivers & Lakes

- Science plays an important role as the foundation/basis of project designs and implementation activities
- Most projects are mainly on water quality, many others on hydrology/water balance and social/governance issues
- Important emerging issues for consideration in future projects:
  - Climate variability and change
  - Contamination from pharmaceutical products/wastes
- A number of methods applied to engage local and international scientific entities
  - Underrepresentation of social scientists
  - Lack of involvement of local communities/universities especially at early stages
  - Role of stakeholders involvement plan

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Rivers & Lakes

- Outcomes of projects helped enhance knowledge on basin issues, including evidences on relationships between physical and human components of basin issues
- Results/science were communicated through different methods (publications, websites, symposia, etc.)
  - Few known publications in peer-reviewed journals
  - Lack of peer-review - lack of formality and visibility of findings and recommendations to allow an efficient contribution to policies
- Importance of reliable scientific data and its dissemination for linking science and policy implementation
- Several evidences of use of project outcomes
- Sustainability of some project components relies on the availability or improvement of local expertise

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Rivers & Lakes

- Some projects identified impact indicators
  - Development/selection of indicators is not clearly indicated
  - Verification of project benefits not integral part of projects
  - Need to institutionalize monitoring in riparian countries through the transboundary organization/commission
  - Importance of harmonized and standardized measurements
- Adaptive management (TDA-SAP cycles) is evident in basins with longer history of GEF-funded series of projects
- Suggestions for communicating newly-synthesized knowledge:
  - Develop a mechanism for all GEF projects to include and disseminate scientific information
  - Establish repository of scientific information
  - Encourage participation of certain user groups in the project activities (esp. local academic and research institutions)
  - Peer-review of documents and publication of scientific papers in refereed journals
  - Organize events for sharing of scientific findings and information

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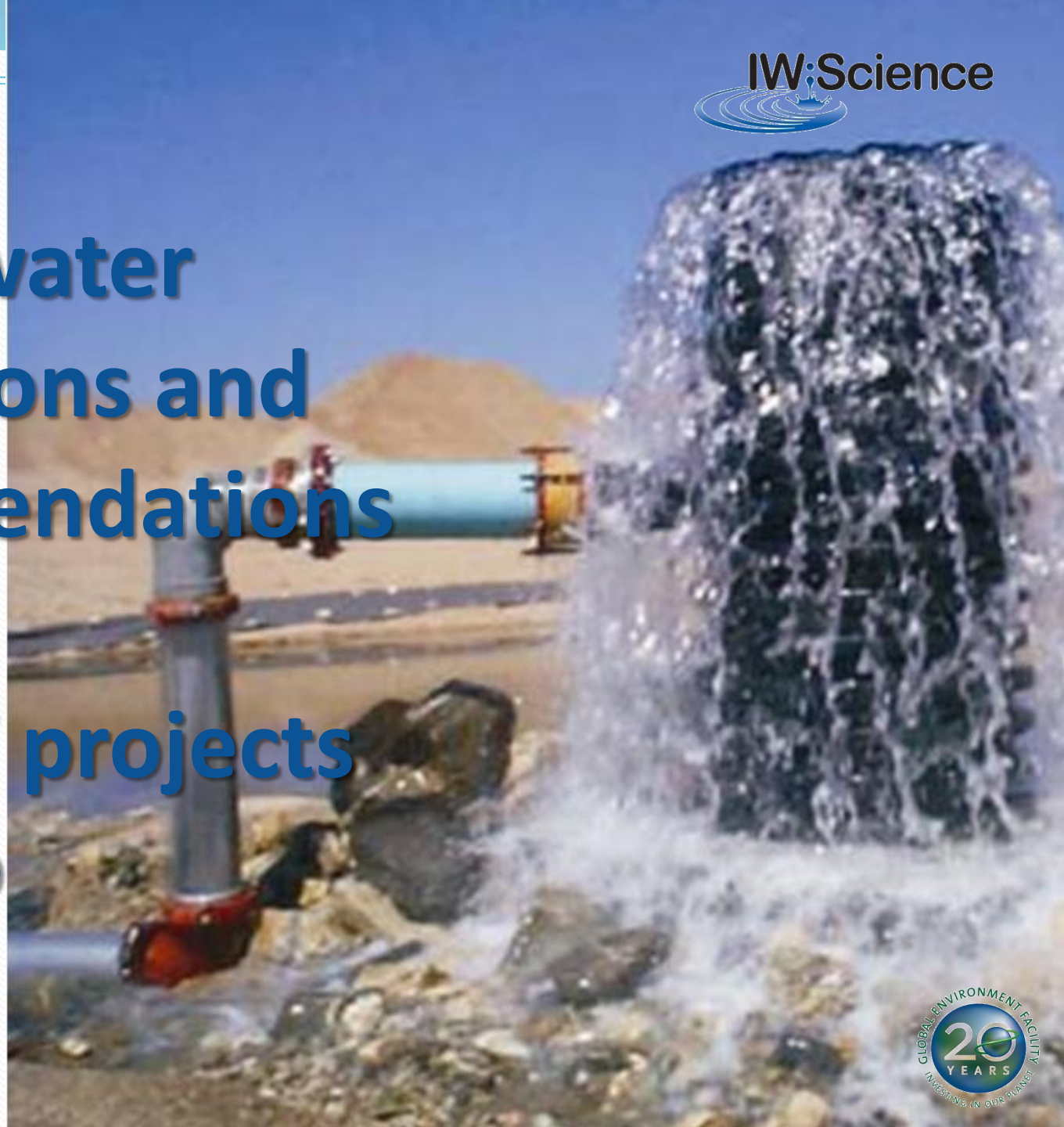
Groundwater Conclusions and recommendations on GEF's IW projects portfolio



General conclusions

- The reviewed projects have produced valuable scientific outputs
- Applied science rather than hard science
- Accessibility and dissemination of project documents is a prerequisite for learning: some projects are exemplary, others could do better

→ Knowledge management is crucial to ensure permanent accessibility of technical and scientific project outputs

‘Critical Science Issues’

- New projects need a holistic perspective, interlinking relevant policy fields *(e.g. water and land use)*
- Identification/analysis of drivers to be included in all projects that investigate possible futures *(e.g. using causal analysis)*
- Improve balance between natural and social sciences
- Multiple dimensions of processes needs to be captured in framework of analysis
- In large TBAs: actions to be focused on priority areas
- Model studies need proper calibration and should be alert on uncertainties

‘Generation and use of science for underpinning policy and management’

- Adaptive management is suitable to deal with uncertainty, but has its limitations for TBA management
- Good balance between local science and ‘wider science’ in the majority of the projects
- Transition from science to policy depends on many factors
- Project design shall include effective science communication
- Media plans are required in all IW projects

Recommendations on 'transition from science to management'

- Arrangements are needed for post-project activities
- RBM rather than AM is preferred for the short-term and it should be supported by a set of indicators *(still to be developed)*.
- A different set of indicators is needed to improve understanding, analysis and policy on TBAs *(in preparation by TWAP)*
- More attention has to be focused on winning political vision between states for TBA management.

Large Marine Ecosystems and Open Oceans

Critical Issues, not yet studied in detail

- Climate change adaptation, acidification, atmospheric change
- Multiple stressors, tipping-points, resilience of ecosystems

Critical issues raised, but not dealt with in large-scale

- Invasive species and diseases, ballast waters, illegal transport and aquaculture
- Causes of harmful algal blooms and nutrient ratio changes
- Impact of improper land-use and unregulated development

Anticipated, emerging issues

- Plastic, microfiber pollution
- Lifestyle chemicals (and nano-particles)
- Deep-sea fishing
- Seamount habitat destruction (conservation)
- Marine renewable energy, carbon capture and storage
- Underwater sound
- Exploitation of methane hydrates and environmental impacts

Potential approaches in dealing with critical emerging issues

- Improving usefulness of forecasting future conditions and consequences;
- Encouraging innovation (and mechanisms for evaluation) in technological, policy and social responses to achieve global sustainability

Coastal Dimensions,
Critical and Emerging Issues and Scales of Adaptive Management

Coastal dimensions

Population
Consumption
Trade

Climate
Sea level rise
Tectonic

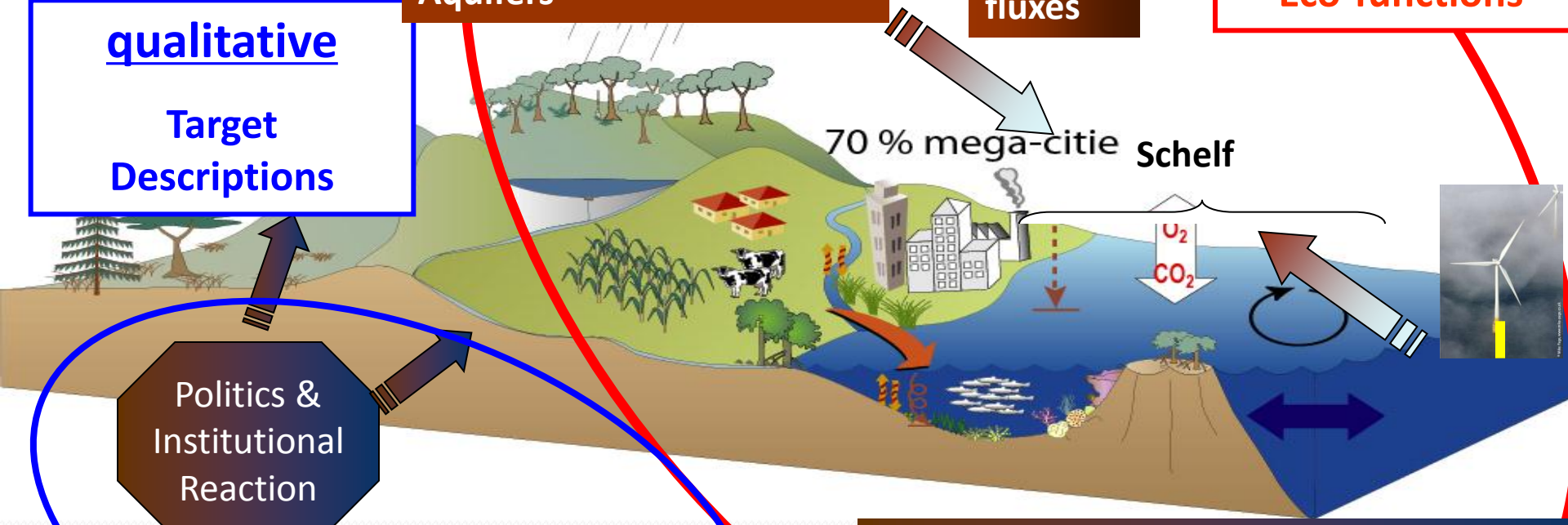
quantitative
biogeochemial fluxes,
"Eco-functions"

Rivercatchments, Lakes, Aquifers

Material fluxes

qualitative

Target Descriptions



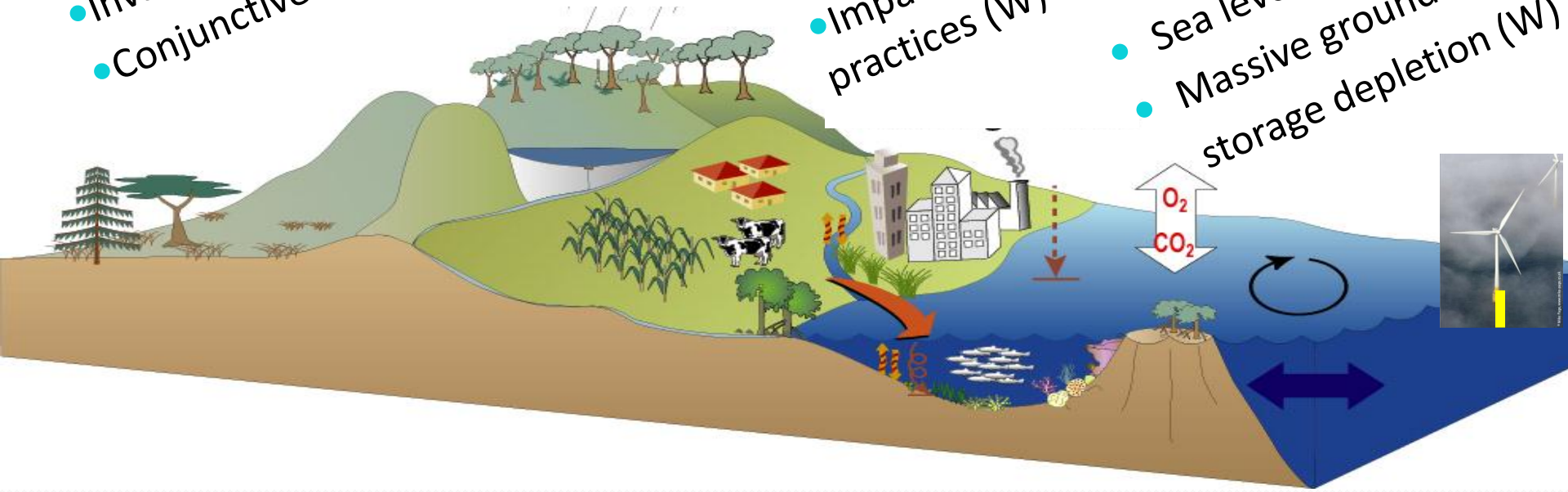
Politics & Institutional Reaction

Sozioeconomic Implications

changed Geomorphology
River-(Lake/Aquifer)-Coast-Shelf „Water Continuum" –biogeochemical Cycles, Productivity & Biodiversity, 90% Fishery,
Ecosyst. services: ~$17.5 trillion, (Global ES ~$33.3 trillion)

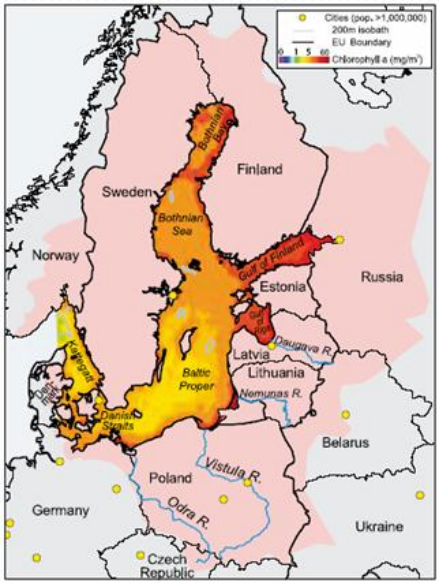
Current & emerging issues

- Land use changes, incl. water management (W)
- Water quality degradation (T/W)
- Invasive species (W)
- Conjunctive use of surface water and groundwater (T)
- Long range transport of contaminants (W)
- Impact of changing energy policies (W)
- Impact of changing agricultural policies and practices (W)
- Sea level rise (T/W)
- Massive groundwater storage depletion (W)



- Multiple stressors, tipping points and resilience of ecosystems (W)
- Invasive species and diseases, incl. ballast water (T), and aquaculture (W)
- Causes of harmful algal blooms and nutrient ratio changes (W)
- Impact of improper land use, unregulated coastal development/urbanization (W)

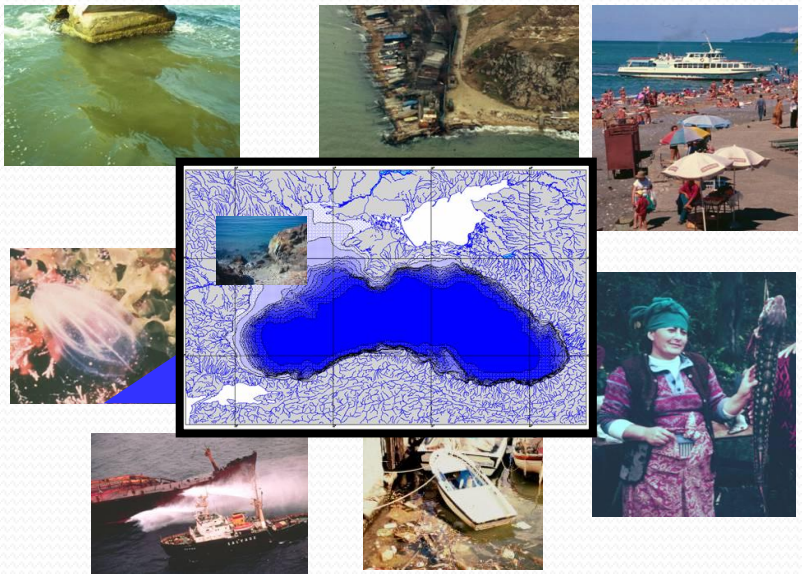
Scales of emerging issues: the water continuum in a socio-ecological system context; difficult to model appropriately?



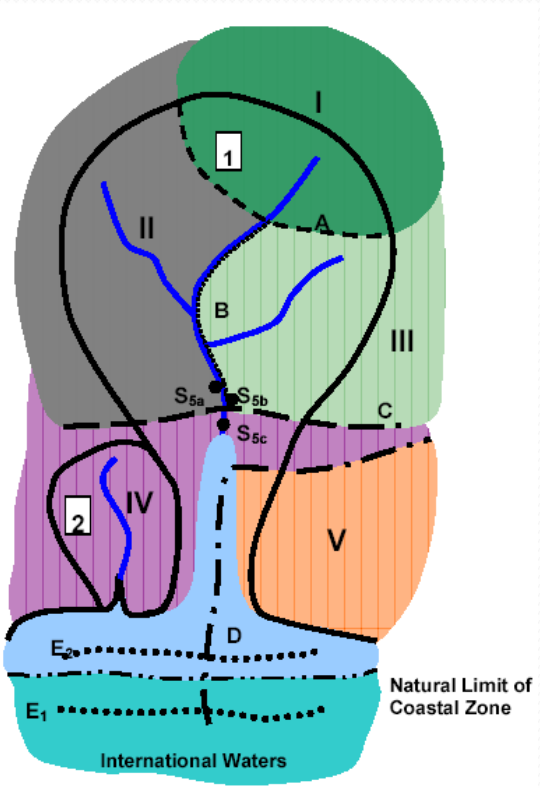
Natural and human sciences have different epistemologies and often lack a common currency.

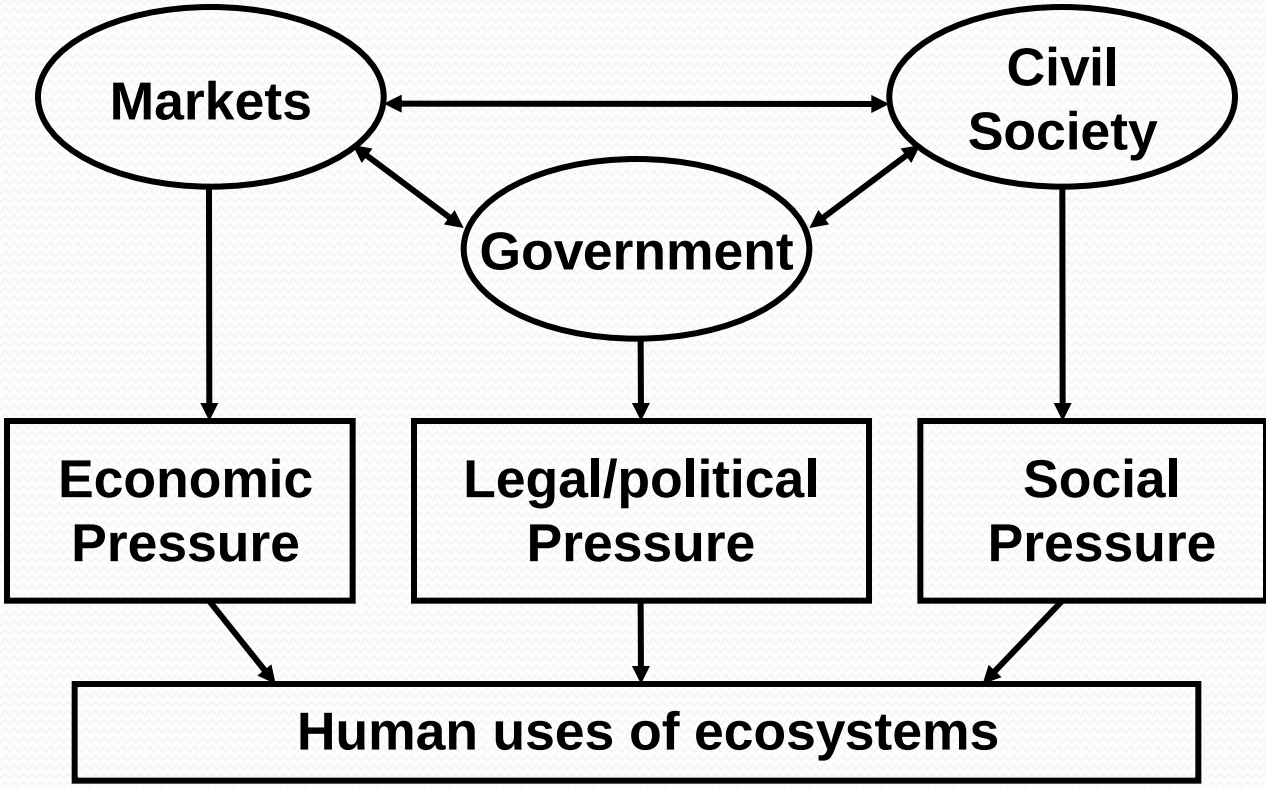
S-E systems demonstrate :

1. Non matching scales (e.g., regional seas scale analysis requires understanding of sub-systems in space and time!)
2. surprises (non-linearities – chaotic systems e.g., fish/climate/nutrients/hypoxia/socio-political change)
3. Interconnection with other systems
4. memory-effects
5. choke and switch points (requiring a proper system understanding and base line to identify potential thresholds



Scales of adaptive management: Human interaction with nature and mechanisms of regulation and institutional organization (Governance)





administrative and/or political scales in the water continuum

A: across river networks; B: following river courses.

C: coincidence of river catchment control station (S5) with international boundary; D: shared estuary between countries.

Limits of international waters, EEZ outside (E1); inside (E2) the geomorphic limit of the coastal zone. Political or administrative entities: I to V.

after Meybeck & Vogler 2005

LOICZ Governance WG, concept note 2007 and governance base-line handbook, Olsen et al 2009, LOICZ R&S 34

Part 2

Keeping in mind ...

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Synthesis Findings – User:

- IW Projects need to be better informed about contemporary science, as well as identify project-relevant research needs
- Synthesis through a broader scientific community needs to drive solutions for IW projects, help identify appropriate technologies and practices and facilitate adaptive management
- Developing countries need to ensure their capacity to develop and sustain their scientific know-how related to IW projects
- Based on a scientific gap assessment of the IW projects, the portfolio to identify ideas for targeted research
- Science-policy links and bridges need to be enabled – particularly based on a broader scientific synthesis

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Project Impacts

Improved utilization of science-based outputs of GEF IW projects to:

- Identify program gaps and prioritize future GEF interventions
- Strengthen the scientific underpinning for IW Transboundary Diagnostic Analysis (TDA)
- Catalyze the building of research capacity within the GEF IW family
- Strengthen results-based, adaptive management
- Improve science-to-management linkages

Discussion / Working Session

How to ensure a sustained uptake of the IW:Science project findings with the following key audiences;

- Governments of the countries that implement GEF projects, the Implementation Agencies, and stakeholders benefitting from GEF projects;
- GEF STAP;
- IW:LEARN, including the whole portfolio of projects and the Communities of Practices; and,
- The GEF Secretariat, providing input to the TDA and tracking tool development ?

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Thank You


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