Twin2Go

Coordinating twinning partnerships towards more adaptive governance in river basins

# D. 1.1: Review Report

## Different methodological approaches for comparative analyses in water management projects

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Authors: Claudia Pahl-Wostl, Britta Kastens, Louis Lebel (eds.)
with contributions from all Twin2Go Partners

**Twin2Go** Coordinating twinning partnerships towards more Adaptive governance in river basins

Coordination:

Prof. Dr. Pahl-Wostl | University of Osnabrück | Institute of Environmental Systems Research

Partners:

Adelphi Research | Germany

Chiang Mai University | Unit for Social and Environmental Research | Thailand

DHI | Denmark

EcoPolicy | Russia

Friedrich-Schiller-Universität Jena | Department of Geoinformatics | Germany

Soresma | Belgium

VITUKI | Hungary

Contact:

Dr. Britta Kastens

University of Osnabrück

Institute of Environmental Systems Research

Barbarastr. 12; 66/E24

49076 Osnabrück | Germany

E-Mail: info@twin2go.eu


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| **Lead authors** | Claudia Pahl-Wostl, Britta Kastens, both USF Osnabrück<br>Louis Lebel, Chiang Mai University |
| **Contributors** | (in alphabetical order) Anita Bartosch, Csilla Belavari, Jan Cools, Kathrin Knüppe, Palle Lindgaard-Jørgensen, Elena Nikitina, István Zsuffa |
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# 1. Introduction

Over the past years, the EU has funded several projects that undertook research on specific integrated water resources management (IWRM)[1] issues in case studies carried out on twinned river basins from Europe and from developing countries. The aim of Twin2Go is to review and synthesise the research on adaptive and integrated water resources management in basins around the world.

Actual approaches and measures applied in order to implement the IWRM concept still remain insufficient. Gaps refer for example to the elaboration on water management under uncertainty and development of approaches and methods towards adaptive water management strategies (GWP-TEC, 2000). Also, further development of the scientific base of IWRM is needed in terms of both empirical knowledge and concepts that allow effective transfer of successful experiences across basins and frontiers. To improve the conceptual and methodological base in order to realize the goals of IWRM, more flexible approaches, such as adaptive water management, have been advocated as an essential and timely extension of the IWRM approach (Pahl-Wostl et al. 2008; Moberg and Galaz, 2005). Adaptive management is defined as a "systematic process for improving management policies and practices by learning from the outcomes of implemented management strategies" (Pahl-Wostl 2007: 1). This definition goes beyond the original use of the concept in environmental management, which has been based upon the possibility of conducting well-defined experiments to test different hypotheses about system behaviour (Holling, 1976; Walters 1986). Water management is seen as a political process and the implementation of all policies is to some extent an experiment. The systems to be managed are too complex to predict with accuracy the outcome of management interventions and to know and control all relevant processes. Adaptive management in its novel conception is thus more responsive to changing conditions of and demands on ecosystems and also focuses on the constant re-evaluation of goals, objectives and perception of processes, since new information is developed.

IWRM as well as adaptive management require a framework where the different and often competing interests of the various water sectors find a common platform and where multi-sectoral stakes are regulated and balanced (GWP 2003, 2). This framework is usually provided by a governance structure that follows the needs of adaptive IWRM. Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society (Global Water Partnership 2002). The water governance system includes formal water rights or informal participatory approaches in more flexible management schemes. Governance also covers economic aspects (e.g. water pricing and the valuation of different water uses) and organizational forms of water management (e.g. different forms of public-private partnerships). The failure of governance systems has been identified as being one of the most important reasons for the increased vulnerability of populations to water related disasters (Rogers and Hall, 2003). Malfunctions in governance

[1] IWRM refers to 'a process which promotes the co-ordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.' (GWP-TEC, 2000: 22).

and the policy environment exacerbate the impact of variability and uncertainty related to climate change, population growth, urbanisation, and economic development.

So far, many studies on IWRM are descriptive and limited to recording success or failure of single cases. However, not much work is available on comparative analyses of management experiences in a wider range of river basins (Myint 2005; Wolf 1997). The aim of Twin2Go is to fill this gap and to review, compare, synthesise and consolidate the outcomes of several EU-funded, and other, projects on IWRM in basins around the world in order to draw context-sensitive, but transferable approaches for improving IWRM so that it becomes more adaptive. In total, selected basins of about seven projects will be analysed. These are the projects Brahmatwinn, WETwin, CABRI-Volga, ASEM Waternet. NeWater, TwinLatin and Twinbas.

A key element for scaling up the results of the different projects is to elaborate a comprehensive methodological framework that allows evaluating all important attributes of adaptive water management and adaptive governance in the context of the impacts of and adaptation to climate change. Considering the high variety of the projects involved in Twin2Go, the project aims at building a methodological basis for addressing the twin challenge of scaling up the projects' results in terms of multiplying them on a large scale and learning about scaling up by immediate interaction with the projects and their key stakeholders. Elaboration of the methodology thus takes place in direct and early co-operation with project partners to guarantee the comprehensive evaluation of all aspects and facilitation of knowledge exchange from the beginning.

The purpose of the comparative exercise is decisive to find or develop the methodological framework. In general, one can here distinguish between

- Assessment of the performance of current governance regimes
- In depth analyses of governance regimes and dependencies of different factors

Whereas the first exercise aims at an assessment of the current state, the second approach has the ambition to derive general insight on causalities and factors that lead to the current state.

Another distinction is between

- Focus on specific processes/factors and their influence on the water governance regime (e.g. influence of water price or role of corruption)
- Systemic approaches that try to analyze different regime configurations and their performance under different contextual conditions.

The purpose of the comparative analysis of Twin2Go is an assessment of the performance of governance regimes with the focus on adaptation to climate change. The assessment should be linked to an analysis of the factors that determine success or failure and the potential transferability of insights from one basin to others. Based on a first literature review (e.g. UNDP, 2000; Dietz et al 2003; Folke et al, 2005; Pahl-Wostl, 2007a,b; Pahl-Wostl 2009, Armitage, 2008, Rosenau, 1995; Ostrom, 2005; Saleth and Dinar 2004; Meinzen-Dick 2007), three essential dimensions that need to be addressed to be able to make a comparison of

governance regimes can be distinguished. These three dimensions refer to factors of **performance**, the **water governance regime** and the **context**. The first overview of their most important measures was identified within the Twin2Go kick-off meeting, which took place in Osnabrück in June 2009.

**Factors of the water governance regime include**

- Institutions and the relationship and relative importance of formal and informal institutions;
- Actor networks with emphasis on the role and interactions of state and none-state actors and power relationships.
- Multi-level interactions across administrative boundaries and vertical integration across levels and horizontal integration across sectors;

**Factors of the context** within which a governance regime in embedded refer to characteristics of the 'water system' that are assumed to have a strong influence on the nature of a water governance regime and its performance. Variables include the societal dimension and the environmental dimension e.g. including for the societal dimension

- State of societal development as indicator for available capacity (e.g. measured by the Human Development Index)
- Cultural properties
- Social sustainability (e.g. Gini Index as indicator for the extent of inequality of basic assets)
- Economic sustainability (e.g. GDP related measures)
- Effectiveness of formal institutions (e.g. measured by the Corruption Perception Index)

and for the environmental dimension

- Water availability and its variability
- Natural storage capacity
- Degree of human influence
- Water quality
- Biodiversity classification

Finally, **measures for the governance regime performance** should allow assessing and evaluating the degree of satisfaction with the current state of the regime. Obviously a governance regime should achieve its stated goals. Failure of doing so is a clear sign of a non-satisfactory performance without alluding to any normative claims. The following performance measures are based on normative principles:

- Fulfilment of good governance principles as indicators for the process dimension.
- Sustainability of the water system as measured along the three dimensions of sustainability with focus on water specific indicators.

Further, the ability to respond to the challenges of climate change is a more recent requirement. It is an indicator for the response to a specific challenge and a measure for the adaptive capacity of a regime. Here no generally agreed principles exist yet. Nevertheless one can state that the way how risks are managed and uncertainties are dealt with plays a major role.

As a first step for the development of a methodological framework, Twin2Go builds upon recent conceptual and methodological advances used in the projects. The report at hand provides a review of the methods and conceptual frameworks applied in the various projects and it represents the basis for the final methodological framework of Twin2Go. In the next section (section 2), the methodologies applied in the different projects will be described. Besides the purpose, design and analytical framework also the specific challenges of each method will be shown. In detail, the method descriptions cover the following aspects:

- Purpose
  - main kinds of research questions
  - Problem focus (attributes, factors of interest)
- Design
  - Units of analysis (spatial scale, time frame)
  - Case selection criteria (inclusion, exclusion)
- Analytical framework
  - Framework (actors, institutions, context, performance)
  - Measures (metrics, indicators, questions)
  - Graph/ figure of main components
- Challenges-Insights (method specifics)
  - requirements of methods: costs, uncertainties, data needs, political/ cultural (social) barriers
  - insights into what kinds of processes
  - Final synthesis statement on the methodology (judgement on the message, individual project experience, room for improvement)

Section 3 discusses the different methods regarding their suitability for a methodological basis to analyse factors of adaptive governance in the context of climate change. Moreover, the section will give a concluding overview of the available and missing methods' components for the development of an overall methodological framework for the Twin2Go project.

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# 2. Description of Methods used in the Twin2Go Projects

## 2.1 NeWater: Management and Transition Framework (MTF)

### 2.1.1 Purpose

The main purpose of the MTF is to conceptualize an interdisciplinary framework supporting the analysis of water systems, management processes and governance regimes. The MTF offers a standardized language for comparative analyses of various case studies. Due to this property, it allows deriving practical guidance for the implementation of transition processes towards more adaptive management of river basins. An additional target of the framework development was the integration of concepts from a variety of fields dealing with the characterisation of social systems, the behaviour of individual actors, interactions between social and ecological systems, as well as the dynamics of societal systems (with an emphasis on social learning and institutional change). Due to its modular structure the MTF can be adjusted to those aspects that are of interest, e.g. with regard to water management processes, governance characteristics and physical or social basic conditions.
A major advantage of the MTF is the support of flexible and context sensitive analyses without being case study specific. In doing so, it is possible to compare water management cases embedded in different social, ecological and economic contexts. The MTF enables conclusions as a basis for policy recommendations. The overall goal is to gain transferable insights on adaptive and integrated management practices that are resilient to climate and global change in a long-term perspective. For this, the MTF facilitates a “diagnostic approach” that considers the dynamics and complexity of water systems as well as the adaptive capacity of management regimes.

### 2.1.2 Design

The MTF analysis was done (and is still running) for the following seven cases:

- Guadiana Basin
- Rhine Basin
- Elbe Basin
- Tisza Basin
- Amudarya Basin
- Orange Basin
- Nile Basin

Most analysis was done for national parts of the basins. Though international, regional and local levels were also taken into account (e.g. institutional settings influencing local or basin specific issues). Typical time periods of processes investigated cover about ten to twenty years.

### 2.1.3 Analytical framework

The MTF builds on three conceptual foundations, which capture the overall thematic areas of:

- adaptive management and characteristics of adaptive and integrated water management regimes,
- social learning and transformation processes,
- the Institutional Analysis and Development framework to analyse collective choice processes

The *NeWater* assumptions of an integrative and adaptive regime based mainly on concepts and empirical evidence for the individual elements of a water management regime.

| | Integrated, Adaptive Regime |
|---|---|
| Management paradigm | Management as learning in complex adaptive systems |
| Governance style | Polycentric, horizontal, broad stakeholder participation |
| Sectoral Integration | Cross-sectoral analysis identifies emergent problems and integrates policy implementation |
| Scale of Analysis and Operation | Transboundary issues addressed by multiple scales of analysis and management |
| Information Management | Comprehensive understanding achieved by open, shared information sources that fill gaps and facilitate integration |
| Infrastructure | Appropriate scale, decentralized, diverse sources of design, power delivery |
| Finances and Risk | Financial resources diversified using a broad set of private and public financial instruments |

**Table 1:** Expected properties of integrated and adaptive regimes (Pahl-Wostl, 2008)

The framework consists of two main components, which will be briefly introduced in the following. The first component is the **MTF activity diagram** (see Figure 1 and 2), which addresses processes in water management. It distinguishes two overall types of management cycles, i.e. (classical) policy cycles and learning cycles. Whereas policy cycles serve to design and improve measures in the context of conventional management, learning cycles aim at finding and realizing alternative, more innovative approaches. In these learning processes, new actors from civil society are involved to develop and test experimental measures in a less regulated environment. Gained insights can be adopted in the established policy cycle. There are two types of learning cycles. On the one hand, double loop learning is about the reframing of problem perspectives to develop new management approaches. Triple loop learning on the other hand rather deals with the transformation of societal boundary conditions like underlying values and beliefs in order to open up further paths for water management.

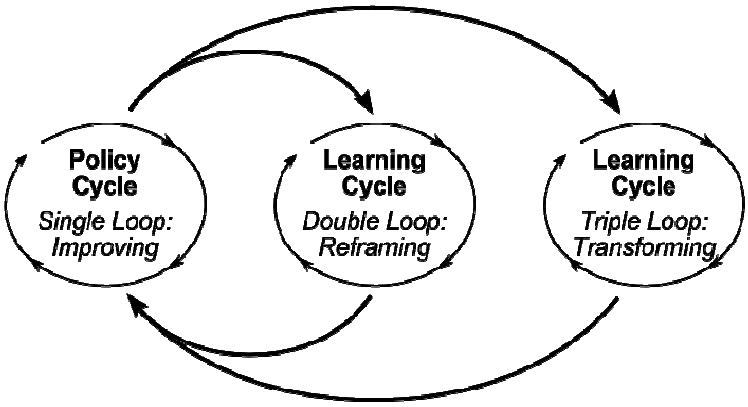


**Figure 1:** MTF activity diagram (triple loop learning): improving, reframing, transforming (modified after Pahl-Wostl 2009, p. 361)

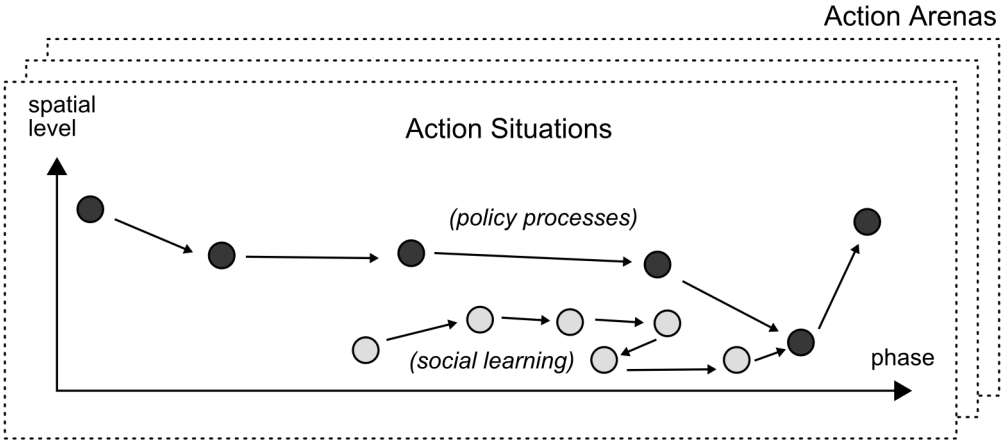


**Figure 2:** Simplified illustration of policy and social learning processes consisting of connected Action Situations (modified after Knieper et al. (submitted))

The second component is the **MTF class diagram** (see Figure 3). It deals with the various elements that are embedded in water systems and addresses their interactions. The class diagram serves to examine the basic conditions that shape the setting for water management. For instance, it is possible to take into account structural determinants like ecosystems and their services, institutional settings and technical infrastructure. Furthermore, the MTF class diagram allows for analyzing the main elements that play a role in the interplay of management processes (e.g. actors, action situations, action arenas). In this way, governance properties can be identified as well as their effect on the adaptive capacity of river basins. The class diagram explicitly takes into account influencing factors for human behaviour (e.g. mental models, situated knowledge). In this sense, the MTF represents a tool for in-depth analyses of the interdependencies in water management and of the underlying basic structural conditions.

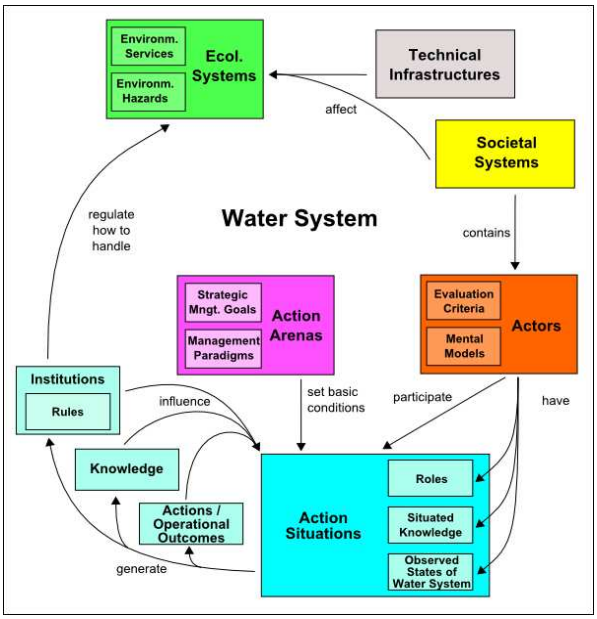


**Figure 3:** MTF class diagram (simplification) – addressing the elements in the water system and their linkages.

### 2.1.4 Challenges (method specifics)

- Analysis of complex management regimes requires a big amount of data, especially detailed data are hard to get (e.g. situated knowledge, roles of actors)
- Cooperation willingness of case study experts
- In spite of a shared language and the same criteria applied to map each case, there is still a certain degree of freedom how to represent a case (especially when various people are involved), which affects the results of analyses
- A high number of cases is needed to derive insights that can be generalised (large workload required)
- The large amount of data may have the consequence that people run the risk of loosing the overview, which reduces the quality of the formalised case representation

Next to these challenges, hitherto experience let us conclude that the MTF can be a valuable approach to conduct comparative analyses of water management regimes. The main benefit of the approach is that the framework provides a comprehensive shared language, which is prerequisite for systematic comparisons.

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## 2.2 Method of BRAHMATWINN Project

### 2.2.1 Purpose

Main aim is the analysis of the extent to which existing governance arrangements within a country facilitates IWRM in the context of climate change.
Important issues: transboundary water management and conflicts, data exchange and lack of communication, monitoring networks, problems of water availability (floods and droughts), respective problems like river bank erosion and sedimentation

### 2.2.2 Design

- Described governance analysis was done on national level, but within the BRAHMATWINN project governance system in respect to IWRM was evaluated for different levels:
  - International level: basin wide organizations, bilateral agreements
  - National level, national law and institutions
  - … until smallest level where data are available, regional level, sub-basin level (Wang Chu in Bhutan, Lhasa River in Tibet)
- Inclusion of all countries within the Upper Brahmaputra River Basin (Tibet, Bhutan, NE India) and Upper Danube River Basin (Germany and Austria)
- Focus on major problems in the area, e.g. flood management in Indian state Assam

### 2.2.3 Analytical framework

Project partner: Scientists from systems analyses, socio-economy, water law and policy, natural sciences, engineering and computer sciences ensure holistic system approach

The type of experts to be consulted during field trips includes:

- government officials responsible for law & policy development, implementation and review within the relevant ministries, ie., energy, agriculture, foreign affairs, environment (national environment commission), forestry, local development, disaster management, etc;
- local authority officials within the case basin responsible for implementation of law and policy - both district and community level (geog), including representatives of the above mentioned national ministries;
- academics with expertise in law, including constitutional, international and environmental law;
- international organisations with an in-country presence that are working on law and policy issues broadly and especially related to natural resources;
- Private lawyers/ policy consultants involved in developing, implementing and reviewing law related to IWRM and climate change.

Context:

- Analysis of institutional framework and how water management is organized, hierarchal structures and division of responsibilities

- Consideration of expected future climate conditions and runoff due to downscaling of GCM scenario data (until 2080) and hydrological modeling
- comprehensive analysis of natural environment and human dimension as well as of existing IWRM practices
- Performance:
- Effectiveness of formal institutions in form of commitments and implementation analysis
- Analysis of governance in respect to 4 good governance elements: accountability, transparency, predictability and participation

- a set of questions (Annex I) designed and structured in a way that provides key information concerning the four elements of governance; key questions/ issues of interest are listed in the Annex
- a set of integrated indicators suitable to identify and quantify the present system status and system changes
- They are based on a comprehensive system assessment by means of a DPSIR approach (framework for system understanding): Driving forces, pressure, state, impacts and response
- chosen indicators are based on existing indicator catalogues and additional legal and institutional indicators were developed for the management of trans-boundary waters
- indicators ordered in categories/pillars of sustainability: Environmental, Social, Economic, Governance

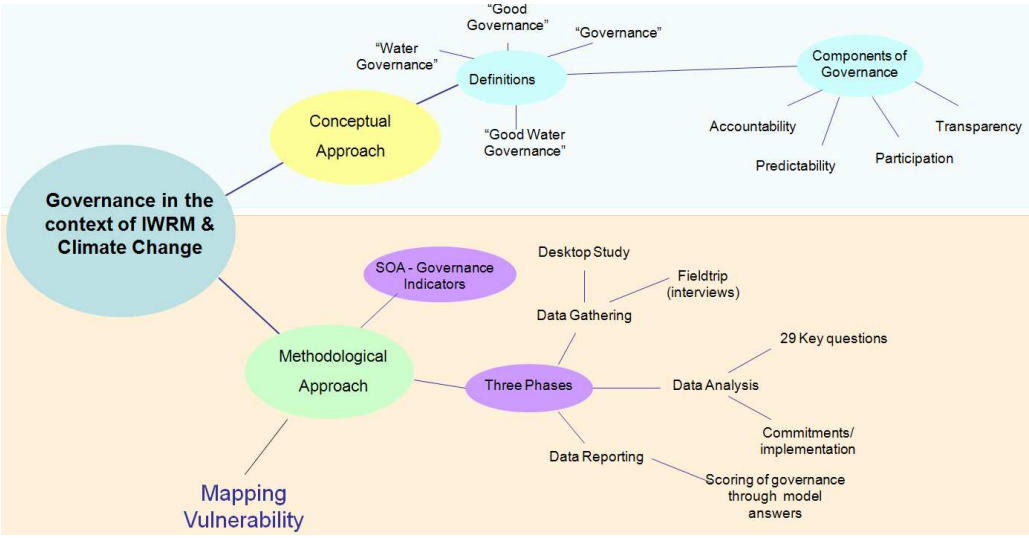


**Figure 4**: Governance analysis approach (scheme)

### 2.2.4 Challenges-Insights (method specifics)

Data:
The answers to the questions can be derived from a combination of desktop studies and interviews with key experts. In-country interviews are especially important in order to evaluate the extent to which commitments have been implemented in practice. This was done by several stakeholder workshops and visits.
Barriers:
It should be noted that the most comprehensive assessments have been made with respect to Austria and India – Assam. Less information is available in the China – Tibet and Bhutan contexts for a number of reasons, and this may therefore skew the results unfairly against these countries: in the former case, many of the primary legal sources are not currently available in English and it has not been possible to have additional sources translated. Additionally some officials in both Assam and Bhutan did not seem willing to answer all the questions in the questionnaires.
The governance framework in each basin state has been deconstructed and analysed through the comprehensive series of questions posed in the methodology, allowing conclusions to be drawn about both the adequacy of the governance framework in the context of climate change events, and the degree to which implementation of that framework is successful. But the analysis depends on a comprehensive data basis and access to these data. Local representatives have to be willing to give information concerning policy implementation. The methodology is suitable to do comparisons between river basins; because it is based on a scoring system the results are comparable. The approach can be extended by developing new key questions in respect to a specific issue. A review of the most relevant governance indicator projects yields some useful guidance when determining both the content and the methodological approach to be undertaken in the Brahmatwinn project.
Final stakeholder workshop will take place in November. Here benefits of the project outcomes for stakeholders will be demonstrated. This workshop will allow an evaluation in regard to the success and benefits of the project

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## 2.3 APN project: Institutional capacity in natural disaster risk reduction: (IFA)

### 2.3.1 Purpose

A comparative analysis of institutions, national policies, and cooperative responses to Floods in Asia

**IFA Research questions**

- Study and compare existing institutional designs, capacities, national policies, and cooperative responses towards flood risk reduction in 4 countries of Asia, i.e. Japan, Russia, Thailand and Vietnam
- Identify possibilities and constraints, and explain major successes and failures in implementation of policies and measures in floods management and in behavior of main stakeholders
- Exchange major lessons learned from domestic and regional practices in particular cases of flood events in 4 countries
- Generalize about specific and common features of institutional capacities and flood risk reduction policies in 4 countries
- Develop policy recommendations on how institutions can be made more effective and enhance human security of local communities

**IFA Problem focus**

IFA explores the challenging problem of *how to effectively shape human institutional responses* to the risk of natural disasters with a special focus on floods in 4 countries of Asia - Japan, Russia, Thailand, and Vietnam. Although a variety of domestic and regional institutions, including legislation, administration, programmes aiming to respond to floods are in place today in the Asian countries, and protection measures are undertaken the number of people affected by floods has almost doubled during the last decade both in developed and in developing countries; the poor communities are especially vulnerable. In this context the overarching research question is *how* national and regional institutions are designed and what policies and measures are undertaken for floods risk reduction and *what* can be done to enhance institutional capacity in each country to make local communities more resilient to floods. Why are existing institutions and behavior of main actors not always effective to enhance human security? Why implementation failures occur? What innovations and reforms of institutions are needed? How to shift from conventional hazard protection to disaster risk governance? To answer these questions IFA *analyses* and *compares* national and regional institutional regimes, policies and measures to protect (including preparedness, emergency response and rehabilitation) from destructive effects of floods and to reduce risk of floods through their mitigation. Human security in local communities and social rehabilitation of population affected is the red thread of this project; that is why institutions installed and measures applied for this purpose - by the governments at various levels, by business, and through public participation are in the focus of the study. Countries selected for analysis represent developed, transition economies and developing countries: for each of them counteracting floods is at the top of the national risk reduction agenda; institutional capacities

and responses, however, vary considerably across them. IFA compares major lessons learned from rich experiences of these countries, as well as possibilities and constraints for effective risk management. It also explores options for cross-country transfer and adaptation of good practices in institutional capacity building in the region. Basing on generalization from comparative analysis IFA concludes with policy recommendations on how to make institutional capacities more effective.

### 2.3.2 Design for comparative method

The design for IFA comparative analysis is organized according to four major interrelated modules:

- domestic institutions and policies
- case studies of human responses during particular flood events
- comparative analysis
- generalization

1. Study of flood risk reduction institutions/policies in 4 countries

The focus is on *existing* institutional designs and flood risk reduction policies in each of the four countries. Where possible the institutional development and evolution of policies, including their major trends, directions and innovations during the last decade are analyzed.

The analytical format includes analyses of national-regional-local institutions. The components of domestic institutional analysis include legislation, strategies, programmes, administration, funding mechanisms, decision-making, coordination, and packages of tools and instruments applied. The emphasis of institutional analysis is on policies and measures aimed to enhance security of local communities. As institutional responses have certain specifics and rationale according to each stage of flood risk reduction, IFA studies institutional frameworks within each stage of disaster response: flood *mitigation, preparedness, emergency,* and *rehabilitation*.

2. Case studies of particular river floods in 4 countries

The focus of each case-study is on assessing institutional capacities and institutional performance, actions and measures taken by authorities and various stakeholders during particular river floods which had recently taken place in these countries. Success and failures in flood risk reduction, and good practices at each stage of flood management are registered. Domestic factors defining opportunities and constraints for flood risk reduction are evaluated.

Within *case selection* two types of flood events had been chosen for analysis: a) 'show-cases' of recent severe floods with high numbers of population affected, including losses of lives, homes, crops and animals, as well as destroyed livelihoods, economic infrastructure and moral damage, and b) regularly occurring flash floods that affect local population and their livelihoods.

The following case-studies of recent river floods in 4 countries are performed:

- 2000 Red River flood, Vietnam

- 1998 and 2001 Lena River floods, Russia
- Floods at the Chao Phraya River, Northern Thailand
- Fukuoka floods, Japan

3. IFA Comparative analysis in 4 countries

The focus of comparative analysis is on flood risk reduction institutions and their performance, on policies and measures, and on domestic socio-economic and cultural contexts for their implementation. Comparative study is based on results and findings from the above-mentioned analysis of both domestic institutions/policies and particular flood cases registering institutional performance in four countries.

Cross-country comparison (according to flood risk reduction stages) is made of:

- institutions, capacities, performance, gaps and shortages
- policies and measures, implementation problems
- actors behavior (especially local public) and factors defining behavioral patterns
- good institutional practices
- success and failures and explanations why it happened
- opportunities and constraints for policy implementation
- major lessons learned and major messages from practical action

Identifying similarities and differences in institutional design and domestic policies is among crucial stages of comparative analysis.

4. Generalization

Results of comparative analysis are used for further aggregation of findings and generalization of project results. IFA believes that generalization is an essential (although a tricky task), if comparative analysis is to be valuable. Thus, IFA tries to search for generalizations, for regularities in behavior across countries and across flood cases, or more ambitiously – for rules and common patterns of social and institutional processes. It is difficult, but provides interesting results.

IFA attempts to identify distinctive ways, instruments, mechanisms in which different societies deal with problems at each stage of flood risk reduction. Aggregation of *common* and *specific* features, *trends* in institutional development is extremely useful output of the project. Explaining similarities and differences in institutional designs and processes, in practices applied by societies contributes to better understanding the diversity of flood risk reduction governance systems.

### 2.3.3 Analytical framework

There are several distinctive features of IFA analytical framework used for comparative analysis.

First, the mission of IFA analytical framework is in identifying and assessing *similarities* and *differences* in institutional design, domestic policies and actions dealing with river floods in four countries under study. For example, IFA compares the ways in which national-regional-local governments *face* similar problems related to floods and *respond* to them, as well as to the needs and demands of those affected by floods. Further identifying *common* and *specific* nature and features characteristic for institutional systems in countries under study is a part of analytical task.
Second, IFA relies on the combination of analysis of flood risk reduction governance systems in each country with the method of *explaining* similarities and differences between them. Indeed, comparison of institutions/policies in the countries needs both *description* of institutional design and action in particular cases of floods, and accurate information allowing further to track *how* and to *what extent* they are similar or different from each other. Explanation of causal pathways and *why* they do so is essential. In order to identify and explain similarities- differences IFA attempts to understand how 'individual' systems in four countries, or parts of these systems, function. That is why substantial attention of project country teams is paid to analysis of domestic flood risk reduction institutional frameworks (1) and to case-studies of floods (2) which are 'nested' into the former.

Third, after identifying major drivers and 'situational' factors defined by domestic specifics (geography and types of floods, socio-economic, political culture), and explaining effective/ineffective performance IFA compares its success, or failures drawing upon experiences of the countries under study (for example, in early warning, emergency action and rescue, social rehabilitation, cooperation of local authorities and business, resettlement, subsidies and fund raising, insurance schemes, alternative jobs creation during regular flooding, etc.). Lessons learned from their practices are extremely useful. They are used to drawing more general recommendations on how to enhance institutional capacities. General conclusions about whether and how to *transfer* and *adapt* imported institutional practices are based on generalizations from comparative research: good practices applied in some countries might be not as effective, or even misleading, in the others.

Fourth, among features of IFA analytical framework is that besides study of institutions and policies, it looks at actors and their groups (municipalities, business, river basin organizations, NGOs, households), at interactions between them, and tracks their behavior and attempts to explain it. It tries to analyze and compare the roles of various actor groups and manner in which public and individuals participate in decision-making, compare ways in which different actor groups express their views and formulate their demands. It compares and explains a variety of problems existing in the countries related to loopholes and poor social services, support and rehabilitation in flood cases.

Fifth, comparison of domestic institutional frameworks and implementation problems across four countries and flood cases is made according to common *Research Protocol* (see, summary table attached). It serves as an important tool for comparative analysis. It reflects the criteria for analysis of similarities and differences. Study of institutional designs and actions in particular flood cases are performed by all country teams according to its common format; its research questions are answered by all teams, and country data-sets based on it are compatible.

### 2.3.4 Challenges-Insights (method specifics)

The *specifics* of method are in a broad vision applied to institutional analysis.
IFA experience shows that combination of comparative analysis of flood risk reduction institutions/policies across countries with the usually widely applied by research projects the case-study analysis of actions and measures undertaken during particular flood events is a helpful methodology. It allows not only identifying the diversity of practices, actions and measures undertaken in concrete flood cases. It provides for more profound analysis of how the latter ones are 'nested' and fit(unfit) into the general institutional frameworks of countries under study, and allows to evaluate the possible 'gaps' between institutional design and action. It also allows tracking performance and assessing effectiveness of existing general institutional frameworks, and if needed, to suggest means to reshape and adjust them to urgent quests. Such approach also helps to assess and explain major lessons, success and failures in flood governance, and to provide broader generalizations.

IFA comparative methodology covers various stages of flood events – mitigation, preparedness, emergency and rehabilitation. Each stage is characterized by the specifics of policies and measures. Also the roles, potentials and involvement of various stakeholder groups differ across stages. Such desegregation into stages allows for grasping better insights of the institutional process in flood risk reduction.

Among particular *difficulties*, there appears to be the final stage of analysis, which requires generalization *(*for the countries and for flood cases) that is the heart of comparative method. It is not easy because of the multiplicity and diversity of human responses in flood risk reduction across countries. Varieties of interplay of factors affecting institutional systems, policies and their performance at particular stages of flood risk reduction are significant. Also, IFA finds that classification of institutional systems for floods risk reduction across countries is a difficult task, as most of them are different and they do not fit neatly into rigid categories.

IFA has quite ambitious objective to analyze not only institutions/policies and their performance, but also behavior and roles of actor groups, which presents significant challenge. Not all goals in this area were met, and in a course of analysis additional queries were identified which require additional attention and time. Data gathering in this field faces some problems. That is why the new international research project has been developed, and it is running currently – "Reducing water insecurity through stakeholder participation in river basin management in the Asia-Pacific" (REWIND). It is the successor of IFA, and it focuses on comparative analysis of the roles and abilities of various stakeholder groups in river basin management, including flood risk reduction. Incorporating its findings and experiences into Twin2Go assessments can be regarded as a valuable input.

IFA experience suggests that selected methodology of comparative analysis is very useful and helpful for understanding major features and trends in the study of formation, implementation/effectiveness of flood risk reduction institutions and policies. It also provides

valuable results in analysis of stakeholder involvement. It can be further applied not only to other countries of Asia, but in a broader context worldwide.

| Functions | **Phase of Disaster Cycle** *(Timing)* | | | |
|---|---|---|---|---|
| | **Mitigation** *(Well before)* | **Preparedness** *(Before)* | **Emergency** *(During)* | **Rehabilitation** *(After)* |
| **Deliberation** *What should be done?* | How are decisions made about what and who should be at risk?<br>Whose knowledge is considered, whose interests are represented ("rulers', or 'ruled')?<br>Does main focus center on preparedness/response, or on proactive mitigation of floods? | What are major perceptions about how to deal with floods?<br>How are decisions to give special powers to particular authorities made?<br>Is the public consulted and informed about disaster preparations? | What is the major domestic 'tool-kit' in flood emergency?<br>What special directives or resolutions are invoked?<br>How are decisions made about what and who should be saved or protected first? | How are decisions made about what is to be on the rehabilitation agenda?<br>Whose knowledge is considered, whose interests are represented? |
| **Coordination** *Who is responsible?* | What national and basin-level policies, strategies, legislation , administration or funding mechanisms are in place to reduce risks of floods?<br>What is the combination of structural and non-structural measures and priorities? | How coordination (horizontal and vertical) between responsible authorities is ensured?<br>How responsibilities are divided among authorities and public?<br>Is an appropriate early warning system implemented? | How are specific policies targeting emergency operations implemented?<br>Are there gaps between stated responsibilities and performance of key actors?<br>Who is in charge? | Are the resources mobilized for recovery adequate?<br>Are they allocated and deployed effectively?<br>How is rehabilitation integrated into community, basin or national development? |
| **Implementation** *How is it done?* | What structural measures are undertaken to reduce likelihood of severe flood events?<br>To what extent are laws and regulations regarding land-use in flood prone areas implemented?<br>What measures are taken to improve coping and adaptive capacities of vulnerable groups? | Are public authorities well prepared?<br>Is the public well-informed?<br>How are specific national or basin-level policies targeting disaster preparedness implemented? | How are emergency rescue and evacuation operations performed?<br>Are special efforts made to assist socially vulnerable groups?<br>Are there any measures taken to prevent looting? | Do the groups who most need public assistance get it?<br>Who benefit from reconstruction projects?<br>Is insurance available and used and if so how are claims processed?<br>Is the compensation process equitable and transparent? |
| **Evaluation** *Was it done well?* | How is the effectiveness of risk reduction measures assessed? | How is the adequacy of preparedness monitored? | How is the quality of emergency relief operations evaluated? | How is the effectiveness of the rehabilitation programs evaluated?<br>What tools and mechanisms are applied? |
| | To whom and how are authorities accountable?<br>What are interactions between authorities and non-government stakeholder groups?<br>Are institutional changes and adjustments made to address capacity and practice issues learnt about in the previous disaster cycle? | | | |

**Table 2:** IFA: Framework for assessing and comparison of institutionalized capacities and practices with regard to flood-related disasters

### 2.3.5 References

Lebel, L., E. Nikitina, V. Kotov, and J. Manuta. 2006. Assessing institutionalized capacities and practices to reduce the risks of flood disasters. Pages 359-379 in J. Birkmann, editor. Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies. United Nations University Press, Tokyo.

## 2.4 ASEM WaterNet Reflecting on dialogues

### 2.4.1 Purpose

As one contribution to ASEM Water Net work on governance Susan Neto, Patrick Huntjens, Jeff Camkin and Louis Lebel are working on a critical and comparative analysis of multi-stakeholder dialogue experiences on water. It will draw in detail on 4 case studies from most likely: The Netherlands, Australia , Portugal, and Mekong Region (Table 2).

The working paper is being written for conveners and facilitators, and so will also include more generalized but still practical suggestions on what to look out for.

### 2.4.2 Design

Case studies insight are being explored and sometimes compared primarily through a set of shared questions about the initiation, format, content and outcome of dialogues, as follows:

- Initiation
  - What triggered the dialogue?
  - How was support for the dialogue mobilized?
  - What constraints and opportunities on initiation arise from context, that is, cultural norms, legal provisions and governance arrangements?
- Format
  - Who was invited to participate, and who attended? Who spoke or wrote?
  - What was the structure of the event? What kind of organizational and presentation formats were used? How were exchanges between participants facilitated?
  - How do cultural norms affect format of events and how these are connected to each other?
- Content
  - What information was made available to participants beforehand? Was it relevant? Was their sufficient time to review the input materials?
  - What issues were addressed during the dialogue? What critical topics were excluded or avoided as a result of other contextual factors?
  - What kinds of evidence and arguments were used? Which sort of assumptions was challenged and on what issues was their wider agreement? Did participants learn useful things from each other?
- Outcome
  - What follow-up was their by conveners and participants?
  - How did the dialogue influence negotiations or decisions?

Context may be considered a fifth dimension but for moment we have treated it as a cross-cutting consideration.

### 2.4.3 Analytical framework

Indicators:
For the format dimensions we are working towards agreement on a small number of measurable and comparable indicators (Table 1).
For the other three dimensions we have not agreed on a more rigorous set of variables to extract from each case; in my view it is not yet obvious that such an approach will be more helpful than more conventional text-led descriptions, reflections and comparisons, at least in the first round of analysis.

| **Indicator** | **Measures** |
|---|---|
| Adequacy of stakeholder representation for effective dialogue | Participant lists<br>• by known/expected positions on key issue areas<br>• speaker lists vs participant lists<br>• sectoral breakdown<br>• gender balance |
| Adequacy of format and development of sessions | Structure, design and timetable of sessions<br>• adequate time allocated to questions after keynotes<br>• all parties comfortable with raising queries or arguments<br>• debates facilitated to ensure reasonable opportunity to address topic for all panelists<br><br>Multi-directionality of conversations<br><br>Observations of interactions (e.g. in roundtables or other formats where interaction can actually happen)<br>• listening / attention / respect given to speakers (and audience)<br>• opportunities given to all to contribute (e.g. translation help, writing rather than speaking, time allocation)<br>• obvious breaches of ethical conversation (slander, abuse, threats, character assassination…) |
| Learning takes place | Participant evaluations<br>• acknowledgement of improved understanding after listening to others (especially where have different position or interests)<br>• praise for process overall as leading to better mutual understanding of specific areas of agreement and disagreement<br>• effort to investigate further areas where not enough is understood (by calling in experts on that topic)<br><br>Programme / project implementation as behavioral change<br>• indicator from ASEM scorecard<br>Institutional Changes |

**Table 3**: Simple framework for assessing and comparing key features of the format of dialogues focusing on participation and facilitation

| Dialogue | Countries | Period | Geographical scope |
|---|---|---|---|
| Community water forums and Premier's Water Symposium | Australia | 2002 | Western Australia (State) |
| Exploring water futures together: Mekong Region Waters Dialogue (and related public engagement exercises of Basin Development Planning by Mekong River Commission, World Bank and Asian Development Bank) | Lao PDR, Cambodia, Vietnam, Myanmar, China & Thailand | 2004-7 | Transboundary river basin (795,000km$^2$) |
| Scenario exploration and alternatives leading to master plan for IJsseldelta | Netherlands | 2004-7 | Area in one province |
| Alqueva Dam building and public discussion (most likely, some other options also being considered) | Portugal and Spain | 1960-2000 | 55,000 km$^2$ |

**Table 4:** Water and basin dialogue processes in Asia and Europe upon which the analysis of this analysis will be based.

### 2.4.4 Challenges-Insights (method specifics)

This method is still work in progress. The challenges and insight can only be identified after application of the method, which is not possible at this stage.

## 2.5 National Status of water resources governance (NSWRG)

The subsequent evaluation is based on work undertaken by the “UN-Water Task Force on IWRM Monitoring and Reporting” and the “World Water Assessment Program”. The NSWRG format is enclosed as annex 1 to this note.

### 2.5.1 Purpose

**Main kinds of research questions:** The aim of the National Status of Water Resources Governance is to assess the progress at national level towards an efficient, equitable and sustainable development and management of water resources. Countries and regions have different physical characteristics and are at very different stages in economic and social development. The National Status is designed as a tool helping in the comparison of status over time- and less in comparison over space in between countries - and in the identification of bottlenecks to achieve improved water resources management at national and river basin level (both national and transboundary)

**Problem focus (attributes and factors of interest):** NSWRG intends to provide not only an assessment of the governance but also an overview of the **context** in which water management takes place at the national level (geographic, social and economic situation, water resources situation and the water resources management situation, perspectives, constraints and opportunities for reforming water resources management). The context in which governance of water resources takes place is combined with a concrete **assessment of water resources governance** through the use of a questionnaire of status on the *enabling environment* (water policy, water laws and regulations), *institutional framework* (organization and institutions in place, institutional capacities and constraints, human resources, *processes and milestones* in the reform process of water resources management). NSWRG has up to now had four main applications: (i) monitoring WSSD target on IWRM Plans (ii) National monitoring of IWRM Reforms (iii) Regional accountability showing to neighbors which whom water is shared that reform processes are taking place and (iv) International accountability showing progress towards Agenda 21 and the wider international goals for development.

### 2.5.2 Design

**Units of Analysis (spatial scale, time frame)**: The spatial unit of analysis for NSWRG is the national level but it deals also with river basin and local level and addresses linkages between the various levels of water management with a particular focus on the governance within the water sector. NSWRG however also assesses – “out of the water box” - including how water sector governance is harmonized with governance in other sectors using or depending on water, with international agreements and with national planning and reform systems like poverty reduction strategies, national development strategies, energy plans etc. Assessing NSWRG over time has been done by ECOWAS, UDC and GWP using the same questionnaire system and can be a useful tool for adaptive management helping countries to focus on the steps to be taken towards better water governance, drawing inspiration from the IWRM principles and the plans and strategies that they have prepared to catalyze change.

**Case selection criteria (inclusion/exclusion):** NSWRG has been applied at national level in a wide number of countries (101 countries reported by UN Water to CSD in 2008 of which more than half reported using the context and assessment system based on the questionnaire). There is no need to set up exclusion criteria for application of the NSWRG at national level, except that the questionnaire should be filled in by a person with a significant overview of the water governance system.

### 2.5.3 Analytical framework

**Framework (actors, institutions, context, performance):** NSWRG is intended to be applicable by any stakeholder interested in the water sector governance. In cases where NSWRG has been used to prepare national reports on progress towards IWRM like to the UN CSD meetings, NSWRG has been used and filled in by employees of the public water sector typically from a water ministry or ministerial sector institution.

**Measures (metrics, indicators, questions):** NSWRG is based on the framework developed by Olsen et al, 2006, using a four group indicator system, each representing progress at various steps of the IWRM progress cycle. The four groups (or orders as Olsen calls the groups) comprise both of process related and impact outcomes which are derived both from the factual information and from the factual questionnaire.

- First order outcome: Enabling conditions for IWRM are in progress comprising stakeholder awareness and participation, policies, legislation, regulations and political will. Order indicators are formulated like “Water Policy approved”, “Regulations approved” etc.
- Second order outcome: IWRM reform process takes place like “allocation regulations enforced”, “basin based management takes place” etc.
- Third order outcome- key water issues are being mitigated like the root causes of key water resources issues relevant to and identified by the country itself. Examples are “appropriate infrastructure in place and operational”,
- Fourth order outcomes- progress towards sustainable water resource management, showing a better balance between economic, environmental and equitable uses of water, like the “economic value of water increased”, “ecological flows protected by legislation and maintained”.

NSWRG comprise of a combination of:

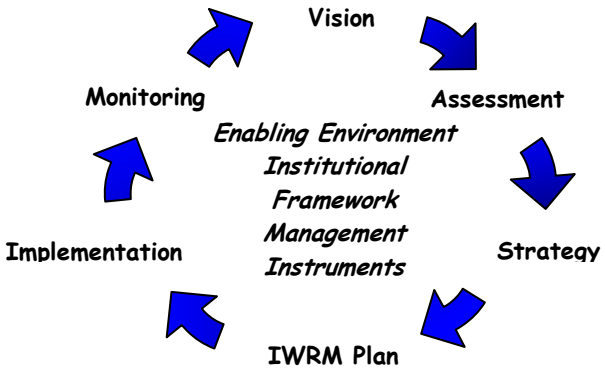
- factual information on geography, social and economic context and water resources situations (where information has to be based on actual data at national level from various data sources)
- a factual questionnaire (with possibilities to answers like yes/no/partly to questions related to water policy, water legislation, regulations supporting the water law, institutional framework and planning framework
- Qualitative assessments using a four scale score on institutional capacity, institutional constraints, human resources and awareness.

As the context assessment and questionnaire is based on available information and a combination of quantitative and qualitative data, data availability has not been observed as a problem in the national assessments undertaken. Likewise the development of a glossary with definitions has significantly helped stakeholders in filling into NSWRG.

No metrics has been developed to combine the results of NSWRG into score or an index. Some semi-quantitative assessments has however been done by GWP, UDC and recently by UN Water classifying countries into three classes: (i) no or limited reform towards IWRM, (ii) some progress and (iii) good progress. More important however has been the use of NSWRG to identify key issues for water resources management key bottlenecks and to focus steps towards improved water management in IWRM plans and roadmaps.

**Graph/figure of the main components:**

NWRSG monitors the progress on IWRM – i.e. all elements from vision to strategy, IWRM plan, implementation and supports decision of revisions. The graph below show the main elements of NWRSG , with its focus on monitoring of the enabling environment, institutional framework and management instruments and the progress toward achieving milestones like IWRM Plans. The figure makes it clear that NWRSG support adaptive water management.




### 2.5.4 Challenges - Insights (method specific)

Data on the context for water resources management are however some times limited and needs to be collected and even established through collection of raw data. In the latter case the cost may be considerable. Data to be filled in the questionnaire however are rather simple and most information is readily available. UDC/DHI - which has been engaged in 58 cases where the questionnaire has been filled in - started in the early days of using NWRSG by asking one person in a Ministry to fill in the questionnaire and then asked a wider group of expert on comments to the filled in questionnaire. Presently a workshop process is used in which the questionnaire is filled in often by a group of water professionals through a facilitated process aiming at getting agreement to the answers. Likewise a facilitated workshop process is used to identify key root caused and priorities for action. Uncertainty of the NSWRG stems from most often from limited data on the context for water resources governance and from the qualitative assessments. it has often been observed that a civil

servant in a water ministry has a more positive assessment of progress that e.g. a NGO or research institution representative. NSWRG is highly relevant as a systematic approach to assess the national context and status for water resources management- and thus also as a framework for assessing basin management- either at national or transboundary level. Using a workshop mode for filling in questionnaires and assessing key issues of water management highly improves the usability of the result of NSWRG as a tool for adaptive water management. The World Water Assessment Program is in the process of developing a list of water governance indicators, which presently has been tested in Zambia and Bangladesh. This work has resulted in a list of 16 prioritized indicators as listed in the table below: The indicators can be assessed through quantitative and qualitative assessments and is a sub-set or derived from the NSWRG.

| **Indicator name** | **Explanation** |
|---|---|
| IWRM principles in the national water policy | The core principles of IWRM relating to equity, environment and economics are contained in the national water policy either explicitly or implicitly. |
| IWRM in national budgets | The national budget contains budget lines that detail planned expenditures that support the application of IWRM. |
| IWRM reflected in legislation & regulations | Existence of legislation and regulations that take into account IWRM principles (either explicitly or implicitly). E.g. framework for stakeholder participation, gender mainstreaming, cost recovery, social rights etc. |
| Gender mainstreaming | Role of women in water management supported by law. |
| Stakeholder involvement | Framework/mechanisms for stakeholder participation established |
| IWRM & climate adaptation | Plans take into account natural disasters, climate change, and climate change adaptation. |
| IWRM status (vision, roadmap, action portfolio, degree of implementation) and assessment of water resources | Existing knowledge and processes related to IWRM collected across sectors and analysed together with a water resources assessment |
| Information management requirements | Requirements for data collection, analysis and dissemination of information on IWRM and water resources established |
| Cost recovery | Existence of a mechanism for users' financial contribution. E.g. Tariff policy and tariffs for WRM applied |
| Stakeholder awareness | Open access and fluid exchange of information related to water management. |
| IWRM in other plans | IWRM (either explicitly or implicitly) in national development plans and strategies; and listed amongst priority actions in implementation plans and costing schedules. |
| Impact assessments and mitigation procedures to protect water resources | Appropriate impact assessment procedures support the management of threats to sustainable water use. |
| Capacity building | Management potential and constraints considered, with a plan developed that addresses how gaps can be addressed. |
| IWRM infrastructure implementation projects | A portfolio of projects in support of the IWRM plan implementation established, and appropriate financing and cost recovery structures are established |
| Decentralisation | Responsibilities for IWRM at decentralised government institutions (e.g. river Basin organizatins) defined and established by law. |
| Institutional analysis and plans | Institutional Framework assessed and plans to address constrains in carrying out responsibilities prepared |

**Table 5:** World Water Assessment Program list of water governance indicators

The list of indicators will be developed through a working group on governance indicators set up by WWAP over the coming year or so. The outcome of this work can be highly relevant for development of assessment systems for adaptive management.

It could also be further investigated how to upscale and/or aggregate the NSWRG outcomes on river basin level.

### 2.5.5 References

Guide and questionnaire for country reports on IWRM, DHI in cooperation with UNEP Collaborating Centre, 2008.

Status report on Integrated Water resources Management and Water Efficiency Plans. Prepared for the 16th session of the Commission on Sustainable Development, UN-Water, May 2008

A brief on monitoring and indicators for processes leading towards IWRM. UNEP Collaborating Centre for the UN-Water Task Force on IWRM monitoring and reporting, September 2006

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Zambia National Water Resources Report to 3rd World Water Development Report, Ministry of Energy and Waters, Zambia and DHI

## 2.6 The Watershed Sustainability Index – a comparative method

The subsequent evaluation of the Watershed Sustainability Index method is based on the paper of Chaves and Alipaz, 2007.

### 2.6.1 Purpose

The aim of the Water Sustainability Index (WSI) is to assess the level of sustainability of river basins, taking into account its integrated, dynamic nature. WSI is designed to be a tool helping not only the *comparison of river basins* over time and space, but also the *identification of bottlenecks* in order to achieve basin sustainability.

WSI intends to integrate issues impacting sustainability of a river basin, overarching hydrologic, environmental, life and policy issues (the so-called HELP platform of UNESCO). A relatively small number of indicators are used, which are viewed as readily available in most countries, and facilitate wider uptake of the index. The simple and additive scoring process (mean of indicator values, with each indicator being given equal weight) ensures that eventual estimation errors of indicator parameters are, to an extent, compensated for in the overall index, thus rendering an additional robustness to WSI. Special emphasis is given to cause-effect relationships: indicator components are embedded in the pressure-state-response (PSR) model, which helps users seeing the interconnections.

### 2.6.2 Design

The spatial unit of analysis for WSI is the watershed, which is one of its distinctive features as regards to other indices aiming at answering similar or related research questions (eg. Water Poverty Index, WPI, or Environmental Sustainability Index, ESI). Smaller units can equally be chosen as reference areas if needed (ie. sub-basins, see next paragraph). WSI is representative of the state of river basin over a selected period of time, which is preferably a longer period, on the order of magnitude of at least a few years. Calculating the index for different time periods in the same watershed allows for evaluation of river basin sustainability over the years and thus can be a useful tool for *adaptive management*.

The WSI is suggested to be applicable to smaller watersheds (up to 2500 $km^2$ in area), though larger ones could also be assessed by dividing the watershed into sub-basins, calculate the WSI to these smaller spatial units, and subsequently combine individual sub-basin scores into the index of the whole watershed. Hence, the WSI of larger basins could be calculated by the weighted mean of the WSI of individual sub-basins, using the area as the weighing factor. No other exclusion criteria are formulated, though data availability is of course a precondition. Nonetheless both qualitative and quantitative parameters required are deliberately selected in general as being easily obtainable and commonly available, in order to facilitate uptake and enhance applicability of the index.

### 2.6.3 Analytical framework

WSI is intended to be applicable by any stakeholder interested in water sustainability, using publicly available data. The four indicators comprising the index (**H**ydrology, **E**nvironment, **L**ife, water resources **P**olicy, see Figure 5) are composed of 3 to 6 parameters each. The relatively low number of parameters is intended to help the universal applicability of the WSI. Parameters are selected to be easily accessible, publicly available, understandable to non-expert audiences, relevant to changes in the management and activities in the watershed, credible and integrative.

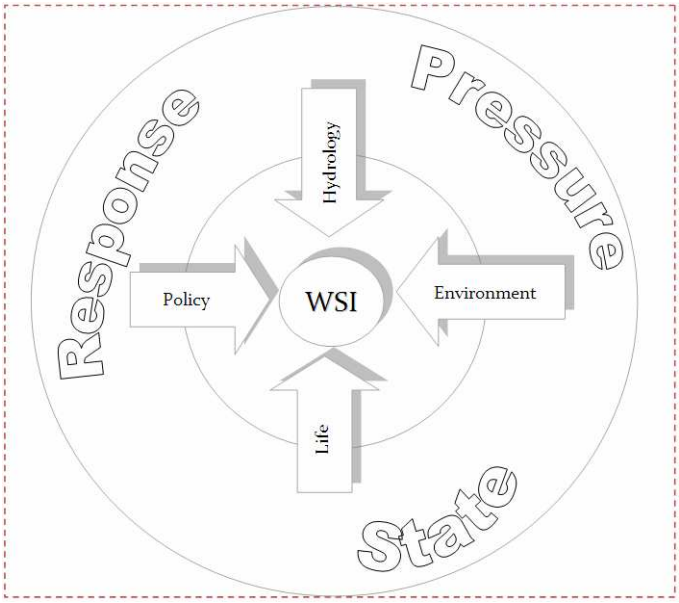


**Figure 5:** Main components WSI

Individual parameters are categorized as being representatives of a *pressure* on the river basin, of the *state* of the river basin, or of the *response* given to the formers (Table 6).

| | ***Pressure*** | ***State*** | ***Response*** |
|---|---|---|---|
| **Indicators** | ***Parameters*** | | |
| **H**ydrology | - Variation in the basin's *per capita* water availability in the period;<br>- Variation in the basin BOD5 in the period | - Basin *per capita* water availability (long term average)<br>- Basin BOD5 (long term average) | - Improvement in water-use efficiency (last 5 yrs.);<br>- Improvement in sewage treatment/ disposal (last 5 yrs.) |
| **E**nvironment | - Basin's EPI (Rural & urban) in the period | - % of basin area with natural vegetation | - Evolution in basin conservation (% of protected areas, BMPs) in the period |
| **L**ife | - Variation in the basin per capita income in the period | - Basin HDI (weighed by county population) | - Evolution in the basin HDI in the period |
| **P**olicy | - Variation in the basin HDI-Education in the period | - Basin institutional capacity in IWRM | - Evolution in the basin's IWRM expenditures in the period |

**Table 6:** Indicators and parameters of WSI as embedded into the PSR model

Parameters are mostly quantitative, and are divided into equidistant, 5 scale scores (from 0: poorest to 1: optimum conditions). Scoring is based on predefined threshold levels of the parameters, reflecting different watershed conditions (in case of the quantitative parameters, expert judgment is needed in order to assess the appropriate level of the parameter for scoring) ( Table **7**, 8, 9).

| Indicator | ***Pressure Parameters*** | *Level* | *Score* |
|---|---|---|---|
| **H**ydrology | Δ1- Variation in the basin *per capita* water availability in the period studied, relative to the long-term average ($m^3$/person.yr) | Δ1< -20%<br>-20%< Δ1 < -10%<br>-10% <Δ1< 0%<br>0 < Δ1 < +10%<br>Δ1 > +10% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| | Δ2- Variation in the basin BOD5 in the period studied, relative to the long-term average | Δ2>20%<br>20%>Δ2 > 10%<br>0 < Δ2 < 10%<br>-10%<Δ2 < 0%<br>Δ2 < - 10% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **E**nvironment | - Basin E.P.I. (Rural & urban) in the period studied | EPI>20%<br>20%<EPI > 10%<br>10%<EPI<5%<br>5%<EPI<0%<br>EPI<0% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **L**ife | - Variation in the basin per capita HDI-Income in the period studied, relative to the previous period. | Δ< -20%<br>-20%< Δ < - 10%<br>-10%<Δ< 0%<br>0 < Δ< +10%<br>Δ >+10% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **P**olicy | - Variation in the basin HDI-Ed in the period studied, relative to the previous period | Δ<-20%<br>-20%<Δ < - 10%<br>-10%<Δ< 0%<br>0 < Δ < +10%<br>Δ > +10% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |

**Table 7:** Description of WSI Pressure parameters, levels, and scores

| Indicator | ***State Parameters*** | *Level* | *Score* |
|---|---|---|---|
| **H**ydrology | - Basin *per capita* water availability ($m^3$/person.yr) | Wa < 1,700<br>1700<Wa<3,400<br>3400<Wa<5,100<br>5,100<Wa<6,800<br>Wa>6,800 | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| | - Basin Long Term $BOD_5$ (mg/l) | BOD>10<br>10<BOD<5<br>5<BOD<3<br>3<BOD<1<br>BOD<1 | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **E**nvironment | - % of basin area under natural vegetation (Av) | Av<5<br>5 < Av < 10<br>10 < Av < 25<br>25 < Av < 40<br>Av > 40 | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **L**ife | - Basin HDI (weighed by county pop.) | HDI<0.5<br>0.5<HDI <0,6<br>0.6<HDI<0.75<br>0.75<HDI<0.9<br>HDI >0.9 | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **P**olicy | - Basin institutional capacity in IWRM (legal & organizational) | Very Poor<br>Poor<br>Medium<br>Good<br>Excellent | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |

**Table 8:** Description of WSI State parameters, levels, and scores

| Indicator | *Response Parameters* | *Level* | *Score* |
|---|---|---|---|
| **H**ydrology | - Improvement in water-use efficiency in the basin, in the period studied | Very Poor<br>Poor<br>Medium<br>Good<br>Excellent | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| | - Improvement in adequate sewage treatment/ disposal in the basin, in the period studied | Very Poor<br>Poor<br>Medium<br>Good<br>Excellent | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **E**nvironment | - Evolution in basin conservation areas (Protected areas & BMPs) in the basin, in the period studied | Δ < -10%<br>-10%< Δ< 0%<br>0 < Δ < +10%<br>+10% > Δ > +20%<br>Δ> 20% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **L**ife | - Evolution in the basin HDI in the basin, in the period studied | Δ < -10%<br>-10%< Δ< 0%<br>0 < Δ < +10%<br>+10% > Δ > +20%<br>Δ> 20% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |
| **P**olicy | - Evolution in the basin's WRM expenditures in the basin, in the period studied | Δ < -10%<br>-10%< Δ< 0%<br>0 < Δ < +10%<br>+10% > Δ > +20%<br>Δ> 20% | 0.00<br>0.25<br>0.50<br>0.75<br>1.00 |

**Table 9:** Description of WSI Response parameters, levels, and scores

The Watershed Sustainability Index of the basin is derived by calculating the arithmetic mean of the parameter scores across Pressure, State and Response, and also across Hydrology, Environment, Life and Policy (Table 10).
If the BOD is not the limiting water quality parameter in the basin studied, it is replaced by the limiting parameter (e.g., total nitrogen, phosphorous etc).

| | *Pressure* | | *State* | | *Response* | | *Result* |
|---|---|---|---|---|---|---|---|
| | **Level** | **Value** | **Level** | **Value** | **Level** | **Value** | |
| | 4.8% | 0.75 | 33,600 | 1.00 | Medium | 0.50 | |
| | 4.6% | 0.50 | 1.3 | 1.00 | Poor | 0.25 | |
| **Hydrology** | | 0.63 | | 1.00 | | 0.38 | 0.67 |
| **Environment** | 11% | 0.25 | 26% | 0.75 | 2% | 0.75 | 0.58 |
| **Life** | 3.4% | 0.75 | 0.81 | 0.75 | 5.1% | 0.75 | 0.75 |
| **Policy** | 6.3% | 0.75 | Poor | 0.25 | 5% | 0.75 | 0.58 |
| *Result* | | 0.59 | | 0.70 | | 0.66 | **0.65** |

**Table 10**: Levels & values for the parameters, and the basin WSI; application of the WSI to the SF Verdadeiro river basin in Brasil (Chaves & Alipaz, 2007)

### 2.6.4 Challenges-Insights (method specifics)

Data required for the computation of the index are simple, wide-spread and low in numbers, consequently, speaking in relative terms, little effort is needed and low cost are incurred. They are explicitly intended to be easily accessible and publicly available form e.g. censuses, hydrological and water quality monitoring, economic indicators etc. However, it remains a

question whether all data are consistently and reliably available for the period(s) studied for all parts of the world, as well as whether these data can be explicitly delineated for the river basin or some approximation is needed (e.g. weighing of country data by area population). Appropriate scoring of the qualitative parameters by expert judgment also requires considerable insight and profound local knowledge.
Uncertainty of the final WSI score stems from two main sources, i.e. uncertainties associated with the raw data, and the arbitrary, cut-off nature of the threshold levels used for assigning scores to parameters. For instance, political and social pressures may exist to underestimate loss of natural vegetation in the basin or dis-improvement in water quality, at the same time to overestimate the increase in average income or educational level of the population. Interbasin variability in watershed conditions may also be an issue in judging the validity of scoring thresholds. Additionally, several assumptions underlie the overall scoring system (e.g. higher expenditures on IWRM increase the chances of water-related objectives, higher population educational levels increase the ability and willingness to be involved in watershed management, consequently both of these increase sustainability of the watershed), their validity might be in question in certain cases. Nonetheless the composition of the index, i.e. its linear structure, is fit to leverage these uncertainties, thus adds robustness to WSI despite them.

The WSI struck a good balance between applicability and data availability, without compromising on relevance. It builds on experience with other widely used and popular integrative indexes, while at the same time fills in important gaps with its unique focus and approach.
WSI is suitable for comparing different river basins and also for monitoring the progress of adaptive river basin management and governance. With this respect, it does a similar job like the National Status of Water Resources Governance (NSWRG) with the major difference that the spatial unit of NSWRG is the country and not the river basin. Nevertheless, it would be interesting to investigate how WSI and NSWRG can be linked/integrated.
It is also advised to investigate how the WSI can be linked to the Ecosystem Services approach. It would also be promising to apply the WSI not just to basins and sub-basins but also to characteristic units of the basin such as wetlands.
It would also be interesting to investigate how the WSI method can be coupled with the DPSIR (Driving force, Pressure, State, Impact, Response) analyses method. The following questions arise in this respect:

- How the outcomes of specific DPSIR analyses can be up-scaled and aggregated on the generic level of WSI?
- How is it possible to link the ‘Pressure-State-Response’ system of the WSI with the ‘Driving force-Pressure-State-Impact-Response’ system of the DPSIR system? How to identify ‘Driving force’ and ‘Impact’ in the WSI system?

### 2.6.5 Reference

Chaves, H.M.L., S. Alipaz. 2007. An Integrated Indicator based on Basin Hydrology, Environment, Life, and Policy: The Watershed Sustainability Index. Water Resources Management. Volume 21, Number 5.

## 2.7 The DPSIR framework and its application in the WETwin project

### 2.7.1 Purpose

The DPSIR framework has been developed by the European Environmental Agency. The purpose of DPSIR analysis is twofold:

- Revealing the full cause-effect chain behind a given environmental problem
- Supporting the identification and evaluation of 'responses' the society or policy makers may take to solve the environmental problem

The elements of the cause-effect chain are classified into the categories of 'Driving forces', 'Pressures', 'State' and 'Impact'. 'Responses' may link in the basic DPSI chain at any place, thus modifying the subsequent steps, including the impact at the end of the chain:

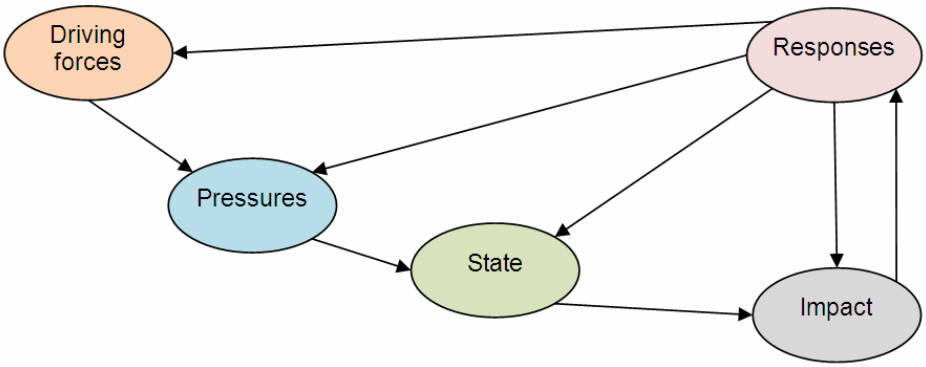


**Figure 6:** The DPSIR framework

*Driving forces* are represented by natural and social processes which are the underlying causes and origins of pressures on the environment (Fondazione Eni Enrico Mattei, 2006). Driving forces may act in the past, at present and also in the future. In this later case driving forces and their effects are called *vulnerability scenarios*. *Pressures* are outcomes of the driving forces, which influence the current/future environmental state (Fondazione Eni Enrico Mattei, 2006). *State* describes physical, chemical or biological phenomena in the given reference area. It reflects the condition of the environment (Fondazione Eni Enrico Mattei, 2006). E.g. air, water, soil quality. Pressures cause changes of State (e.g. decreased water levels, eutrophication) which ultimately result in impacts. *Impacts* on population, economy, ecosystems describe the ultimate effects of changes of state. E.g. biodiversity loss, reduced flood regulation capacity. *Responses* demonstrate the efforts of society (e.g. politicians, decision-makers) to solve the problems encountered in the investigated system (Fondazione Eni Enrico Mattei, 2006), e.g. policy measures. For more details about the DPSIR framework the reader is referred to Kristensen (2004).

DPSIR is essentially a qualitative method. It reveals the cause-effect relationships within the investigated system in a qualitative manner. It is not a model, even though it can form the conceptual basis for model construction.

Thanks to its robustness and resilience, DPSIR is applicable for a wide range of environmental problems. In addition it is also capable to reveal cause-effect relationships across multiple sectors. The DPSIR framework can be used as a base for environmental

management allowing the linkage between environmental and macro-economic models, making it possible to integrate the conservation functions (biodiversity and ecological) with socio-economic development (RIVM, 1995).
For the WETwin project the DPSIR framework has been coupled with the Ecosystem Services approach in such a way that 'Impact' has been defined as impact on ecosystem services.

### 2.7.2 Design

There are no restrictions with regard to spatial scales. DPSIR can be applied on river basins, sub-basins, wetlands or any other hydrological/morphological/ecological/administrative units of the environment. In addition it supports revealing cause-effect relationships across different spatial scales. For example: the basin scale driving force of agricultural activities puts wetland scale pressure on the water quality of the wetland (state on wetland scale) in the form of nutrient loads. DPSIR is applicable for analysing past, present and future environmental problems. Also it supports revealing cause-effect relationships across different time frames: e.g.past driving forces have resulted in pressures and impacts in the present.
Thanks to its robustness and resilience the DPSIR method is applicable for all sort of environmental issues.

### 2.7.3 Analytical framework

DPSIR is intended to be applicable by any stakeholder interested in environmental management, using publicly available data.
Quantitative indicators can be associated with the different DPSIR elements. Caeiro et al., (2004) for example used various environmental, economic and agricultural indicators for defining driving forces and pressures acting on the Sado estuary in Portugal.
Indicators makes possible to link DPSIR to quantitative decision support tools such as models and multi-criteria decision analysis techniques. The mDSS4 software (Fondazione Eni Enrico Mattei, 2006) is an example for such a complex DSS.

The generic graph of the DPSIR method is given on Figure 6.
The specific DPSIR tool developed for the WETwin project has five components:

1. A table for reviewing the Ecosystem Services of the investigated system (a wetland in case of WETwin). This table identifies the types, beneficiaries and seasons of the ecosystem services.
2. DPSI cause-effect chain(s) that have been identified behind problems related to the ecosystem services of the system
3. Table(s) providing detailed descriptions of the components of DPSI chain(s). This table(s) also indicates the spatial and temporal dimensions of the components.
4. Cause-effect chain(s) of Responses ('RDPSI' chain(s)) proposed for solving the identified problems
5. Table of indicators associated with the DPSIR components
6. Annex I of this document shows how these components look like in case of a specific problem related to one of the study sites of the WETwin project.

### 2.7.4 Challenges-Insights (method specifics)

Costs: DPSIR analysis is cost free as it doesn't require special equipment, tool or input data. At this point it is worth to mention that the mDSS4 software is also a free, public domain tool.
Data needs: basic, qualitative information is sufficient for setting up the basic DPSIR chains.
Major information sources: literature, stakeholders (stakeholder consultations!)
Uncertainty: Being a qualitative method, DPSIR analyses doesn't carry numerical uncertainties. Nevertheless the non-quantitative nature of DPSIR does bring a lot of uncertainties into the method, since DPSIR is not suitable for indicating the strengths or weaknesses of the cause-effect links. Elimination of these uncertainties requires models, for which the DPSIR chains would provide the conceptual basis. There are uncertainties also in the classification of the elements of the cause-effect links. For example it is not fully clear how to classify the 'stepping stones' between the fundamental driving force and the ultimate pressure on state. Are they driving forces or pressures? Depending on the problems in hand these sub-chains could be quite long and complicated. Also the same item can appear in different components depending upon which target we are focusing on (Greeuw et al., 2001). The method may also fall to capture the complexity of the relationships in complex systems (Kelly, 1998).
A given problem may have several causes. The use of DPSIR may not reveal all these causes and hence may not result in all possible – or most suitable – response. This is particularly the case where problems can be treated from a technical/scientific angle or from an institutional angle (policies, laws, administration…). This will largely depend on who is involved in setting-up the cause-effect chains.
Political/cultural(social) barriers: There are no such barriers in the application of the method. DPSIR is based on the universal logics of 'if-then', which makes it understandable and attractive for everybody. Nevertheless, it should be kept in mind that DPSIR alone says nothing about the (social/cultural) acceptability of the proposed responses.

DPSIR method is simple and fully transparent. It doesn't require specialised knowledge or skills to understand and apply it. This makes DPSIR attractive to stakeholders, and as such supports effective stakeholder participation.
Nevertheless, confusion may arise as to whether a certain issue should be considered as a driver or a pressure, just as there may be some confusion in defining state and impact. On the other hand, this may not be very critical as long as the chain of events remains logic.

- DPSIR is an excellent tool for revealing the cause-effect mechanism behind given environmental problems
- It supports the identification of responses taken or planned to be taken for solving the problems, and helps to reveal the impact mechanism of these responses.
- Its resilience enables to apply it to various sectors and scales. It makes possible to carry out analyses across sectors and scales (both spatial and temporal)
- Its simplicity and transparency supports stakeholder involvement
- Due to its qualitative nature DPSIR is loaded with high uncertainties. Accordingly decisions cannot be made on the basis of the DPSIR analysis alone. For this purpose reliable, quantitative, model-based decision support systems have to be built up for which DPSIR could provide the conceptual basis. (e.g. the mDSS4 software)

So far DPSIR have been applied mainly on environmental problems, where the DPSIR elements are related to environmental phenomena and units. The method can be improved by involving governances/management issues since several environmental problems have been caused by the ineffective governance systems. There seems to be two ways for involving such issues in DPSIR analyses:

1. Complementing environmental DPSIR chains by involving management/governance issues as driving forces. Such chains would show how management problems contribute to the pressures on the state and to the impacts on ecosystem services.
2. Constructing separate DPSIR chains for management/governance problems, where each component corresponds to management/governance issues. Figure 7 shows an example for this approach:

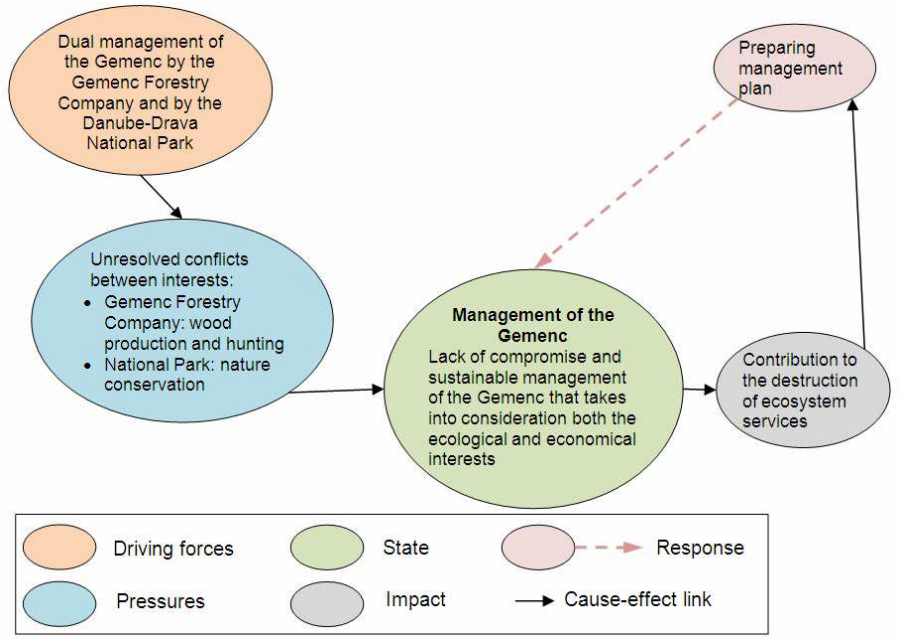


**Figure 7:** The DPSIR chain describing the main management problem of the Gemenc floodplain (based on: Pataki, 2009; VITUKI & VTK Innosystem 2005)

It is also advised to establish more links between DPSIR and other analysis methods dealing with environmental issues. For example DPSIR can be coupled with the Watershed Sustainability Index (WSI) method (Chaves and Alipaz, 2007) in such a way that DPSIR reveals the cause-effect mechanism behind the low sustainability of the river basin detected by WSI.

DPSIR analysis needs to be developed further also by strengthening the role of stakeholder involvement. Inspiration could be found for example with classical methods such as the Problem Tree Analysis (PTA) (MDF, 2005). On the one hand, PTA is similar to DPSIR as it also aims at identifying cause-effect relationships and responses; on the other hand, PTA, unlike DPSIR, explicitly identifies where and how stakeholders could intervene into the process. Other methods such as the Methodology for Participatory Assessment (MPA) can also provide reference for the further development of DPSIR.

## 2.8 ASEM Waternet: Scorecard method (Product of WP5 Water Governance)

### 2.8.1 Purpose

In order to facilitate a comparison of ongoing work in the selected projects and river basins of ASEM Waternet, a scoring methodology was being developed.

This methodology is intended to support the comparison between the ongoing projects and/or river basins, which will hopefully open new perspectives for water managers and stakeholders in both Europe and Asia. The developers expect there to be reciprocal exchange of insights based on experiences in all basins without necessarily assuming wholesale transferability of models in Asia to Europe or vice-versa (Miller & Hirsch 2002). Key contrasts in context include levels of economic development and wealth, histories in political systems and international relations, and diversity of state and more local water management institutions, for example, related to rice production, flood management and navigation.

The main objective of this activity is to develop a methodology for comparing water management and governance regimes across the set of selected river basins in ASEM Waternet, and eventually this experience could be used to develop protocols and initial entries for a global database to support broader comparisons in the future (being developed by the Global Water System Program, www.gwsp.org). With only a small number of cases it is not expected major generalizations to suddenly emerge but the contrasts to help refine the analyses and consideration of options in each basin.

The outputs of the scoring, and the feedback on the scoring methodology, could be used for:

- Supporting more in-depth comparative analyses of the case-studies in ASEM Waternet;
- Developing protocols and initial entries for a global database to support broader comparisons in the future;
- Facilitate knowledge exchange between river basin authorities and the wider water policy communities in the different basins;
- Draw general insights applicable to other basins in a comparative analysis of water management and in particular governance regimes in the different basins.

### 2.8.2 Design

The first analysis was done for 4 Asian, the Bang Pakong, Yellow River, Red River and deltaic areas of the CHARM project (Coastal Habitats and Resources Management) and 4 European river basins, the Mondego, Tisza, Guadiana and Rhine basin. CHARM is a Thai project supported by the EU.
With only a small number of cases it is not expected major generalizations to suddenly emerge but the contrasts to help refine the analyses and consideration of options in each basin.

Amongst others the methodology is developed in order to facilitate knowledge exchange in the different basins and to draw general insights in water management and governance applicable to other basins. Thus, the analysis focuses mainly on the current water governance regimes in the basins. Investigations have a time scale of about 5- 10 years.

The table below provides a complete outlay of indicators of the scorecard based on the methodologies described above.

| IWRM Element | Time to Start (Adaptive)IWRM *0 points* | (Adaptive)IWRM on its Way *2 points* | (Adaptive)IWRM Getting Results *4 points* | Status *Score* |
|---|---|---|---|---|
| **First order outcomes: Assembling the enabling conditions for IWRM** | | | | |
| 1. **Political will** | No policy and implementation framework for introducing IWRM (including environmental flows) | A policy and implementation framework for introducing IWRM (including environmental flows) exists but is weakly enforced | A policy and implementation framework for introducing IWRM (incl. environmental flows) and to demonstrate its application is adequately enforced but with scope for improvement | |
| 2. **Water conservation** | No policy and implementation framework for water use, conservation, and recycling | A policy and implementation framework to promote efficiency of water use, conservation, and recycling is weakly enforced | A policy and implementation framework to promote efficiency of water use, conservation, and recycling is adequately enforced but with scope for improvement | |
| 3. **River basin organization** | No RBO exists yet | RBO has been formed but mandate is not well-defined; and organizational set-up and operational responsibilities need improvement | RBO operates under a clear mandate and organizational-set-up; and improves its performance through capacity building programs | |
| 4. **Regulations** | No legal and regulatory framework to implement the principles of IWRM and its financing | Legal and regulatory framework to implement the principles of IWRM and its financing is not satisfactorily enforced | Legal and regulatory framework to implement the principles of IWRM and its financing is satisfactorily enforced and complied through sound implementing rules and regulations | |
| 5. **Water rights** | No water rights or entitlement administration and customary rights not respected. | Existing water rights or entitlements administration are partly or inefficiently implemented | Water rights or entitlements administration are implemented well, respecting traditional or customary water use rights of local communities and farmers and farmer organizations | |
| 6. **IWRM financing** | No government budget for IWRM | Limited government budget allocated for IWRM | Government budget for IWRM is institutionalized at some levels of governance | |
| 7. **Issue identification** | No specific baseline or issue analysis | Incomplete issue analysis and/or causal chain analysis | Conduct of causal chain analysis<br>Identification of management issues, transboundary issues from environmental and socio-economic point of view | |
| 8. **Constituency building** | No stakeholders analysis | Incomplete identification of stakeholders and their interests | Identification of stakeholders and their interests | |
| 9. **IWRM project status** | No project | In preparation | In operation | |

| Second Order Outcomes: Programm/project implementation as behavioral change | | | | |
|---|---|---|---|---|
| 10. **Stakeholder participation** | No stakeholder participation in river basin planning and management process | Limited stakeholder participation in river basin planning and management process | Polycentric, horizontal, broad stakeholder participation occurs in project specific or river basin planning decisions under an enabling framework | |
| 11. **Private sector contribution** | No private sector participation in IWRM | Private sector participation in IWRM is partly introduced | Several cases of private sector participation in IWRM | |
| 12. **Sectoral integration** | Sectors separately analyzed resulting in policy conflicts and emergent chronic problems | Water and agricultural management are strongly linked, however water management is subordinate to agricultural management | Cross-sectoral analysis identifies emergent problems and integrates policy implementation | |
| 13. **Information management and sharing** | Understanding fragmented by gaps and lack of integration of information sources that are proprietary | Joint research and information exchange need improvement; there are still gaps in certain types of information, communication about uncertainties, assumptions, needs, etc. | Comprehensive Understanding achieved by open, shared information sources that fill gaps and facilitate integration | |
| 14. **Decision support information** | No river basin information systems to support IWRM | River basin information systems to support IWRM are not upgraded, not working efficiently, and not publicly available | River basin information systems are up to standards but there is wide scope for improvement | |
| 15. **River basin planning** | No river basin plan or strategy | No river basin plan or strategy exists yet; but there is river basin profile for basic basin information | A river basin plan or strategy exists as basis for basin investments. The plan gets updated regularly with participation and ownership of basin stakeholders | |
| 16. **Public awareness** | No public awareness programs for IWRM | Public awareness programs for IWRM has just been introduced; and are minimal in scope | Public awareness programs for IWRM are regularly implemented in collaboration with civil society organizations and the media | |
| 17. **Water education** | IWRM not yet introduced in school programs | IWRM is occasionally introduced in school programs | IWRM is regularly introduced in school programs; and with potential to be an integral part of school curricula | |
| 18. **Economic instruments** | No raw water pricing and/or other economic instruments exist | A system of raw water pricing and/or other economic instruments is partly or inefficiently enforced | A system of raw water pricing and/or other economic instruments is satisfactorily enforced that provide share in IWRM costs, stimulate water demand management and conservation, protect the environment and pay for environmental services | |
| 19. **Water allocation** | No system of water allocation resulting to conflicts in water use | Limited implementation of a system of water allocation | Water allocation among uses and geographical areas is implemented in the basin but there is | |

| | | | | |
|---|---|---|---|---|
| | | | scope for improvement, including for participatory and negotiated approaches, and for incorporating indigenous knowledge and practices | |
| 20. **Wastewater permits** | No system of wastewater discharge permits and effluent charges | System of wastewater discharge permits and effluent charges need improvement | System of wastewater discharge permits and effluent charges are acceptable to stakeholders | |
| 21. **Infrastructure for multiple benefits** | No water resources infrastructure providing multiple benefits (such as hydropower, water supply, irrigation, flood management, salinity intrusion, and ecosystems maintenance) | A few water resources infrastructures providing benefits; but not efficiently managed | Several water resources infrastructures exist; and with scope to improve management | |
| 22. **Scale of infrastructure** | Massive, centralized infrastructure, single sources of design, power delivery | Trends to decentralisation of infrastructure, e.g. detention reservoirs in upper and middle part of River instead of merely dike reinforcements | Appropriate scale, decentralized, diverse sources of design, power delivery | |
| 23. **Watershed investment** | No investment to protect and rehabilitate upper watersheds | Minimal investment to protect and rehabilitate upper watersheds; with little collaboration with local communities and civil society organizations | Enough investments to protect and rehabilitate upper watersheds in close collaboration with local communities and civil society organizations | |
| 24. **Allocation of financial resources** | Financial resources concentrated in structural protection (sunk costs) | Public and private instruments exist, but need improvement | Financial resources diversified using a broad set of private and public financial instruments | |
| 25. **Disaster management** | No investments in combined structural and nonstructural interventions | Separate and minimal investments for either structural or nonstructural interventions | Substantial investments in combined structural and nonstructural interventions to reduce vulnerability against floods, droughts, chemical spills and other disasters | |
| 26. **Flood forecasting** | No flood forecasting and warning systems | Flood forecasting and warning systems exist but need improvement | Flood forecasting and warning systems are adequate and efficient | |
| 27. **Flood damage rehabilitation** | No investments in the rehabilitation of infrastructure after floods | Government provides limited budget allocation for the rehabilitation of infrastructure after floods | Government provides enough investments for the rehabilitation of infrastructure after floods | |
| 28. **Water quality monitoring** | No basin-wide water quality monitoring and application of standards | Partial water quality monitoring and weak application of standards | Basin-wide water quality monitoring; and adequate application of standards | |
| **Third Order Outcomes: Achievement of specific ecosystem goals** | | | | |
| 29. **Revenue gathering** | No change in revenue gathering | Unequal revenue gathering depending on categories | Successful revenue gathering from those benefiting from the exploitation of watershed and coastal resources | |
| 30. **Human quality of life** | No improvement or worsening | Limited to some categories | Greater equity in human quality of life and development of more diversified livelihoods | |
| 31. **Water quality** | No structural and | A few structural or | Several structural and | |

| | | | | |
|---|---|---|---|---|
| | nonstructural interventions that reduce point and non-point water pollution | nonstructural interventions that reduce point and non-point water pollution | nonstructural interventions that reduce point and non-point water pollution | |
| 32. **Wetland conservation** | No investment to conserve and improve wetlands with steady loss of wetlands | Minimal investment to conserve and improve wetlands as integral part of the river basin ecosystems maintaining things as they are | Substantial investments to conserve and improve wetlands as integral part of the river basin ecosystems with significant quality increase | |
| 33. **Fisheries yield improvement** | No measures to protect and improve fisheries | Limited measures with limited results | Adequate measures with significant results | |
| 34. **Groundwater** | No groundwater management with a worsening of situation | Groundwater management is either just starting or is weakly enforced enough to maintain a status quo | Sustainable groundwater management is institutionalized as part of IWRM and starts giving measurable results | |
| **Fourth Order Outcomes: Sustainable watershed and coastal conditions and uses** | | | | |
| 35. **Social sustainability** | Non-equitable use of water resources | Equitable use of water resources is taken into account, but needs improvement | Equitable use of water resources | |
| 36. **Economic sustainability** | Inefficient use of water resources | Use of water resources is becoming more efficient, but needs improvement | Efficient use of water resources and the role for water in overall economic growth | |
| 37. **Environmental sustainability** | Ecosystem integrity is seriously jeopardized, and worsening water quality conditions | Governance is taking into account ecosystem integrity, and water quality protection, but needs improvement | Improved governance allows for enhanced sustainable use of water resources and ecosystem integrity | |
| 38. **Political empowerment** | Water stakeholders and citizens have no democratic opportunities to influence and monitor political processes and outcomes | Water stakeholders and citizens have some democratic opportunities to influence and monitor political processes and outcomes, but this needs improvement | Granting water stakeholders and citizens equal democratic opportunities to influence and monitor political processes and outcomes | |
| 39. **Economic, Social, Cultural and Environmental equilibrium** | Water quality and abundance of resources have been improved but not the dwellers' economic situation | Water quality and abundance of resources have been improved but benefit only to a fraction of the society | A desirable and dynamic balance between social and environmental conditions are sustained and benefit to everybody | |

Table 11

**Table 12:** Outlay of indicators of the scorecard based on the ASEM WaterNet Scorecards

### 2.8.3 Analytical Framework

There are many possible approaches and methodologies for self-assessment and evaluation. Within the ecosystem management context, these approaches may be grouped into two categories:

**Performance evaluations**, designed to assess the quality of the execution of a programm and the degree to which they meet the mandate and responsibilities awarded to them and the commitments made to funding institutions.

**Outcome evaluations**, assesses progress towards the programm's goals. The focus, therefore, is on the impacts of a programm on the watershed and its coastal zone natural and

human dimensions of concern to the programm or the project. An outcome evaluation examines the trends and indicators of direct relevance to the programm and works to objectively estimate the relative contributions of ecosystem-based management policies and processes to observe cultural, social, economic, and environmental change.

Outcome evaluations, is the subject of this scoring exercise. The proposed scorecard composition is made of a number of indicators commonly used for watershed management monitoring, organized around four orders of outcomes. The unifying framework developed by Olsen (2003) allows the desegregating of the sustainable development ultimate goal into a sequence of more tangible thresholds of achievement through the projects or programms life. This framework suggests the sets of indicators that may be used to trace the evolution of an IWRM project or program as they progress from the baseline conditions usually documented during the preparatory and starting stages to progressively more sustainable conditions and patterns of use.
The framework describes the First Order as the most critical outcomes generated by the program/project since it concerns the building up of the enabling conditions or the foundations of the future activities. Building on methods noticeably developed by Canada's International Development Research Center (See "Outcome mapping", www.idrc.org), the implementation of a program/project is defined in the Second Order as changes in behavior in the institutions and human population within and/or affecting the ecosystem in question. Only after the requisite changes in behavior have been practiced for a sufficient period can improvements be expected in the environment and in the social benefits that constitute the Third Order achievement of the environmental and societal goals selected in the earlier phase of the program/project design. In an operational sense, the ultimate goal of sustainable forms of water resource management may be considered as a "north arrow" that points in the direction of desired change.

It is important to recognize that some expressions of First, Second and Third Order outcomes will accumulate concurrently within a given period of time. While there are causal relationships between the three Orders, they are of course not achieved in a strictly sequential order following the learning by doing mode. Experience has repeatedly reconfirmed that the most successful initiative focus their efforts on one or two issues and to expand their scope as experience, capacity, and constituencies are built.

### 2.8.4 Challenges-Insights (method specifics)

The scoring could provide interesting insights, only when it is coupled to an issue analysis and/or road maps of on-going projects. In other words, the scoring results should be embedded in a wider context.
At this moment we have a single point in time scoring, which is not taking into account path dependencies, in other words, time series analysis would be necessary to draw any conclusions on developments in the case-studies. Additionally, Nguyen van Diep (IET) has mentioned that the scoring methodology could be used for monitoring purposes when done in sequence (which is one of our initial objectives within this context). Such a sequential scoring (thus monitoring) should preferably be done by one and the same person for assuring its validity.

Taking above comments into account it is too early to come up with sound conclusions based on the current scoring. However, the current results could serve as a starting point for the monitoring of our case-studies.
Furthermore, the scoring has proven useful, to a certain extent, for identifying similarities and differences between our ASEM Waternet case-studies (also one of our initial objectives). But it is rather limited so far based on comments 1 and 2. Nevertheless, for future purposes it would be worthwhile that Platform papers under development (see synthesis of parallel sessions) would use the scoring methodology for identifying the similarities and differences between other case-studies, especially when they are considering a collaboration or exchange with other case-studies.

### 2.8.5 References

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Huntjens, P., Sombardier, A., Freissinet, C., Aekeraj, S., Duarte, J. (2009) Obstacles and opportunities for stakeholder participation in water management decision making – Experiences from France, Portugal and Thailand. ASEM Waternet joint working paper

Miller, F., and P. Hirsch. 2002. Reflections on international experience of transferring river basin development models. Fifth International River Management Symposium, Brisbane.

Olsen,B., Juda, L., Sutinen, J.G., Hennessey, T.M., Grigalunas, T.A. (2006), A Handbook on Governance and Socioeconomics of Large Marine Ecosystems, University of Rhode Island, 2006

# 3. Conclusions

The previous section introduced eight methods applied in different projects on IWRM and adaptive management. All methods include components that can be used for the development of the Twin2Go methodological framework for comparing river basins regarding governance factors in the context of climate change.
The purpose of the comparative analysis of Twin2Go is an assessment of the performance of governance regimes with the focus on adaptation to climate change. The assessment has to be linked to an analysis of the factors regarding the three dimensions governance regime performance, water governance regime and context. Table 13 below shows, which measures of the three dimensions appear useful for the development of the final methodological framework and which of these measures have been covered by the different methods reviewed.

All methods include elements that allow the analysis of at least some important parts of the environmental and the societal dimensions of a river basin. Regarding the environmental context dimension, most of the methods provide sound measures. Only the two ASEM methods and the IFA do virtually not focus on the environmental aspects of the river basin system. Only few factors, namely the cultural properties or the question of governance efficiency, are not considered by any of the methods or only by one single method.

Particularly the projects NeWater MTF method, the Brahmatwinn method and the ASEM WaterNet Scorecards represent most comprehensive method bases for comparative analyses with a specific focus on governance issues and here particularly the factors of governance performance. Within the NeWater project, a Management and Transition Framework (MTF) has been developed as an interdisciplinary, holistic conceptual approach to support the understanding of water systems, management regimes and transition processes towards more adaptive water management. Resulting from a multi-disciplinary international research project including 37 partners and case studies in 7 basins in Europe, Central Asia and Africa, the MTF comprised and integrated knowledge, concepts and approaches from various disciplines. It is a particularly suitable foundation for comparative analyses of specific basin-related and general project-related results. Moreover, the EU funded multi-stakeholder platform ASEM WaterNet elaborated a scorecard for assessing the state of the art of adaptive IWRM in river basins and projects. The scorecard involves 39 different attributes of IWRM for self-assessment and evaluation of different European projects on IWRM. Important issues of Brahmatwinn were transboundary water management and conflicts, data exchange and lack of communication, monitoring networks and problems of water availability. Based on a broad set of questions and sub-questions, an analysis regarding four elements of good governance was done: accountability, transparency, predictability and participation. All three methodological approaches are based on the concepts of integrated (and adaptive) water management regimes, social learning and adaptive governance. Hence they provide an excellent base for further elaboration.
The final methodological framework needs to take into account the importance of the environmental and societal context and how it influences the transferability of results and will be reported in Deliverable 1.3 “Report on methodological framework for comparing project results as well as for deriving and evaluating best practices”.

| | MTF | Brahmatwinn method | IFA | ASEM dialogues | NSWRG | WSI | DPSIR | ASEM Scorecards |
|---|---|---|---|---|---|---|---|---|
| **Governance regime** | | | | | | | | |
| Institutions (formal + informal) | X (mainly formal) | X | X | --- | X | Partially | X | X |
| Actor networks(role and interactions, power relationships) | X | X | X | --- | X | --- | --- | --- |
| Multi-level interactions (horizontal and vertical) | X | --- | X | X | X | --- | --- | --- |
| **Context** | | | | | | | | |
| *a) Social dimension:* | | | | | | | | |
| State of societal development | X | X | X | --- | X | X | ? | --- |
| Cultural properties | --- | --- | --- | --- | --- | --- | X | --- |
| Social sustainability (e.g. Gini Index) | X | --- | --- | --- | X | ? | X | --- |
| Economic sustainability (e.g. GDP) | X | --- | X | --- | X | X | --- | --- |
| Effectiveness of formal institutions | X | X | X | --- | X | --- | --- | X |
| *b) Environmental dimension:* | | | | | | | | |
| Water availability and its variability | Partially | X | --- | --- | X | X | X | --- |
| Natural Storage Capacity | Partially | --- | --- | --- | X | X | X | --- |
| Degree of Human Influence | Partially | X | --- | --- | X | X | X | --- |
| Water Quality | X | X | --- | --- | X | X | X | X |
| Biodiversity Classification | X | --- | --- | --- | X | ? | --- | --- |

| | MTF | Brahmatwinn method | IFA | ASEM dialogues | NSWRG | WSI | DPSIR | ASEM Scorecards |
|---|---|---|---|---|---|---|---|---|
| **Perfomance** | | | | | | | | |
| *a) Good governance principles:* | | | | | Only very fragmented | | | |
| Participatory | X | X | Partially | X | | --- | --- | X |
| Consensus oriented | Partially | --- | Partially | X | | --- | --- | X |
| Accountable | --- | X | Partially | X | | --- | --- | --- |
| Transparent | Partially | X | Partially | X | | --- | --- | --- |
| Responsive | Partially | --- | Partially | X | | --- | --- | --- |
| Effective and efficient | Effectiveness only | --- | Partially | X | Effectiveness only | --- | --- | Effectiveness only |
| Equitable and inclusive | X | X | Partially | X | | --- | --- | --- |
| Follows the rule of law | X | X | Partially | --- | | --- | --- | X |
| *b) Response to climate change* | X | X | X | --- | X | X | In principle possible | |
| *c) Sustainability of the water system as measured along the three dimensions of sustainability with focus on water specific indicators* | Societal and environmental pillar only | --- | Societal and environmental pillar only | --- | X | X | | X |

**Table 13:** Overview of governance factors as considered in the different methods used for comparative analyses in water management projects (x = considered within the method; --- = not considered within the method)