

Figure 3. Evaluation of transient scenarios.

Some results

During the inception phase the consortium gained insight in social perspectives, the causes and direction in which they might change over time. Also, the method to integrate physical and human system and the RAM was further developed. One of the conclusions is that perspectives are in reality not stereotype and homogenous, which can be illustrated by making use of our perspective map (table 1).

- We need to evaluate the robustness and flexibility of the water management system:**
- to be able to cope with uncertainties in future conditions of our planet;
 - to be able to deal with uncertainties in the working of our planet;
 - to cope with climate variability
- We need transition scenarios:**
- to explore the future
 - to understand which additional preparations, other than water management strategies, need to be taken,
 - to analyze the dynamics between the physical and the socio-economic system
- We need perspective-based scenarios:**
- to ensure consistency and reality in scenarios (including discontinuities).
 - to include perception of society on water management strategies, e.g. on when and how to act, what objectives we want to meet, and the way this may change.
 - to analyze how society will respond to events and developments and its consequences on water management.
 - To evaluate the social robustness of a strategy.
- To support the above activities we need a tool that:**
- deals with the complexity of physical and socio-economic interactions;
 - involves the whole cause-effect chain, from climate to physical conditions (water quantity and quality) to impacts on water services like ecosystems, agriculture, industry, recreation, to the response of people on these impacts in terms of perceptions and water management;
 - includes average conditions as well as events;
 - is able to analyze a lot of possible futures, strategies and implementation paths;
 - is able to run a lot of time-series and ensembles.

		Hierarchist	Egalitarian	Individualist
WORLDVIEW	Water value	Diverse functions	Restfulness & Space	Prosperity and self-development
	Perception water problem	Serious but controllable	Big problem	No problem
	Climate change	Average trend	Extreme trend	Minimal trend
	Socio-economic context	Average trend	Minimal growth - shrinkage	Extreme growth
MANAGEMENT STYLE CONTENT	Priorities water functions	Preservation and win-win	Compensation and ecology	Innovation and economy
	Managing safety	Flood prevention	Avoid certain areas	Adaptation-utilize opportunities
	Water supply	Demand guided	Supply guided	Market driven
	Trust in technology	Positive but reserved	Suspicious	Great trust
	Design water system	Dams, dikes & regulation	Natural restoration	Opportunistic
	Spatial planning	Water follows	Water guides	Water offers opportunities
MANAGEMENT STYLE PROCESS	Responsibility	Government NL and EU	Regional governments and NGOs	Market players and individuals
	Process design	Norms and expert knowledge	Participatory decision making	Free market and privatization
	Identity and knowledge	Water authority NL	Basin and locally	International companies
	Integrality water management	Sectorial	Integral	Competition

Table 1: Cultural theory translated towards water: mapping perspectives. Shaded cells refer to an imaginary perspective.

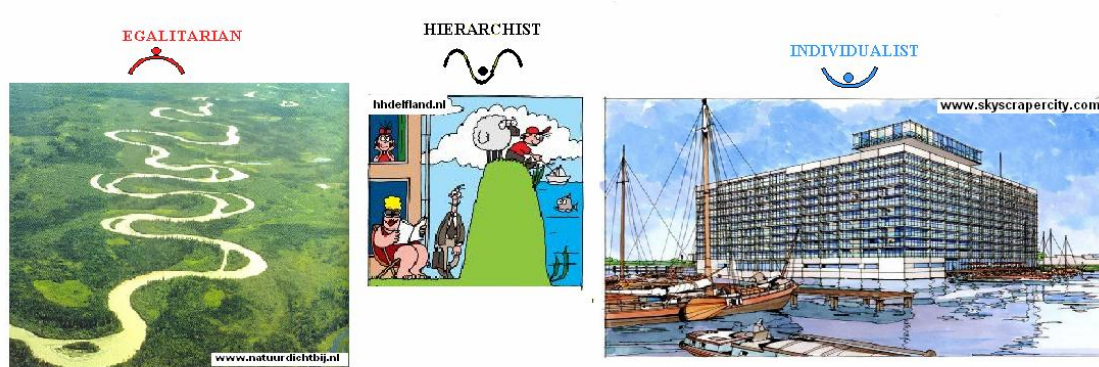
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Perspectives in Integrated Water Resources Management



Information Brochure



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Perspectives in Integrated Water Resources Management

Problem definition

Water management faces major challenges to cope with potential global impacts, and the inherent uncertainties of future developments. Apart from fundamental uncertainties in the physical environment (e.g. climate change, increased discharges), and socio- economical context (e.g. demography, economic growth) there are also uncertainties concerning the societal response towards developments and events in the physical context. The societal response refers to (changes in) how a society thinks about water management, what they expect from policy makers and those who are in charge of meeting determined goals, their (non) support towards policy strategies, and the way they act as individuals. Deltas are areas which are most at risk. Without robust management strategies and adaptation paths, human and natural services in deltas may suffer severe damage and we may be forced into sudden unplanned actions which are far more costly and less appreciated than taking actions right now. Therefore, it is valuable to assess the consequences of different water management strategies under different future developments.

Objectives

The project has three main objectives:

- 1.To assess the vulnerability of river deltas for global change;
- 2.To develop a method to identify robust and flexible adaptation strategies in river deltas given uncertainty, taking into account alternative possible and integrated scenarios for the physical, socio-economic and social system; and
- 3.To provide recommendations on how to use this method to define robust and flexible strategies for river deltas.

Robust strategy: Valid under different future developments in physical and social environment, e.g. increased discharges as a consequence of climate change or a changing social perception on the use of technology.

Flexible strategy: Able to adapt to changes in the physical and social environment, e.g. reversibility and relative easy to change.

Approach

The overall project will be carried out by a diverse consortium of people from Deltares, ICIS-Maastricht University, Utrecht University, Carthago Consultancy, Twente University, DRIFT- Erasmus University, KNMI, and Pantopicon. The project includes 2 PhD projects. One PhD project will analyze physical uncertainties and developments with a dynamical model for effect analysis of transient scenarios. The second PhD focuses on social dynamics, developments and uncertainties and its effects on water management. Both projects will be integrated into a scenarios analysis in which the interrelation between the physical and social system will be described.

Results

The intended results of the project are:

- A method for the development of water management strategies under uncertainty of future physical, socio-economic and societal developments.
- To understand uncertainties of external developments, management strategies and effects on water systems and related services.
- To understand the response of society and policy, the way these responses may change, and their effects on water (management).
- A dynamic model (tool) for effect analysis of transient scenarios, including hydrology and water related services and response of society.

Timeline

In 2007 the project passed through an inception phase, following on the NOP project and will continue in 2008- 2012. The method will be further developed by elaborating the method for an imaginary case, experimenting with the method in different river deltas and comparing the results on perspectives and adaptation strategies.

Methods

The analysis of strategies in water management will be carried out using an approach in which societal and physical research are integrated. The system perspective underlying this idea is the conceptual model of Pressure, State, Impact, and Response (PSIR), which describes the cause effect chain from pressures like climate change or social-economic developments to effects on the water system (state) and related functions (impact) and the response of society to these effects.

A central concept used in this study to structure various interpretations of uncertainties and value sets is the concept of ‘Perspectives’. A perspective is defined as “*the perceptual screen through which people interpret the world [...] and which guides them in acting*”. Within a society or group, a multitude of perspectives can be distinguished. Therefore we need a framework to classify and interpret this plurality of perspectives. For this, the Cultural Theory is used and elaborated, see figure 1.

For the assessment of social perspectives and their dynamics, a combination of qualitative and quantitative methods will be used:

1. Desk research
2. Questionnaires
3. Open interviews
4. Participatory stakeholder workshops
5. Transition approach
6. Scenario analysis



This will result in narratives in which various future developments including the water system, societal responses and external developments are interrelated in a consistent way and illustrate typical transition cases. Scenarios will be based on the perspective theory, stakeholder analysis and the probability distribution of climate parameters.

Dealing with uncertainties related to climate change, sea level rise and living in a delta involves exploring possible futures and effects of these futures and adaptation strategies. Therefore, the approach of this research is to first explore the vulnerability of economic, social and ecological functions in deltas instead of the classical approach to start with climate scenarios.

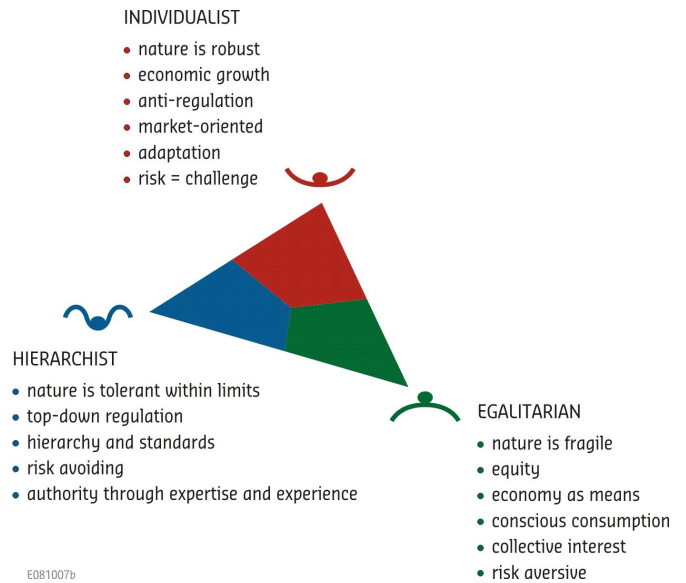


Figure 1: Cultural theory- perspectives triangle.

The vulnerability analysis will be used to define adaptation strategies and setup of a rapid assessment model (RAM), which describes the PSIR chain with physical cause-effect relations for the PSI-part and management and perspective response curves for the R-part. The latter part will be based on the assessment of the social perspectives.

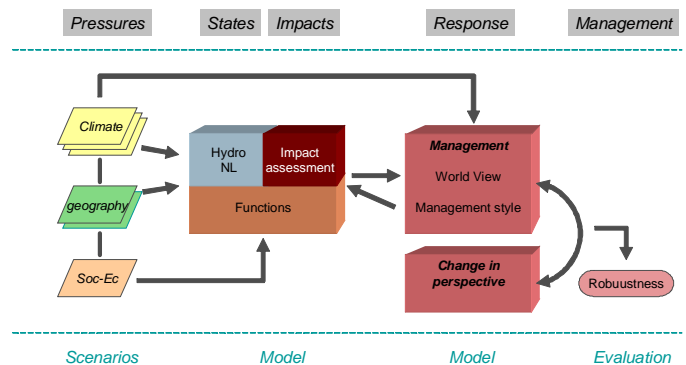


Figure 2. Setup of Rapid Assessment Model.

The RAM will be used to analyse the PSIR-chain with ensemble transient runs to assess the robustness of these adaptation strategies. In this way the study will include the timing aspect of a strategy and deal with the uncertain future of global change, which is not yet been done in other studies. The results of the scenario analysis will be used to evaluate the management strategies and develop adaptation paths (figure 3).