MAIN FINDINGS

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INTRODUCTION

Monitoring Tailor-Made IV is a conference dealing with strategies and practices for the collection and dissemination of information in support of integrated water resources management. It is the stage for scientists from different disciplines and policy makers alike and seeks to connect the different worlds of these groups. The conference aims to obtain new views on information for sustainable water resources management. The previous MTM-conferences converged towards the need for multidisciplinary approaches and an overall integration over disciplines and space when dealing with information for integrated water resources management. This relates for instance to integration of surface water management and ground water management but is also connected to transboundary river basin management. Monitoring Tailor-Made IV builds on this integrative idea and deals with the transition from multidisciplinary to interdisciplinary in integrated water resources management. The issue of spatial integration takes a global perspective by making experiences from local and regional monitoring and assessment available to global assessments and vice versa. The spatial integration stretches out from freshwater to coastal zones and the marine environment.

This paper provides an overview of the main findings of the conference. It will go into more detail on the needs for change that the present water management requires and its consequences for the information-producing sector. Important developments in the use of indicators will be discussed as well as the developments in the more classical monitoring and assessment, especially with respect to the European Water Framework Directive. Finally, the significance of participatory processes will bring us back to the needs for improved water governance.

GOVERNING WATER WISELY

Society today faces problems that can be characterised by large complexity, structural uncertainty, high stakes, and steering problems. For instance Kremer in his presentation described the following series of anthropogenic pressures in water management: agriculture, deforestation and forestation, dams, industrial development, urbanisation, land reclamation and shoreline development, transportation, recreation and leisure, overfishing and aquaculture, etcetera, leading to water degradation and water depletion, increased hypoxia, increased erosion and sedimentation, saline intrusions, oil and contaminants, wetland and ecosystem loss, extinct and reduced biodiversity, invasion of non-native species, loss of sustainability options and an overall degradation of resources and life systems. This non-exhausting listing clarifies the extent of stakes and problems that water management is facing. Because of the complexity of the situation solving one problem may cause aggravation of other problems or may be highly impacting certain stakes. Therefore this type of problems is called persistent problems. These persistent problems cannot be handled by current policies and current research and cannot be solved with incremental changes. As a result we need structural changes in our thinking and acting; transitions in water management are needed. The need for such transitions was emphasised by several authors (e.g. Rotmans, Merrey, Mostert and Kremer). Rotmans summarised the transitions to be pursued as given in table 1.

Old management-style (20-th century)	New management-style (21-st century)
Command and control	Prevention and anticipation
Focus on solutions	Focus on design
Monistic	Pluralistic
Planning-approach	Process-approach
Technocratic	Societal
Sectoral water policy	Integral spatial policy
Pumping, dikes, drainage	Retention, natural storage
Rapid outflow of water	Retaining location-specific water
Hierarchical and closed	Participatory and interactive

Table 1. Required transitions in Integrated Water Resource Management (Van der Brugge and others, this volume)

Our societal complexity requires a new way of governance in which river basin management should be seen as a social-relational activity in which no one entity is powerful enough or has sufficient resources to manage river basins on his/her own. At the same time river basin management is a technically complex task. So, water management requires cooperation; all stakeholders should organise themselves around the issues at stake and start interacting. But the different stakeholders have different values, different biases, different preferences, different cultural perspectives, in short: different mindframes. True interaction can for that reason only be achieved when the actors are aware of the existence of different mindframes and are convinced of the value of the inputs and stakes of the other actors. When the actors realise this interdependence a process of social learning can start. We will come back to this social learning process later on.

MANAGING THE MANAGEMENT PROCESS

One important aspect of information in water management is that a better orientation on the results is needed, including a better focus on the "customer", that is the stakeholders in water management. The previous Monitoring Tailor-Made conferences already stressed this issue and the user focus is explicitly included in the elements 'specification of information needs' and 'information utilisation' of the information cycle. This result orientation however must be built on an enabling environment. This enabling environment in turn builds on leadership; a vision on what is good water governance. Policymakers and management should be aware of the opportunities that already exist in this respect in the results of the MTM conferences and for instance the guidelines that are produced under the UNECE Water Convention.

Water governance requires a vision and leadership. This vision must be based on respect for diversity of stakes and goals, the notion of reciprocity that the actors are interdependent and not able to act alone, and on reflection on the means to reach goals as well as on the goals themselves. Such a vision should aim at a long-term development and because of its multiplicity it will take an extensive process to develop .The vision should then be translated into quantified targets to be able to define measures as well as clear assessment criteria for monitoring the progress and evaluating the results. In this way also the rationale behind seemingly irrational decisions becomes clear.

In developing a vision, the extent of the vision can be essential. Narrowing the spatial scale for instance can exclude certain (groups of) stakeholders, which affects the outcome of the participatory process. Extending the spatial scale on the other hand can make such a process uncontrollable. In essence the choice of scale in developing the vision is political. The case of the Scheldt gives a good example of developing a vision but also clearly shows its limitations.

LEADERSHIP

A vision on water governance needs to be directive as well as have consistence over time, notwithstanding the need to be adaptive over time. The leadership to guide this has to account for three types of processes: the legal and institutional arrangements, the integrated water resources management policies and strategies, and the financial resources. All of these are necessary for implementation of the leadership vision. The "customers" of the process are professionals, decision

makers and society. Each group needs to be addressed in a tailor-made way. As stated above, this can only be achieved through involvement of these groups through a participatory process, where the results from the process feed back into the enabling environment. Such a process should become a social learning process, in which the participants not only give input to the process, but also learn and develop through the process. Gradually, this participatory, social learning process can grow into a continuous learning process leading to innovation and improvement of the water management situation. Summarising, water management has to change from a monistic, technocratic planning approach into a pluralistic, societal process approach in which the focus is more on design and less on solutions, and the emphasis is on prevention and anticipation rather than on command and control. Figure 1 provides a model for managing this process.

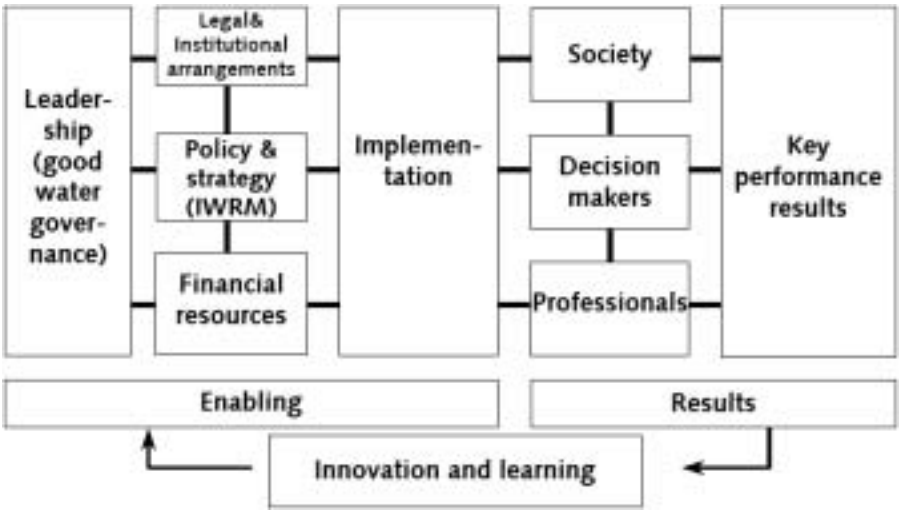

Figure 1 Model for managing and improving management processes (adapted by Cofino from the EFQM Excellence Model (www.efqm.org))

To realise such leadership is not an easy task, as integrated water resources management has to deal with the elements coordination, integration, equity, and sustainability. Integrated water resources management must be done at multiple levels, ranging from the local to the international level. At each of these levels, the management must be transparent, meaning that information must be shared with stakeholders to empower them to take and accept responsibility for decisions. In this new constellation the importance of livelihoods is generally underestimated leading to insufficient attention for local communities and local knowledge. Water governance for that reason must account for sufficient public access to information, participation and justice. But as local stakeholders may not have the capacity to act on the desired level and consequently not participate in the social learning process, empowerment may be necessary to enable this participation. The leadership consequently has to create a level information base and level playing field for all actors.

INTERNATIONAL COOPERATION

In a transboundary situation, water management under these multifaceted circumstances is even more complex as it not only has to account for the variety in stakes and problems, but also has to account for differences in culture, legal frameworks, institutional frameworks and historical backgrounds of different countries as well as different levels of information. In that situation, collaboration in transboundary monitoring has shown to be a solid start of establishing real transboundary integrated water resources management. Experiences show that joint study trips, samplings, workshops and discussions bring the co-operating people closer together within the countries as well as internationally, thus starting the needed process of social learning. In this way, basin-wide water management can become basin-wise water management.

The European Water Framework Directive takes important steps towards this new approach in water management. It shows a clear vision towards a good ecological status as a basis for sustainable development and shows leadership in giving clear directions on how to accomplish an improved water management situation. Nevertheless, there is much freedom in implementing the EU-WFD and in practice it shows that implementation is largely done on a national basis rather than following the river basins. Having this in mind, the UNECE pilot projects have demonstrated that the UNECE guidelines provide a solid basis for the implementation of the EU-WFD, for information purposes as well as for institutional arrangements.

BRIDGING THE POLICY/PUBLIC - SCIENCE GAP

The new views on 'IWRM leadership' are reflected in monitoring and assessment where the emphasis changes from the design of monitoring networks into linking networks to water management. This is among others depicted in the monitoring cycle, where the explicit link is made between information needs and the water management process on the one hand and on information utilisation and the water management process on the other hand. The framework as developed by the USA National Water Quality Monitoring Council shows this connection in the outer circle of collaboration, coordination and communication (the framework is described in Ward and others, this volume). These monitoring frameworks help to link between diverse interconnected tasks. The convergence of thinking with respect to monitoring components leads to comparability between the components and for instance to dedicated supply chain software. The result is a well-defined water-monitoring programme. This consequently supports the production of consistent and comparable data and information for decision-making and the public. However, the interaction between policy and information needs is a troublesome area.

The general idea among scientists is that monitoring is used to collect data. These data are combined into what is called information, which through a process of assessment becomes knowledge. This knowledge eventually leads to the wisdom to govern water wisely. Politicians, decision makers and the public at large on the other hand generally have experiences, perceptions, beliefs and observations that are turned into knowledge, leading to wisdom based on which water is governed. This difference in approach requires a substantial adaptation from the information production community to produce information that feeds in a meaningful way into the water management process.

Indicators are often presented as means to bridge the gap between policy and the public on one side and scientists on the other side. They should simplify the situation at hand, appeal to the non-scientists and give meaningful information. However, we still find that indicators are largely science driven and as such find little appeal with the intended wider audience. Next to this, many initiatives exist in developing indicators leading to an ever-diverging understanding of suitable indicators where convergence is needed.

The quest for finding indicators that appeal to policy makers and the public is ongoing. One important way of reaching this goal is by coupling indicators to the vision. However, often in this process, the coupling gets lost and the resulting indicators are no longer clearly addressing the objectives as initially defined. Another way of defining attractive indicators is by creating a framework of indicators and indices with different levels of aggregation in an accountable, traceable manner. On the highest levels of abstraction we can classify the information with the use of among others: different colours (red is bad, blue is good, etc.), smileys (sad is bad, smile is good), a combination of these two in coloured smileys, the GIWA scoring system scoring between 0 (no known impacts) and 3 (severe impacts), and the 5 classes for ecological quality of the EU-WFD ranging from bad status to high status. That information gives a rough indication for a broad audience. Ideally, if someone from this audience is interested in going deeper into a certain situation, more detailed information is available.

A widely accepted framework of indicators is the DPSIR (Driving forces, Pressures, Status, Impacts, Responses) framework that provides insight into the cause – effect relationships of problems. Nevertheless, additional indicators are needed for policy-support namely policy indicators and process indicators. Policy indicators are directly linked to the policy objectives and show the overall effectiveness of the policy implementation. Process-indicators are necessary to explain the course in

time of the policy-indicators. They indicate how the implementation of measures progresses and this can be attributed to the links between the Response indicators and the Driving force, Pressure, State and Impact indicators respectively.

MONITORING AND ASSESSMENT

Regarding monitoring and assessment we see new needs arising. Where severe problems have disappeared we see the need to monitor weaker signals. Where water management becomes an interactive activity, we see the need for monitoring behaviour of "water actors" or stakeholders and an overall interest into the social-cultural and institutional dynamics. Finally, where the importance of the local levels as well as the international/transboundary level grows, there is a growing need to account for these different levels.

Regarding the weaker signals, there is an important development portrayed by the Joint Danube Survey. This is a prime example of perspectives of ecological monitoring and of integration of chemical and ecological monitoring where chemical elements are supporting the ecological network. Where the classical chemical monitoring no longer provides meaningful information as the levels barely change, ecological monitoring can provide meaningful information of weak changes over longer periods of time. Next to this, ecological monitoring may provide better value for money for countries with few resources, especially as the investments into analytical equipment are much lower. It should also be emphasised that still more emphasis is needed for tailor-making monitoring through better explained and illustrated information needs and through applying step-by-step approaches.

We also find that the quality of monitoring networks is not only defined by scientific standards but also by societal perspectives. Monitoring is not the only source to provide meaningful information, also alternative sources such as expert judgement, models and other sources should be considered. Applying the monitoring cycle in developing and improving monitoring networks helps to advance the quality of the network and facilitates achieving cost-effectiveness. It was noticed that the EU-WFD in combination with reduced national budgets might lead to severe reduction in monitoring efforts. Taking economic risks of inadequate information into account to justify monitoring efforts may counteract this development. Decision makers as well as the public opinion may feel more need for better monitoring in view of the related risks but this requires more than the current public awareness. Active communication is essential in this respect.

As described above, choosing scales can be a political issue, but scale is also important in developing monitoring networks. One reason is that on a small scale, very often, big fluctuations occur that may be essential for decision-making at the local level. If that scale is not included in the monitoring, these fluctuations may be missed. As different processes happen at different scales, monitoring should account for these differences.

EPILOGUE

As discussed before, public participation is a mandatory tool in water management. Public participation is included in legal frameworks as the EU-WFD and the bathing water directive an in conventions like the Aarhus Convention. We are now in the middle of a learning curve of how to implement public participation, and especially important in this process is the aspect of social learning. Monitoring and assessment on the one hand and public participation on the other hand are not yet conceptually integrated in terms of establishing a two way communication and also communication with decision makers is a point of concern.

The conference showed impressive activities and examples of interdisciplinary designed integrated assessments on different levels like the World Water Development Report, assessments of the Global International Waters Assessment (GIWA) programme in Latin America and the Caribbean region, the Land-Ocean Interactions in the Coastal Zone (LOICZ), and the established cooperation between USA and Mexico. One important conclusion that can be drawn from these initiatives is that although they use different indicators and indicator-frameworks, they are also very similar in nature. Therefore, much can be learned from these initiatives. Another conclusion that can be drawn from the many assessments presented is that Geographical Information Systems (GIS) are

very powerful tools in visualising the actual situation and visualising impacts of possible decisions. With regard to the latter it is also emphasised that the relationship between monitoring and modelling should be strengthened. As stated, models can be helpful to provide information next to monitoring and possibly at a lower cost. Also, in the interactive water management context, models are imperative to enable assessment of the effectiveness of measures and also for screening of alternative policies.

From the conference we can draw the following overall conclusions:

- In the pursuit of sustainable integrated water resources management we should not emphasise the differences between institutions and countries, but we should commit to find common ground and emphasise the similarities. This should enable to focus and combine our energy so as to increase impact of measures. The World Water Assessment programme is an example of different teams coming together in one international assessment thus providing a powerful representation of the water sector.
- Communication should be based on the understanding that different people have different mindframes leading to opinions of which the rationale may not be easily be understood by others. Close cooperation towards the same goal on a concrete level, like joint development of a monitoring network or joint assessment report, can be helpful to create a common understanding. Also in this communication, the role for indicators needs to be strengthened and further developed.
- The current water management situation requires drastic adaptations of management structures into participatory processes. Monitoring in this situation has to adapt to serving a wider audience, ranging from decision makers to the public at large. Monitoring also has to include a wider range of disciplines to provide information on social-economic factors and policy implementation next to the classical water quality trends and compliance testing, and the information must be made freely available. These developments call for new innovative ways of producing and disseminating information. More attention is therefore needed for applying ICT tools like models, GIS and the Internet.

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