Factors for and impacts of participatory approaches in the development of management indicators to support effective Integrated Water Resource Management

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Dirk Günther
Institute of Environmental Systems Research
University of Osnabrück / Germany

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1. Introduction

Indicators are considered as important instruments for implementing sustainability and sustainable natural resources management (Tzilivakis and Lewis, 2004). They constitute the basis for assessing the achievement of the objectives within a management process and to evaluate impacts. Consequently, monitoring and evaluation only can be as effective as the indicators are adequate and used by the relevant actors. However, to develop and select indicators for a comprehensive monitoring is a complex effort. The indicators have to represent the social and ecological components of a natural resources system and provide the necessary information for an evaluation of the effects of specific activities. Frequently indicators are ineffective to support the management process because they are inadequate to provide the appropriate information or lack meaning to the involved actors (Dougill/Reed, 2005).

This counts as well for approaches of Integrated Water Resources Management (IWRM), which are expected to deal with the complex issues of managing freshwater resources (GWP-TAC, 2000). The success and the effectiveness of IWRM[1] processes depend on the pre-condition that monitoring and evaluation (M&E) procedures, and therewith the indicators needed, are providing the necessary information about the socio-ecological system, the effects and impacts of management measures and the management process itself. However, case studies provide evidence that indicators are often

[1] Successful and effective IWRM is understood as an integrated approach to water management which results in a utilization of the water resources to improve the economic and social development without increasing the pressure to the water resources, but reduce negative environmental impacts to the water resources system.

not adequate to support water management, due to lack in their usage for management actions by relevant actors.

In resources management literature often a participatory approach of indicator development, with relevant stakeholders, is proposed to overcome the problem of ineffective indicators (e.g. Besleme and Mullin, 1997; Innes, 1990; Innes/Booher et al., 2003). Participatory approaches are expected to increase the adequacy and usage of indicators. Furthermore, current literature on indicators for sustainability and resources management at the local and regional level (e.g. Innes and Booher, 2000; Reed and Dougill, 2003) provide evidence, that stakeholder participation in the process of indicator development can support the procedural aspects of a management process and contribute to the success and effectiveness of management processes.

While theses procedural effects are investigated already in case studies on Local Agenda 21 processes (Besleme/Maser et al., 1999, Sustainable Seattle, 1993, The Colorado Trust and Redefining Progress, 1996) and some natural resource management processes (Reed and Dougill, 2003; Fraser/Dougill et al., korr 2006), research in the field of IWRM is lacking. Research is focusing here mainly on the quality and content of indicator-sets. Moreover, although the IWRM approach highlights the importance of stakeholder participation, the approach of a participatory indicator development seems not to be considered in water management processes yet. Hence the success factors of such an approach and its effects on IWRM are not clear.

This present paper aims to contribute in closing this gap by presenting first empirical results of a PhD study. The research investigated on the one hand contributors for successful participatory approaches of indicator development in IWRM processes. On the other hand possible procedural impacts of such an approach to water management were analysed.

The paper is structured as follow. The subsequent chapter is presenting some backgrounds on Integrated Water Resources Management, its essential success factors, and the role of information and indicators to contribute to success and effectiveness. Chapter 3 describes the methodology of the current research. Chapter 4 presents first results of the investigation. In chapter 5 the paper concludes with a discussion of the results so far and an outlook for further work.

2. Background and research approach

Since the late 1980s the approach of an Integrated Water Resource Management (IWRM) is gaining increased consideration in the management of water resources. The concept is meanwhile one of the most common and widely repeated recommendations in the water resources management literature (Blomquist/Calbick et al., 2005). Derived from the perception that traditional supply-driven and technology and infrastructure-based water management concepts are frequently not adequate to

solve water resources problems, the approach is expected to deal with the complex nature of water resources systems and the understanding of water as a common pool resource (GWP-TAC, 2000).

2.1 Integrated Water Resources Management

IWRM should promote a "coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in equitable manner without compromising the sustainability of vital ecosystems" (GWP-TAC, 2000) from usage of water resources. Like sustainable development, in which the concept is embedded, IWRM is aiming to follow the three overriding principles of economic efficiency in water resources use, equity in the access to water resources in adequate quantity and quality and environmental sustainability (GWP-TAC, 2000:30). Hence, the concept counts as a holistic approach that considers economic, environmental, technical, social as well as cultural issues (Braga and Tucci, 2001) of the water resource. Consequently, the key elements of IWRM and the foundation of its success are integration and balancing of different goals and views[2] in an informed manner. However, IWRM still has to cope as major challenges with the complexity of the management object, with subjectivity of information and with uncertainties. Furthermore, due to differing conditions at different locations, IWRM is not a blue-print-like concept applicable in all circumstances in the same way. To be successful, first it has to be understood as a framework that considers local, regional or basin-scale conditions. Consequently IWRM implies an integrated assessment (Rotmans and van Asselt, 2002; Toth and Hizsnyik, 1998) of the water resources situation and the interactions of the system components within a spatial entity and beyond. To do so IWRM requires the integration of knowledge about the water resource system from different perspectives along the whole chain of causes and effects to provide useful information for decision-making.

Second, the implementation of an IWRM approach has to be understood rather as an interrelated process than as a series of one-of actions, such as construction of dams or irrigation water supply systems or implementing new legislation, and should take place on a step-by-step approach (Medema and Jeffrey, 2005).

[2] Important issues to integrate and balance are inter alia: up-stream and down-stream relations, economic, social and environmental considerations, surface and groundwater management, quality and quantity aspects in resources management and different sectors of policy development and governance scales

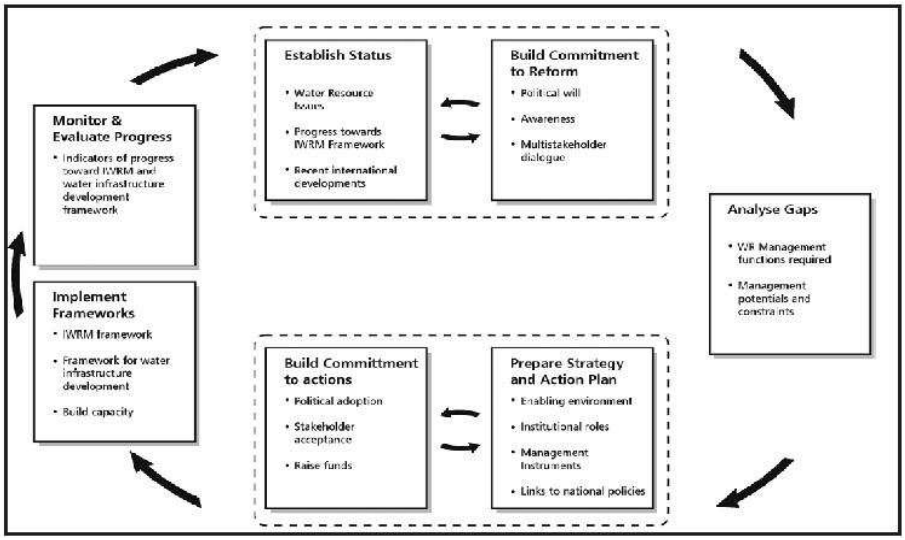

Figure 1: The IWRM cycle (GWP-TAC, 2004)

The processes have to develop and strengthen three complementary elements of an effective water resources management concurrently (GWP-TAC, 2000:30):

- **the management instruments**, including operational instruments for effective regulation, monitoring and enforcement that enable the decision-makers to make informed choices between alternative actions. These instruments need to be based on agreed policies, available resources and the consideration of environmental impacts and socio-economic consequences. A central feature of IWRM success, thus, is to know the available tools and instruments for water management and selecting, adjusting and applying this mix of tools appropriate to the given circumstances.
- **an enabling environment**: the general framework of national policies, legislation, regulations and information for water resources management stakeholders
- **the institutional roles and functions** of various administrative levels, e.g. local, national, international level. In the understanding of IWRM improved performance of water resources management will depend on institutional reforms rather than on additional technologies or more infrastructure (Koudstaal/Rijsberman et al., 1992). Thus, a main challenge is to establish correct policies, viable political institutions, as well as self-governing and self-supporting of local systems (Grigg, 1999)

Figure 2 displays the general framework of the IWRM concept with the three overriding principles and the three complementary pillars.

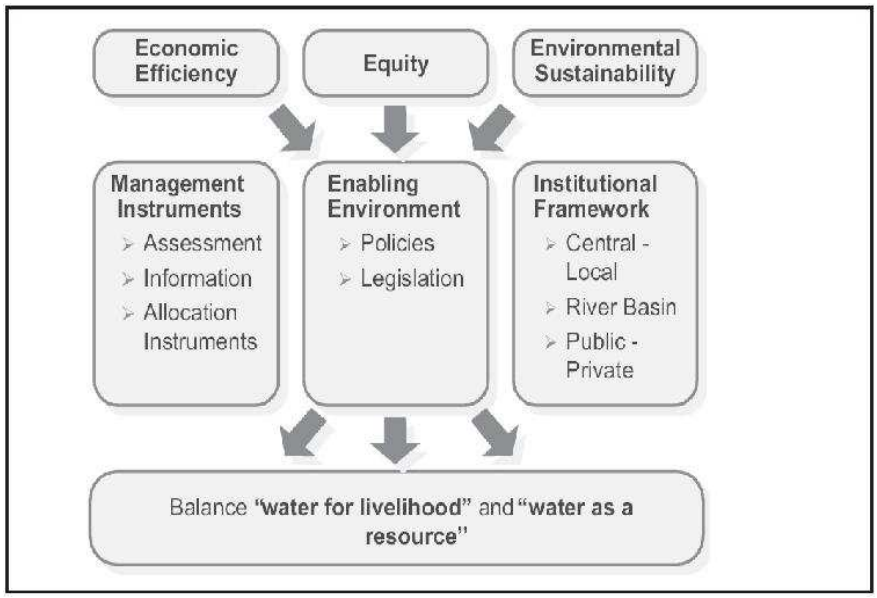

Figure 2: The general framework of the IWRM concept (GWP-TAC, 2000)

However, to make informed choices between alternative actions, to establish appropriate policies within viable political institutions, and for an enabling environment valuable and meaningful information about the resources system and the management process are of essential importance.

As a third factor of success and effectiveness of IWRM processes the adaptive skills of the management process[3] are mentioned (Pahl-Wostl and Sendzimir, 2005; Pahl-Wostl, 2007). Considering that water resources are dynamic and complex systems under constantly changing conditions and following the element of a set of appropriate management instruments, actions once chosen might become inappropriate over time. Thus Pahl-Wostl and Sendzimir (2005) suggest as the central management style to realize effective IWRM processes the adaptive management concept (Holling, 1978/ Walters, 1986), which refers to a "learning by doing" process (Walters and Holling, 1990) in which the outcomes of management actions are used to iteratively refine and improve the management instruments. Again, information of the effects of management actions provided by indicators are needed to enable the mentioned "learning by doing" process.

Hence, concluding on the three complementary elements of IWRM, monitoring and evaluation procedures (M&E) of the outcomes and the impacts of the management can be seen as a fourth fundamental issue in an IWRM framework (McDaniels and Gregory, 2004). The objective of the

[3] The adaptive skills of the management process is the ability of the institutionalised communication and decision-making processes cope with constantly changing complex socio-economic and ecological framework conditions, and to develop adequate and effective, i.e. problem-solving oriented, managing strategies (Holling, C. S., Ed. (1978). Adaptive Environmental Assessment and Management. Chisester, Wiley.).

M&E is not to solve water related problems but to identify them.

The process character of the IWRM framework with its context specific attributes and the suggestion of an adaptive management as the central management style imply, moreover, the need for a strategic and informed management not only of the water resources system (first order management), but for the planning, decision-making and implementation process (Figure 1) as well. Within this “project cycle management” (Baum, 1970), as a second order management, a “process monitoring” should be incorporated as well. This second order monitoring complements traditional monitoring and evaluation approaches (first order monitoring) which usually focus on measuring impacts and physical progress. Process monitoring, in contrast, deals with the processes which determine how progress has been archived and is used as a management tool to take corrective measures for management. However, the approach is not an alternative to the monitoring of physical progress, but rather a complement to it enhancing the quality of conventional M&E approaches. It provides the necessary information on what is working and what is not and why. M&E procedures have to test whether the hypotheses that originally formed the basis of the management action, the management objectives and the implementation activities are adequate to an effective implementation of the chosen IWRM strategy. However, to do so the M&E procedures have to be adaptive as well, in order to be able to evolve according to changes in the information needs of the decision-makers, to deal with environmental, political and societal changes, and to incorporate new technologies and scientific research. The monitoring of the water resources system and the management process, however, should not be a one-off measure in the process of management. Rather it has to be an accompanying and on-going effort to the management process. Evaluating of the physical outcome and impacts, i.e. the potential improvement of the water resources situation, then is established at several points in the course of the process. Thus, it is required to implement an accompanying strategy of monitoring and evaluation procedures within the IWRM process. These procedures have to be decision supportive and based on a conceptual system model of relationships between society and environment. They should consider scale issues, collect different types of information, and integrate water supply and demand measures. Only with such kind of integrated data collection a flexible and realistic approach to assessment and management of water resources system can be taken (GWP-TAC, 2000:52). To avoid any unnecessary delay in the process of implementing improvements to the water resources, at the initial stage monitoring and evaluation should be based as much as possible on existing data and knowledge (GWP-TAC, 2000:52). The initial M&E approach then can and has to be enhanced according to the specific requirements of the IWRM strategy over time.

2.2 The role of indicators and their development to support IWRM processes

The effectiveness and hence the appropriateness of M&E procedures is determined by several issues. The most important factor for the effectiveness is the indicators[4] used for the procedures. Monitoring and evaluation only can be as effective as the indicators which are used for the assessment provide adequate information. Indicators are the central supplier of the information demand by decision maker and water manager. Only if indicators provide an adequate picture of both the water resources system and the management process according to the information needs of decision-makers and water managers they can take appropriate management actions.

Carefully developed indicators also can help to effectively clarify the objectives during the strategy development process, enable M&E processes to identify relevant problematic features of the management and to fine-tune implementation. But to fulfil this, indicators in M&E procedures have to accurately reflect the performance of the management against its objectives. Hence, indicators have to capture the key project objectives and balance the need for specificity with the advantages of allowing management flexibility to use initiative and respond to threats and opportunities as they emerge.

However, to obtain effective indicators the rules and the process, i.e. the institutional framework, of the indicator development is of outstanding importance. Indicators always reflect the current knowledge and value judgements of an actor or an actors group developing them (Köckler, 2005:7). Hence, there is not a value free indicator (Bossel, 2001). But the entire selection process is depending on normative implications and subjective perceptions based on personal norms and values, but also interests. Together these individual norms, values, and interests form a frame of references for the actor which organizes perceptions and interpretations of the complex reality (Schaap and van Twist, 1999). Frames have a selective effect and can lead to a cognitive closedness for facts and information (ibid.) and, hence, the act of deciding what to count and how to count involves a value judgement (Cobb and Rixford, 1998:17). Admittedly, the development of indicators is frequently irreproducible for people different from the developers, as values as well as knowledge can differ personally, temporally and spatially.

Consequently, the process of selecting and developing of indicators is an important part of establishing a successful IWRM process. Innes (1990) argues that if indicators are defined as instruments for managing natural resources (like in IWRM), this should not only include the application, but also the development of indicators. This has to be based on a clear conceptual approach to clarifying exactly what should be measured and how. If not, one may end up with an

[4] Indicators are representatives of an interesting system dimension which is not or only hardly observable and measurable. They are needed in any monitoring and evaluation process to measure the state of a system, whether the development of the system is going into the intended direction, and the longer-term impacts of the selected strategy.

indicator that measures something other that intended (Cobb and Rixford, 1998).

Conceptual approaches to indicator development can be distinguished according to Bell and Morse (2001) into two different paradigms, (1) reductionist approaches and (2) participatory (conversational) approaches. To ensure the adequacy and relevance of the provided picture of an assessment the selection of indicators should be driven by their relevance for the issue to assess. If an issue is identified the indicator which represents the best this issue should be selected. According to the reductionist approaches this is best done due to expert-led development of universally applicable indicators (Reed/Fraser et al., 2005). Current monitoring and evaluation in IWRM is most often done in this way. Scientists, the water authority or another external agency from the process develop and select the indicators to be used in the management process (Günther, 2006). By deriving indicators by experts or the authorities the indicator-set is expected to provide rather objective and knowledge-based measures of reality. However, considering the fact of frames and value judgements in the indicator development, resp. indicator selection, the indicator-set is necessarily biased by the frame-bounded perceptions of the specific actor(s). In addition often the complex variety of stakeholder perspectives to a collective good is not emphasised by the reductionist appraches (Reed/Fraser et al., 2005).

The alternative paradigm of a participatory approach starts from the observation, that “top-down” approaches, i.e. the reductionist approaches, in past environmental management projects failed (Fraser/Dougill et al., korr 2006:114). Often indicators as policy tools in these projects are highly technical in nature and often appear relevant only in the highly specific circumstance in which they were developed, as every conceptual framework represents a genuine approach to information collection and presentation affected by cognitions of the developer (Besleme / Mullin, 1997:43). Consequently, the key messages underpinning the indicators can easily become lost for actors not involved in the indicator development. In order to drive progress towards sustainability it is important to define indicators at a level that is meaningful to the target audience and that encapsulates the spatial and temporal diversity of the system to be managed (Tzilivakis and Lewis, 2004). Innes and Booher (1999), thus, proposed to develop indicators on three different levels of decision-making, each of which provide information relevant to action of different types. At the first level be a small number of system performance indicators, would reflect the central values of the system of concern and serving as a kind of bellwether for its health. Policy and program indicators on the second level reflect the activities and outcomes of various elements of the system. They, hence, are serving as indicators to evaluate the management actions in the narrow sense, helping policy-makers and practionairs to assess whether they should adjust their decision and action and help with troubleshooting when results are not moving in the intended direction.

At the last level rapid feedback indicators should help the individual actors, agencies and businesses to make the best choices for their own daily actions. They will give a direct feedback if specific daily actions are contradicting the intend goal of the mitigation options (Innes and Booher, 2000).

This refers to a second influencing factor for the effectiveness of M&E procedure, namely the use of the procedures. Hence, not only the water authorities and managers are asked to use M&E procedures in water management. At least first order M&E (monitoring and evaluation of the impacts and effects of water management) and the usage of the corresponding indicators is asked from each individual water-user, e.g. in irrigation practices, in land use, or in industrial use. Yet, stakeholder and decision-maker only will use the if they have trust in the assessment process, accept the indicators, have trust in them and perceive them as valuable to them. But, indicators are valuable to decision-maker if they satisfy the information needs of their decision-makers. However, the needs are different for different stakeholder and furthermore might change over time according to changes in the socio-economic and bio-physical conditions of the water resources system.
In particular, in the literature on indicators for local or regional sustainable development (e.g. Besleme /Mullin, 1997; Innes / Booher, 2000; Sustainable Seattle, 1993; Köckler, 2005) as well as in several case studies on natural resources and collective goods management (e.g. Innes and Booher, 1999; Riley, 2001; Reed / Dougill, 2002; Connick / Innes, 2003; Bell and Morse, 2003; Bell and Morse, 2004) frequently evidence is raised that a participatory approach to the development of indicators together with the affected and interested stakeholder is a valuable way to increase the acceptance and usage of the indicators by relevant decision-maker, but also the quality of the indicator-sets.
However, if it is not entirely clear what the indicator-set should measure or if the set is developed without considering priorities and values of community-members, the indicators would be of limited benefit for the actor needing them. Moreover, a supportive indicator-set requests for a balancing of conflicting values and interests to represent collective values and cognitions (Besleme / Mullin, 1997:50). Nevertheless, communities are unlikely to invest resources for indicators unless monitoring and evaluation provide immediate and clear benefits that they can see and feel (Freebairn and King, 2003).

In conclusion, this perspective of monitoring and evaluation and the indicators implies an integration of knowledge from different scientific disciplines. Further, and perhaps more important, an integration of codified and tacit knowledge of stakeholders, their norms and values and their perspectives to and perceptions of the water resources is needed to get a systemic and integrated picture. Though theses integration it would be possible to establish the required trust among the actors as a precondition to an adaptive IWRM. In fact, in particular qualitative assessment often is

not possible without stakeholder input, but from another perspective the assessment can be a powerful tool for mobilizing support for the implementation process by the stakeholders (GWP-TAC, 2004:32). The aim of the participatory approaches, hence, is not only to development effective indicators. But also the establishment of an effective management process for natural resources. The process of indicator development enables participants to recognize shared goals and visions, as well as the limitations of existing measures of well-being and „it is this process that provides meaning and credibility to information in a way that ultimately influences action." (Besleme / Mullin, 1997:44). However, an effective process of active stakeholder involvement is not trivial as the interests of stakeholders are often differing widely, conflicts on management objectives exist among them, and trust is often lacking. To overcome these obstacles the circumstances and the process of stakeholder involvement are crucial to enable and use the advantages of a participatory indicator development approach. Hence the approach of participation has to be adapted to the conditions in the specific water resources system.

Although, the IWRM concept stresses the need to involve all relevant stakeholders into the process and to base water management on a participatory approach (Medema and Jeffrey, 2005), participation yet is not foreseen in the development of management indicators nor applied in the implementation. Also monitoring and evaluation is frequently not understood as a participatory process but more as a separate item in the management process-cycle which is focusing on physical effects (see figure 1). Hence, indicators for monitoring and evaluation of the management process are hardly used and developed.

3. Methodology

Empirical observations lead to the conclusion that most IWRM processes have not lead to the expected results of relieving pressure from the water resources system or even an improvement (e.g. Biswas/Varis et al., 2005). The present study presumes that this in particular is caused by a lack of adequate M&E systems and appropriate indicators. The study further assumes that like in many other cases of natural resources management or local sustainability this is due to a limited usefulness of the indicators for the actors. This raises the question whether a participatory approach in the indicator development for first and second order monitoring and evaluation can contribute to successfully increase the impact of the integrated approaches.

To contribute here first investigations is the overall aim of this study. It will pursue the following research questions:

- How are monitoring and evaluation implemented in current IWRM processes and how valuable are the indicators used?
- What can be learned in IWRM M&E from experiences of participatory indicator

development in other participatory management cases?

- Which contributions are needed to successful participatory approaches of indicator development in IWRM?
- How does this presumably affect IWRM process and implementation?

3.1. A case study-based research framework

Based on the theoretical framework for IWRM and indicator development derived from the descriptions in chapter 2 the present research should generate information about the requirements for a participatory approach within IWRM. If there is leeway for an alternative indicator development approach what are factors that lead to success or failure, in particular in IWRM, regarding participation, scale, management issues or scientific regards. Both analyses, from IWRM process and from indicator development process, are combined in the additional step to investigate which analogy and differences can be identified between the two. A second aim of the research, after the identification of the preconditions, is to derive effects of such an approach to the individual and collective actions of the actors within IWRM and to derive possible impact to the process and impacts of IWRM. Therefore archetypes will be developed in a further step of the research, which, however, is not a target of this paper.

To deal with the raised research questions and to investigate appropriate answers the research design should engaged in questions like “who, what, where, how, why” of contemporary events, which are best covered by a case study and survey research design. Consequently, a combination of both design approaches was applied. A survey of multiple case studies in both water management and indicator development was used. The multiple case study approach was conducted to improve the generalisability of the findings. A case study is defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clear evident (Yin, 2004:13). Thus, a single case study is dependent on specific context conditions, which vary widely in both water management and indicator development processes. These context specific conditions make it difficult to derive generalisable conclusions only from one or few case studies. Hnece it was necessary to base the investigation on a wide range of similar cases in different forms of water management approaches (literal replication). However, the variety of management approaches around the global to the different water resources systems with different management objectives makes it also difficult to base a research only on a literal replication. In particular in combination with case studies of participatory development of sustainability indicators it would be simply impossible. Hence the research used a combination of literal replication and theoretical replication (case studies producing contrasting results for predictable reasons (Yin, 2004)).

To keep the research and case study analysis manageable within the analysis framework of this thesis, the empirical part was split into two branches of case study analysis. First, the research is dedicated to the general approach of Integrated Water Resources Management (IWRM) as a realization of sustainable water management. Case studies are selected and analysed which are, by its own account, generally dealing with an integrated management approach of freshwater resources. The second branch of analysis was dedicated to case studies of processes of participatory or collaborative development of indicators for the management of natural resources and/or sustainability management.

3.2. Data basis

The starting point of the analysis and the foundation of the data basis were project reports and case study descriptions of IWRM processes and participatory indicator development processes. This data basis was raised by a broad literature review regarding integrated approaches in water resources management on the one hand and regarding participatory approaches in the development of indicator for sustainable development and natural resources management.

Regarding IWRM project reports and case study descriptions were first approached via actual projects on water management at the Institute for Environmental System Research at the University of Osnabrück. Namely the projects NeWater, AquaStress, HarmoniCOP and WASAMED provided first case studies for this thesis. In addition, a literature review was done in library catalogues and in the internet. The focus was not only on case studies of explicitly mentioned IWRM cases, but also more general on case in participatory water management with reference to IWRM principles.

Regarding participatory approaches in indicator development case studies were selected from management of natural resources, but also from indicator development in sustainability management on the regional and local level in general, like Local Agenda 21 processes. Although these cases are basically more bottom-up, while the water management processes and other natural resources management process are more top-down, they are supposed to be relevant. In fact, water management is top-down, however, the incorporation of stakeholder and their contribution is basically always bottom-up. Hence the idea is to combine the top-down approach of water management with a bottom-up approach in indicator development. Consequently also case studies of bottom-up management processes can contribute valuable insights to the analysis.

In a first step the entire population of case studies was roughly sorted regarding relevance for the current research. The most important criterion to the selection was the quality of documentation of the case and the possibility to derive factors of success and/or failure. Although it was hardly possible to fulfil representativeness standards, the selection tried to have example from different

setting. In particular regarding case for IWRM it was tried to find case from integrated groundwater management as well as surface water management, i.e. integrated river basin management, from developing countries as well as from European and Northern American countries. After this rough selection regarding whether the case study indeed entailed what was expected a second selections was done regarding the availability of data needed for the analyses. Both selections resulted in a case study selection of highly relevant IWRM case studies and highly relevant indicator development case studies, which were analysed in depth.

The selection criteria resulted in a document population of about 90 case studies altogether (50 in IWRM, 30 in participatory indicator development). Different documents and reports regarding the same case were merged to projects which represent different aspects of the same case.

These relevant case studies were transferred into a readable format to the quantitative data analysis program ATLAS.ti, i.e. electronically documents were formatted into RTF-file, and paper copy documents were scanned and saved in RTF-Format. These RTF-Documents are the primary documents for the ATLAS.ti-analysis. Different documents and reports regarding the same case were merged to projects which represent different aspects of the same case.
In cases where specific aspects were rather unclear or missing single additional expert interviews were undertaken to fill these gaps. The summary transcripts of these interviews were added to the primary documents.
The primary documents were coded with ATLAS.ti according to a code catalogue developed out of the theoretical framework described in chapter 2. The codes from the ATLAS.ti analysis build the sources for another codification used for social network analysis.

3.3. Analysis methods

To analyse the selected case studies a mixed-methodology of a pragmatic combination of qualitative social science research methods was used. The research focus was on structures of the social networks in water resources management and indicator development and on the communication within these networks. In doing so a mixed qualitative methods based on the Grounded Theory was applied which were open enough to deal with the inherent complexities of both branches.

Within this framework a three step-approach was established. First, as fare as possible and relevant for the research an institutional analysis were undertaken to frame the management or development process into a specific setting relevant for its overcomes. The legal and political framework, the overall paradigms on resources management and participation as well as some cultural issues on resource management and participation were considered. Furthermore issues on the procedural characteristics of the processes were examined. Second, an analysis of system structures and

process should give insights to the characteristics of the actual processes of water resources management and indicator development. Here the setting of the processes, i.e. discourses networks composed of the different actor and their linkages among them was analysed. This step include a stakeholder analysis and a discourse network analysis. This means, the more content oriented discourse analysis was combined with a social-network analysis, which is more structure-oriented. The study supposes that the discourses between stakeholders are strongly determined by the existing structure of the social actors' network, like communication relations, trust, interest structures and alliances. This is followed be the third area, the actual analysis of the processes and discourses within the processes.

For all three a qualitative text analysis of the case study material was conducted. First, by a review of scientific literature on water resources management in general and Integrated Water Resources Management in particular and on sustainability indicators and their development in general and participatory approaches in indicator development in particular. This constituted one part of the coding catalogue for the later axial coding of the data and the boundaries of the research. Important elements identified in the approach were for example the institutional setting, the characteristics of the participatory process, the characteristics of the government-stakeholder relationships, communication and learning issues, assessment and process monitoring issues and the adaptive capacities of the processes. Second the case study material and scientific documents were analysis and coded in an iterative process according the Grounded Theory right from the beginning of the research. The categories used for the analysis were developed in an iterative process in the analysis of the case study material. If literature provided evidence of the relevance of a further, not yet considerate category this was crosschecked and if needed added to the framework.

Both branches will be combined in a further second steps to a matrix of supportive and impeding factors of both a successful participatory indicator development approach and successful IWRM implementation. From the resulting matrix of findings it is intended to derive the potential effects and impacts of a participatory approach to management indicator development in IWRM processes.

4. First results of the investigation

This chapter presents first preliminary results from the case study analyses established up to now. According to the overall structure of the investigation it is structured in

(1) first results of the investigation of IWRM processes,

(2) preliminary results regarding the investigation of participatory indicator development approach and

(3) possible impacts of an application of this approach in IWRM .

4.1. Preliminary result from IWRM processes

Regarding the success of IWRM processes a first interesting result was, that it wasn't possible to find a single case were the implementation of the IWRM approach has lead to an release of pressure to the water resources or even an improvement of the water resources system. This support the critic on IWRM processes by several authors (e.g. Jeffrey and Geary, 2004; Biswas, 2004; Jonker, 2002). This might have different reasons and to judge which one is the most relevant is hardly possible within the framework of this research. The following three reasons seem to be of high importance: (1) Most of the IWRM processes are relatively young and haven't fulfilled the hole project cycle yet. Hence it might be too early to judge on improvements to the water resource system. But it is evident that often institutional reforms, e.g. establishment of decentralised regulatory structures, or the implementation of conflict solving forums, are not accompanying the management reforms, which might lead the process in unsuccessful situations. (2) The case study analyses find that most often IWRM is implemented without a substantial shift in the underlying management paradigm. Like often happens in sustainable development processes as well the IWRM concept is used to name incremental reforms in water management without a shift in the underlying paradigm. However, following the argumentation in chapter 2 a paradigm-shift also reflected in the institutional setting is needed to successful and effective integrated water management. (3) There is the further evident observation from case study analysis that most of the processes have spent neither much time nor substantial resources on monitoring and evaluation procedures. Nor stakeholders have been involved neither in the monitoring and evaluation, nor in the development of criteria and indicators for the monitoring. Following the argumentation from chapter 2 of the extremely high importance of an adequate M&E system and the role of stakeholder involvement the above observation might explain the lack of positive impact of the processes.

The case study analysis shows, however, that much data and information is already available in water resources management. The problem seems to be first the accessibility of these information by water-manager and second the adequate selection and usage of the information in a valuable manner by decision-maker and stakeholder. Indicators frequently are seen as very much legally regulated, without much leeway to participatory approaches. In fact, often indicators for water management are already set by legislation, e.g. national or regional water laws. However, these fixed indicators are most often only considering water sources in a hydrological and/or economic sense, or environmental aspects directly focusing on water quality (first order M&E). Only few processes raise data for monitoring and evaluation procedures to assess the impact of the IWRM process and utilize them as a basis for management actions and adjustments.

The research findings support the results by Sabatier, et al (2005) that evaluations are mostly done on the basis of perceived impacts. These are valuable data to assess subjective aspects of the IWRM

process and the survival of the collaborative effort. Although this is not sufficient to assess the outcome success, it may constitute a basis for participatory approaches in monitoring and evaluation. Aspects evaluated in these processes and the indicators developed and used are mostly focusing on water sectoral activities (see for example Enders and Grangler, 2001). Comprehensive and integrated indicator systems in water management are still rare.

Another important result is that a frequent major problem in IWRM implementation is the lacking of representativeness of relevant stakeholder. Often not all relevant actors are considered to participate in the IWRM process. Often stakeholder involvement is restricted to the "official" stakeholder of water managers, representatives of water user associations and the like. Actors not direct involved in water management, but having a stake in it nonetheless are frequently not considered. This can lead to rather homogenous social network structures in water management discourses and hence in less conflictive processes which are hardly innovative but often bounded in trajectories. In addition this leads to a social and cognitive closedness (Schaap and van Twist, 1999) of the management processes in the sense of policy-networks, resulting in a resistance to new ideas and shifts in management means.

Furthermore, implemented participatory approaches are often only informative or consultative and rarely designed for an active involvement of stakeholders. This fact is mainly devoted to the institutional setting of water management, which is often not adapted to the participatory requirements of the IWRM concept. Consequently, these participatory approaches are not very attractive to invest resources by stakeholders, in particular to M&E and indicator development. However, it is possible with reservations to conclude that participatory approaches are working in water management. But it is also evident that these processes take time and are resources intensive. Case studies from the US and Canada show that these kind of stakeholder processes take at least four years or more to come to first substantial outcomes. This long term perspective is often lacking in current IWRM implementation, where the approach is more like a one-off action without the requested process character. However, as mentioned many processes are rather young and may have potential in developing the requested long-term perspective.

4.2. Preliminary results from Processes of participatory indicator developement

The analysis of case studies of participatory approaches to indicator development found that the scientific request for participatory approaches is rarely implemented in practice. In particular in Europe indicator development is still dominated by the traditional top-down and external approaches. This result is also supported by a study of Ladeiro (2006). However, examples for participatory approaches in indicator development can be found in Northern America and especially

in Africa. For Europe a few examples are documented. For example, Fraser et al (2006) mentioned a case study of community-involvement in the development of sustainability indicators in Guernsey, UK to monitor the environmental, social and economic impacts of changes in economy. Köckler (2005) describes a participatory process to the development of regional sustainability indicators in the Märkische Kreis (a German county) in West Germany.

Similar to stakeholder processes in IWRM participation processes for the collaborative development of indicators are resources and time intensive to come to a common problem view and develop the required trust to management collectively. But if there is sufficient time and resources to support the process actors involved are most likely to come to a consensus or agreement on problem view and indicators. However, processes and hence outcomes are frequently also affected by social and cognitive closedness of the policy network.

An important factor for the success, however, is the participatory intensity of the selected approach for stakeholder involvement. The case study analysis raises evidence, that participation should be understood best as an active involvement of stakeholders. Consultative approaches or even informative participation are not likely to result in effective, i.e. used and appropriate, indicators. Stakeholders need to get a stake to the indicators. Hence, they need to know and incorporate what the aim of the indicators is and be sure that they input is valued and recognised by the decision-makers. In line with this results an additional finding is the important role of the governance approach of the process, resp. the network. It is not entirely clear yet whether self-governed approaches or a lead-organisation governed approach (Provan and Kenis, 2005) is more appropriate to the success of collaborative indicator development process and the effectiveness of indicators. However, there is evidence, that there is an strong interrelation also with the resource or system to be managed. Further research is needed here.

Like other participatory processes an indicator development process can fail on several points in the participation process. Mainly this is due to:

(1) Lack of planning and forethought together with little or no experience of the process manager in planning and implementation
(2) Challenges in engaging non-technical and technical communities in dialogue with each other
(3) Selection of stakeholder (groups) to include in the dialogue, exclusion can lead to a refusal on the part of the excluded key group to accept the outcome

Consequently, the management and facilitation of the process is of high importance to the success.

Another observation, supported by a study of Dougill and Reed (2005), is that approaches to participatory indicator development sometimes fail in ensuring accuracy and reliability. Mainly this is coursed by a non-scientific perspective to the system. Hence, to ensure scientific accuracy and

reliability the involvement of experts / scientists is of essential importance and scientific indicators are needed.

The case study analyses show as well that stakeholder involvement in the indicator development has a significant impact on the usage of the indicators, processes are more effective and the implementation of the management process is less resources and time intensive.

However to get the development process successful the actor have to have an interest in the usage of the indicators and the process and to take reciprocal commitments.

Fraser et al (2005) analysed three case studies (forest management in Canada, indicators for sustainable land management to reduce desertification in the Kalahari / Botswana, and sustainability indicators in Guernsey, UK) where there has been a shift from "top-down" indicator development towards a greater community involvement. They draw three primary conclusions:

(1) Participatory indicator development not only provides valuable data for decision-making in management, but the process of stakeholder involvement also provides an opportunity for community empowerment that conventional approaches have failed to provide

(2) If multi-stakeholder processes not feed formally feed into decision-making forums they risk to be perceived as irrelevant by policy-maker and stakeholder. An observation at is also supported by findings in this research from IWRM participation processes.

(3) It is crucial to be flexible in choosing the scale at which monitoring, evaluation and decision-making occurs.

These conclusions are in general also supported by other case studies analysed up to now in this research.

4.3. Possible impacts of participatory indicator development to IWRM

Combining the hitherto analysis of the both case study populations it can be supposed that a participatory approach in monitoring and evaluation and in particular in the indicator development can positively affect IWRM implementation processes.

The experiences in stakeholder involvement in the development of indicators raise evidence that the expected procedural effects indeed support decision-making and consensus-building in management processes. It can be expected that this will be happened in IWRM process as well, presumed that both concepts are applied comprehensively in an integrated manner.

Participatory Indicator development can make a useful contribution to integrated assessment, as it combines both a contribution to knowledge development (by developing relevant indicators) and a contribution to knowledge sharing and stocktaking of different perceptions and values/norms.

Hence, the discourse about criteria and indicators support consideration of different perspectives, interest and knowledge within an actors group, i.e. the water management process. This also increases the perception of different aspects of the water resources situation and possible starting

points for effective water management measures. Even if the water resources are not collectively managed, but by a single authority the participatory indicator development approach will foster the water authority to broad its information and knowledge base and improve the selection of appropriate management instruments.

Furthermore, a participatory approach of indicator development can improve the alignment of the IWRM concept implementation to the specific conditions of the water resources system to be managed, as local tacit and codified knowledge will increase the information basis. The same may count for the adaptive skills of the management process in general and the required “learning by doing” process in particular.

Several other positive effects of a participatory indicator development approach may be found. However, the findings of the present case study analyses suggest that these effects are strongly depending on the quality of the participatory process, its facilitation and the structure of the social network among the actors.

5. Discussion and Outlook

This paper presents first results of an investigation of preconditions, supporter and constraints of a participatory / collaborative approach to the development of indicators in Integrated Water Resources Management. As well first assumptions on the possible positive effects of such an approach were investigated by a meta-case study analysis.

The study shows that the approach of a collaborative development of indicators and the participatory monitoring and evaluation in IWRM can have several effects to improve the management of water resources. Not only the information and knowledge base about the water resources system as well as the management process can be increased and improved. But also the procedural effects resulting from stakeholder participation in indicator development and / or selection are able to improve the management process itself, as it will empower stakeholder and increase trust and legitimacy in the process.

However, the first results of the investigation presented here indicate that these supportive effects are not given per se and a matter of course. They depend strongly on the approach chosen for IWRM implementation and in particular on the chosen approach to monitoring and evaluation and to participation and how the process is facilitated with time and resources.

Regarding participatory approaches the analysis concludes that an active involvement is the best approach to result in effective and decision-supportive indicators, as the stakeholder will have a stake also in the indicators and hence an interest to come to useful and valuable indicators. However, it leave an open question how the policy networks are best governed. This has to be further investigated on the case study material.

Regarding the monitoring and evaluation the indicators used for it are valuable to incorporate assessment and M&E activities as an accompanying process to the water management process assessing continuously the impacts and the management process itself.

However, to realize these theoretical supporting effects in current IWRM implementation needs frequently also an adjustment of the IWRM approach itself. The analysis of case studies in IWRM up to now results in the finding that current IWRM implementation is frequently not inline with the conceptual idea of the approach. The case studies raise evidence that IWRM often is just as a new name for more or less business as usual approaches, without institutional change or paradigm shifts. Implementation often remains on water sectoral approaches without considering the cross-sectoral integrated requirements.

Also participatory approaches in current IWRM are often not supportive to an application of collaborative indicator development approaches, as they remain frequently in the state of actor information or consultative approaches. This comes back to the lacking institutional changes in water management.

However, the detailed causal chains of participatory monitoring and indicator development approaches to the success of IWRM processes need further analysis and investigation. In particular in supporting communication and interaction structures within actors groups are not analysed yet. But these dimensions are presumed as of high importance for the success of participatory approaches in both, IWRM and indicator development, as the quality of the process and the ability to build the required trustful and enabling environment is strongly dependent on these issues.

It remains also to be investigated what are the detailed factors for success of participation in the process and for the effectiveness of the process from participation. Hence, in particular the network structures with in the processes need further analysis. Also the use of M&E procedures and indicator in IWRM need to investigated more in-depth.

An additional important step is the combination of both research branches and the development of archetypes of participatory approaches in the development of indicators in IWRM to derive concrete possible effects. This remains the next step in the research.

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