Towards better water governance: putting Integrated Water Resource Management in place

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Abstract: Water is a finite, renewable, yet in certain circumstances depletable, natural resource with essential value for life. The uneven distribution of water resources, amplified by numerous conflicting water uses, constrains economic development and the wellbeing of humans. The excessive quantity of water as a result of land use and/or climate change (and thus at least partly accountable to human activities) poses additional threats. To ensure an efficient allocation and protection of water, a holistic (integrated/comprehensive) management based on the principles of the ecosystem approach was endorsed by a broad scientific and policy community. Such management was aimed at promoting pro-active, non-structural and demand-side interventions favouring a more cautious exploitation of resources, but the implementation of the concept may turn into a continuous frustration. Meanwhile, some authors consider IWRM an elusive (and fuzzy), amorphously-defined and evolving political process. In this paper we review the issues behind the lack of its successful implementation. We argue that the IWRM stands for policy-making which relies more than ever on interdisciplinary, pluralistic, inclusive approaches, with scientists participating alongside other stakeholders in deliberative decision-making, participatory assessment, or group model building. In the paper, we present a framework of water governance which facilitates the involvement of different actors in the formalisation of integrated environmental models and assists participatory planning and decision-making about water resources.

Keywords: Integrated Water Resources Management; Decision framework; Participatory modelling; Scientific Policy Aid; Policy Analysis

1. INTRODUCTION

Water resource management has attracted vast levels of attention in the recent decades. This is partly because of the fundamental value water exhibits for sustaining life and development. It is also because water management is confronted with problems with characteristics similar to other environmental issues such as climate change, biodiversity decline and air pollution. Water is a finite, depletable, non-substitutable and unevenly distributed resource with a unidirectional flow pattern, which incites conflicts and prompts a number of threats such as floods, landslides and erosion.

Integrated Water Resource Management (IWRM) is, after Sustainable Development (SD), the most frequently discussed normative framework and guiding principle [Meppem, 2000; Shi, 2004]. Similar to SD, IWRM attracted immense interest, both unwarranted enthusiasm and, partly misplaced, criticisms. In its appealing and intuitively understandable meaning the concept stands for an integrated, trans-disciplinary and coordinated management which summons all interdependent water uses and users.

Though, the concept proved to be difficult to implement, as discussed later in the paper. The issues encountered are not different from the concerns being debated in the context of SD. This is why we draw a parallel with the discussion of drivers and epistemological frameworks related to SD.

In this paper, following the discussion about the content and main criticisms related to IWRM and SD, we outline a governance framework in which the challenges are addressed. The framework relies on a methodological pluralism [Sneddon et al.;

Soderbaum, 1999] and deliberative policy-making [van den Bergh et al., 2000], complemented with strategies to mitigate the conflict and maintain the commitment of involved actors. The framework does not intend to add yet another, new sub-set of ’guiding principles’ but to draw on essentials proved useful in different methodological contexts.

2. SCIENCE FOR POLICY SUPPORT

The IWRM/SD concepts are occasionally criticised as ill-defined and elusive, and as such hardly implementable, afflicted with a continuous frustration and susceptible to misinterpretations and hypocrisy [Biswas, 2004; Robinson, 2004; van der Zaag, 2005]. The persistent lack of implementation reinforces the perceptions that “pledges… [are] by now so severely debased by non delivery that [they are] widely perceived as worthless” [Watkins et al., 2005] page 40.

Criticisms related to IWRM/SD can be conceived as a part of a broader exasperation experienced at the interface of science and policy. To explain this, many have argued that policy (or action) -related research differs from mainstream science in several aspects: it is action-oriented (in the sense that the implementation concerns are a part of the research), integrated, value-committed (as opposed to ‘value-free’), situation-specific, operating on the long term and sensitive to the lack of commitment of involved actors [Meppem, 2000; Shi, 2004]. Different epistemological frameworks (e.g. post normal science, ecological economics) have been proposed to describe the characteristics and ‘guiding principles’ of such research. Common to all these frameworks is a re-definition of relations between science and society; integration in the sense of a release from disciplinary and institutional rigidity; methodological pluralism (embracing of ambiguity); surfacing one’s own normative assumptions, values, motives, potentials and limits; and an engagement in ongoing dialog [Muller, 2003].

From the perspective of these propositions, the success of IWRM/SD needs to be reconsidered. Rather than solutions or recipes, they are interpreted as a way of looking at problems, guiding principles, encouraging reflection, and thinking outside of the box [Mitchell, 2004; Muller, 2003]. Indeed, the vague definition of the concepts has encouraged enormous discussion and reflection about values, differences, goals and means to achieve them, which in turn lead to a high commitment translated into a number of institutions and policies which embraced IWRM/SD.

This interpretation has two important implications for scientific policy support: first, the role of scientists shifts from (inviolable) experts to facilitators of policy-making processes [Meppem, 2000]; and secondly, the process of policy-making is given at least as much attention as its outcomes. The need to assess quality (research rigour) of such context-related research with (partly) incommensurable outcomes remains crucial.

The lack of successful implementation was probably nowhere discussed more than in the field of Decision Support Systems (DSS). In environmental management DSS embody interdisciplinary and policy-oriented research. There are many reasons for DSS being rarely adopted by policy makers. In some cases the systems developed to tackle specific issues fail to address the problems’ changing context. System complexity; highly demanding user interfaces not geared to users’ skills; low transparency of the system’s mode of operation (‘black box’ technology); mismatch between requested and supplied functionality; failure to consider the institutional issue of DSS implementation are also frequently quoted reasons for DSS failure. Cognitive obstacles, such as an aversion among senior executives to DSS technology, have been reported as significant in specific situations. The rational approach to decision-making which motivates the DSS is considered unnatural as it is subjected to ’intuitive-style’ and ’feeling-style’-users whose decisions are based on subjective impression and highly personal judgements.

Unlike any other tool, DSS stand for a catalyst of interdisciplinary researches and despite the above challenges they are still a buzzword attracting huge attention. The development and implementation of DSS entail complex interactions between the human mind and computer technology which, if dealt with sensitively, may stimulate learning, question beliefs and tacit assumptions and render decision-making processes more transparent and effective. In this context the success of DSS is not distinctive from that of scientific policy aid, or in more general terms, the acceptance of innovation.

3. FRAMEWORK FOR ENVIRONMENTAL GOVERNANCE

As discussed earlier, IWRM is related to the way water and associated land management decisions are debated and agreements instigated. In practical terms it means to link together multiple, different methods and techniques with distinct, yet compatible purpose and partly redundant content. These include (i) methods and techniques to identify affected actors; select a representative and manageable group of actors without compromising the diversity of knowledge, values and viewpoints associated with the problems; and raise/maintain commitment to the outcomes of the process; (ii) models and methods for their construction to surface beliefs and tacit knowledge; and to explore consequences of different policy options; and (iii) methods and normative frameworks for elicitation and aggregation of decision preferences – value judgements, allowing to determine the overall degree of goals satisfaction by different policy options, and facilitating the choice and consensus building.

These three classes of techniques, methods and models are neither internally homogeneous (as they encompass a number of different approaches) nor mutually exclusive. For example, the first class consists of different techniques for selecting stakeholders, measuring the relations between them, and analysing discourses within and between different stakeholders groups. These techniques do not only allow insights into problems at hand from different perspectives, they also help to surface beliefs and grasp basic preferences.

The classes follow to some extent typical steps of decision processes, which are frequently put in a linear or spiral (evolving) order. It is practical to distinguish these steps since they correspond to the extent to which the problem is specified in terms of problem boundaries, policy options, decision criteria and preferences. It is important to realise though that the commitment to the process outcomes is not linear and the fundamental reasons/motivations have to be discussed again and again throughout the whole process.

The framework is not a loose combination of the above-mentioned methods. It has to (i) facilitate the choice of a single technique (or a set of techniques to be applied simultaneously) which are most appropriate for a given situation; and (ii) reduce effort, which already amounts to a considerable level if the whole framework has to be applied, by reducing redundancy and using the insights gained at one stage of the process in all the other stages when required. The framework may also be applied in a reduced way, depending on the available knowledge and/or purposes and resources.

In the following subsections we discuss the typical methods and techniques applied at different stages of the process. The framework, referred to as NetSyMod has been applied in different contexts and the results are reported elsewhere [Giupponi et al., in preparation]. It is useful for several reasons: First, it controls a successive application of several techniques and methods, making use of the synergies between them and reducing so the requested effort. For example, the assessment of a policy is easier if it is preceded by a participatory model building or conflict mitigation techniques.

Secondly, the framework facilitates the comparison of different technique with similar scope, by scrutinising their implicit assumptions and exploring different (competing) perspectives on the problem at hand. For example, simultaneous application and critical examination of results of two different assessment techniques (e.g. cost benefit analysis and multiple criteria decision analysis), which may potentially yield different results, is more likely to approximate the real preferences.

Finally, as a consequence, the framework helps to balance the involvement of various stakeholders and to maintain their commitment.

3.1 Building of representative groups of stakeholders

A common characteristic of different epistemological frameworks is the participation of wider actors influenced by the policy or who may influence its successful implementation. Public participation (PP) is probably the most discussed topic in environmental management. As shown in [Stirling, 2006] PP brings into play normative (application of deliberative democracy), substantive (acknowledgement of different forms of knowledge) and instrumental (higher commitments increasing implementation success) arguments but also imposes significant contingencies in terms of who should be involved or invited to deliberate. This is important also because the viewpoints of the involved stakeholders have a significant implication for the definition of the problem [Rittel and Webber, 1973].

Although any PP starts with the identification of the stakeholders and, indeed, a number of different techniques exist to facilitate the search (e.g. 4Rs, snowball technique), the way the stakeholders have been identified and the quality assessment of the process are mostly omitted in the reports [Bryson, 2004]. Most PP-related articles refer to the later phases of the participative deliberation [Bell and Sheail, 2005; van Asselt and Rijkens-Klomp, 2002]. In this context, stakeholder analysis (SHA) also facilitates the understanding of a system by identifying the key actors or stakeholders on the basis of their attributes, interrelationships and by assessing their respective interests related to the system, issue or resource [Mushove and Vogel, 2005].

Another related problem is the selection of a representative set of stakeholders, without compromising the diversity of values held, viewpoints and perspectives. At the same time building cohesive, isolated groups and groups with skewed power distributions should be avoided, as these groups tend to perform poorly in terms of the survey of alternatives and objectives and uncertainty/risk appraisal, leading to defective decision-making [McCauley, 1998; Moorhead et al., 1998].

There is a range of different techniques for this purpose: *Social Network Analysis* (SNA) enables investigation of social structures, by translating core concepts of social and behavioural theories into a formal language, and evaluates the associations between actors in relational terms [Doreian, in press]. SNA consists of a number of techniques for collecting sociometric data and measuring the degree of an association. *Discourse analyses* help to identify story lines and complex discourses; understand divergences and values and way of bringing them into the debate [Elands and Wiersum, 2001; Stamou and Paraskevopuolos, 2004]. *Q-analysis* employs questionnaires and interviews alongside with a statistical analysis to measure similarity of opinions [Davies et al., 2005; Duckstein and Nobe, 1997].

3.2 Participative model building

The variety of identified perspectives and viewpoints needs to be made explicit to elicit debate and mutual (social) learning among the involved stakeholders. Mental models (MM) attracted a high attention in technical disciplines such as system dynamics, The attention paid to MM can be explained with the intuitive similarity to computer-based simulation models, developed to explore (and explain, communicate or predict) policy options. In this context MM is a synonym of deeply held beliefs and perceptions, used for learning and qualitative reasoning, but it is incomplete and imprecisely stated, implicit, intuitive, and often wrong. Connecting MM with formal modelling approaches is motivated by the need to improve efficiency in handling large amounts of data, representing complex phenomena, or capturing non-linear feedback processes. An alternative, frequently-used concept is that of “frames” which refers to cognitive structures guiding “sense making” and communication with others [Dewulf et al., 2005].

The soft operational research (OR) methods, also referred to as problem structuring methods (PSM), have a similar scope. PSM is a group of methods (e.g. SODA, SSM, SCA, Robustness analysis, drama theory), rather than a single one, addressing complex problems for the tackling of which classical OR methods fail. Characteristics of such problems are to a large extent identical to those described earlier in the paper, including multiple actors and perspectives; incommensurable, conflicting interests; and fundamental uncertainties.

Representing different perspectives in a group facilitates understanding of each other’s positions and fosters social learning (SL) which in turn favours compromise-building and a constructive attitude to conflict reconciliation. SL refers to the act of learning which can be facilitated by a number of social-interaction techniques such as role-playing games (RPG). By this technique the stakeholders assume tasks and positions owned by another actor [Barreteau et al., 2001].

3.3 Deliberative decision-making

In previous steps the boundaries of the problem, policy options and decision criteria have been negotiated and the negotiation process itself promoted commitment building and understanding positions of others. In the final part the extent to which the policy options satisfy pursued goals and stakeholders’ expectations is analysed.

This part is characterised by a far higher variability of available techniques, underlying theories and assumptions. While the previous steps were concerned with the representation of more or less tangible differences (actors and relations between them, beliefs and perspectives), capturing and representing decision preferences may be hampered by cognitive biases, judgemental heuristics, incommensurable differences and intractable conflicts which pose significant challenges to policy and decision-making.

The different approaches such as environmental valuation (especially contingent valuation (CV) applied in connection with cost benefit analysis), multiple-criteria analysis (MCA), OR methods, Bayesian Networks (BN), and risk assessment methods consist of a number of (significantly) different techniques. In some cases the variability (differences in methodological framework and assumptions) within a group is as large as between different groups of techniques.

The choice of the applied method is not a simple task, as different methods normally yield different results. Although in some situations the choice may be facilitated by specific requirements for the policy choice to be made, in general terms the problem of methodological variability has not yet been sufficiently resolved. The emerging paradigm encourages application of multiple methods. This helps to learn the problem and one's own preferences/judgements by applying different methodological lenses and by doing so, to acquire a higher confidence in the scrutinised options. Another recommendation is to focus more on the process than on the result of a technique. In other words, the ultimate aim of a decision support method is not to prescribe a choice but to facilitate learning about different aspects of the problem, positions of other affected actors, while critically investigating one's own beliefs and values. The learning is informed by preference mapping and aggregation, facilitated by one or more formal decision tools, but the final choice is the result of one's own retrospection and informed judgement.

It is obvious that this perspective imposes increased requirements on the policy process itself and the results of such process will depend on other significant factors, such as the institutional framework in which it is embodied. The success of the process depends on the ability to raise and maintain the commitment of the involved parties, which in turn depends on the individual perceptions and satisfaction with the process so far.

4. CONCLUSIONS AND DISCUSSION

In previous sections, the framework of water governance was roughly outlined in terms of tasks and methodological tool-boxes. A fundamental challenge is the quality assessment of policy advices, engendered by the application of such a framework. This regards both the integration of partial results into a final policy recommendation, as well as an assessment of the policy success in terms of on-ground implementation. Neither is a simple task since IWRM in essence refers to conflict management, and quality assessment in this context has to take into account intangible and incommensurable aspects such as subtle changes in behaviour, level of trust, and changes in relations.

The implementation issue is not independent of the lack of unambiguous success metrics. Achievements can be materialised in the decision outcomes (more effective and efficient decisions) and in the (changes to) decision process (more informed, inclusive and transparent decision making). Therefore, quality assessment of an application of the presented framework should take into account both the outcomes and process itself. Besides, the quality assessment has to include a critical reflection about the evaluation itself.

Within DSS/policy advice, judgements of success or failure have to take into account a variety of benefits which go beyond simple measuring whether the policy recommendations were upheld by the policy-makers or not. However, if wider benefits are to be accounted for, the foundation of DSS has to be revised. The definition of DSS must not be restricted to a piece of software but should include a set of supporting methodologies/ techniques, not coded in form of computational algorithms, which facilitate software development, implementation in a given institutional context and application to a specific management problem.

Over the past years the Natural Resources Management Research programme at FEEM was involved in various attempts to develop DSS to advise water policy within the Water Framework Directive (WFD). The presented framework of water governance, only sketched in this paper but more comprehensively described in [Giupponi and others, in preparation], is a result of these efforts.

The framework which was given the working name NetSyMod (Network Analysis – Creative System Modelling – Decision Support) was tested in different case studies. A comprehensive report about the results from the case studies goes beyond this paper and is described elsewhere. A real challenge is the choice of methods/techniques out of a number of existing ones. The choice should facilitate exploring different perspectives and choosing a robust policy. Yet, there seems to be a trade-off between these two aspects: the application of multiple methods to learn more about the problems at hand is encountered by policy-makers with scepticism and confusion. Learning that different scientific techniques may end up with divergent recommendations tends in some cases to increase rather than reduce the indecision and hesitation to make a decision. With increasing dependence on a professional moderation of the process, it is difficult to transfer the tools to the policy-makers. On the other hand the professional moderation is hampered by a substantial lack of consultants trained in interdisciplinary problem analysis and multimethod policy support.

Perhaps the most important challenge is to understand how satisfaction with the policy process is translated into higher acceptance of the process outcomes.

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