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Trends, drivers and dilemma's in the transition towards sustainable water management

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Introduction

In recent years in many occasions changes in the way of water management have been labeled as new. Opinion leaders strive for a new water culture (European declaration, on a New water culture), research projects are labeled new (NewWater), legislation and policies like the water Framework Directive are presented as new frameworks. This all suggests some split with the past and a transition from old to new.
Authors take a normative perspective that a transition is necessary because of the deficits in the past and the necessities of water management in the future. We want to take as a more empirical starting position here, that there is a transition in water management from a technocratic, expert dominated and relatively closed policy field with clearly defined problems to be solved towards a much more open, stakeholder oriented approach dealing with interdependent problems and multiple and partly conflicting goals. And that this transition is widely acknowledged by academics and in policy practice.
In general 'new' is not always only better than 'old'. Many of discussions about new water management hold the implicit hypothesis that new water management also means more sustainable water management. We have to recognize that some changes in water management are made because we want to make water management more sustainable, but other changes are made because we were unsatisfied with the characteristics of the old water management or because we are simply faced with new challenges like climate change that ask for a new way of water management. But does this mean that new water management is by definition more sustainable?
We first start with some general characteristics of old water management, and than define some general characteristics of what is called new water

management. Because there is an ongoing transition we can not just simply take the characteristics of the new water management and assess it with criteria to call it more or less sustainable. We have to look alternatively at the trends and drivers of this transition to assess the sustainability of the new approaches.
So the first question we ask ourselves in this paper is what are and were the major drivers for and trends in this transition? Our second question is, do these drivers and trends really lead to sustainable water governance? Lafferty has conceptualized sustainability as an issue of policy integration. A major concept for all innovation attempts in water management and a major diver for the transition are the concept of Integrated Water Resource Management and the adaption of integrated approaches in water management. Sustainability has to do with environmental, economic and social concerns and it implies a concern for long term policy effects. We will assess the 'new' water management approach against the perspective of sustainability as a form of inter-sectoral and inter-temporal integration. We will illustrate that the different drivers for the transition in water management can lead to dilemmas on the integration of policies if we assess them against Lafferty's criteria comprehensiveness, aggregation and consistency.

Characteristics of 'old' or traditional water management

What are supposed to be the characteristics of the old or traditional water management? We run the risk of making a caricature of water management in the past. But in general we could say that 'old' water management focused on a technological fix of well defined problems often on a local scale, with a relatively closed governance structure and a governance style that could be best described as 'command and control'. Water management was driven by supply and often approached in a mono disciplinary way.

Technological fix of well defined problems
Typical for old water management was that it dealt with relatively well-defined problems as water sanitation in cities, protection against flooding and eutrophication problems in lakes. These types of problems could often be solved efficiently in a technical way like building infrastructure (dikes, sewage) and increasing the technological sophistication of wastewater treatment plants. However as during the 19th and 20th centuries urban populations became more concentrated and industrial and agricultural productivity was intensified, these well defined problems grew increasingly urgent and became more complex. Because these problems were generally dealt with in isolation from a small (urban) scale perspective, potentially

undesirable long-term consequences and side effects on other problems and areas were not taken into consideration.

Governance style of 'command and control'
The governance style within the old water management has been often been characterized as a "command-and-control" approach. Water systems were typically targeted as being highly predictable and controllable. The governance is described as centralized and hierarchical, with narrow stakeholder participation.

Supply-driven water management
Typical for the old water management would be that water resources managers and policy makers were driven to manage and supply water to people for their direct use. The direct and obvious uses were water to drink, grow and prepare food and provide power for domestic and industrial use. This supply-driven water management was characterized by maximizing the volume of water available for direct use.

Mono disciplinary engineering approach
Old water management approached water problems often from an engineering perspective with fits with the perception of water problems as well defined problems that can be solved with technical end-of pipe solutions. This sectoral approach of water problems meant that problems were considered from one particular discipline at the time.

Characteristics of 'new' water management

As summarized in the previous section in the old water management water and problems were generally dealt with in isolation from a small (urban) scale perspective with a strong engineering focus and water management was supply driven.
In the past two decades, new approaches to water management have been developed to address the perceived shortcomings of traditional water management. Key word of the new approaches is integration. By considering (1) the water system as a whole with (2) multiple purposes with a wide range of potential trade-offs at (3) different scales in space and time potentially undesirable long-term consequences and side effects on other problems and areas are taken into consideration.
These new approaches also attempt to overcome the shortcomings of technical end-of pipe solutions by taking a more (4) interdisciplinary look and a non-engineering (5) demand driven perspective on water problems. The style of governance is less hierarchical and more participatory.

System approach and uncertainty
Typical for 'new' water management is the recognition that water problems can not be dealt with in isolation, but that problem solving has to be done within a water system with different components and their interdependencies. New water management is about influencing system change. The increasing awareness of the complexity of water problems and of the water system as complex, unpredictable, and characterized by unexpected responses to interventions means that management can not be simple 'command and control'. New approaches in water management use concepts such as resilience, vulnerability, and adaptive capacity to express this system dependence and the importance of uncertainty in system change.

Water governance structure
The implementation of water management policies in a given river basin must take into account its political, economic, and social realities and thus requires a transparent and open discourse between scientists and policy makers a shift toward a more participatory management style. Governance is less hierarchal with broader stakeholder participation.

Multiple purposes for water and multiple objectives for water management
The new water management approaches recognize that water has different purposes for different actors like specific water management agencies, governmental and stakeholder groups, geographic regions (upstream-downstream), etc. Given these different purposes of water actors will also have different objectives with water and look at different dimensions. For instance specific water agencies deal with water supply, wastewater and water quality services, storm water and flood control, hydropower, navigation, recreation, and water for the environment, fish, and wildlife. Dimensions and aspects are for instance (Mitchell, 1990):

- dimensions of water (surface water and groundwater, and quantity and quality)
- interactions with land and environment;
- and interrelationships with social and economic development.

Geographic scale of analysis and operation
Were in the old water management the scale of analysis and operation was often the local or urban scale, in the new water management approaches there are multiple scales of analysis and management, stretches out from small watershed, major river basin, region, or state, even up to global scale. This multiple scale perspective is logical from the system perspective were problems on different scales influence each other.

There is a tendency in the new approaches to take river sub-basins as the most important and even exclusive scale of analysis. The necessity of river basin management received positive attention at the Hague Forum, the Bonn Conference, and the WSSD summit and is a leading principle for the WFD (see hereafter). River basin management raises the question of transboundary management, because rivers cross borders and government jurisdictions.(Lulofs and Coenen, 2007)
Scale is not just about water problems. The views of stakeholders on different scales must also be balanced. Examples include issues between upstream and downstream stakeholders, issues among stakeholders in the same region, and views of stakeholders in a basin of origin versus those in a receiving basin.

Interdisciplinary perspective
The complexity of water problems requires knowledge from different disciplines. The analysis of water problems in a given water system should not only take into account the natural and technical system but also the political, economic, and social system. Bringing together knowledge from engineering, law, finance, economics, politics, etc. gives valuable knowledge about the possibilities and consequences of water management decisions and actions. For example, engineering knowledge might focus on physical infrastructure systems, whereas political science or psychology might focus on human behavior. This interdisciplinary approach enables water management to use many disciplines to identify promising alternatives for solving complex problems and to assess the full range of impacts on the natural and human environments instead of focusing on technical solutions. We need also non technical policy solutions like regulation, communication and incentives.

Demand driven water management
Opposite of supply-driven management in old water management is a demand-driven approach ways how to be found for water allocation and conservation of fresh water supplies (Al
Given the rapid rise in human population we have unprecedented water demands. We can not longer maximize water supply in terms of the volume of water available for direct use but have to work on regulating the demand for water.

Sustainable development and integrated water management

Sustainable development and integrated water management are closely linked. In 2002, at the Johannesburg World Summit on Sustainable

Development (WSSD), The Technical Advisory Committee of the Global Water Partnership defined Integrated Water Resources Management (IWRM) "*as a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems*," and emphasized that water should be managed in a basin-wide context, under the principles of good governance and public participation.

Does integrated water management lead to sustainable development? Another way to frame this question is to what extent do water policies contribute to sustainability. Although there are a myriad of definitions of sustainability, the literature emphasizes a long term vision. For example the IUCN (1993) refers to sustainable development as achieving a quality of life that can be maintained for many generations. Such a long term quality of life then can subsist because it is, for example, socially desirable (fulfilling people's in equitable ways), economically viable, and maintaining the long-term viability of supporting ecosystems.

Substantively such a definition of sustainability refers to three dimensions (Denters and Klok, 2004):

- a social perspective: to what extent are social goals like social cohesion and social equity achieved?
- an economic perspective: to what extent are economic goals like growth and efficiency achieved?
- an ecological perspective: to what is the ecosystem's integrity respected and are environmental constraints taken into consideration.

Analytically there are two approaches to the actual measurement in terms of sustainability. The first approach is based on substantive criteria , that relate to the substance of the policy programs. Here one might focus on the ultimate effects and outcomes of the implemented policies. In line with the three dimensions three types of effects would be of interest: economic effects, social effects and ecological effects..

The literature on sustainability also offers an alternative to a measure based on expected economic, social and ecological effects. William Lafferty (2002), has conceptualized sustainability as an issue of policy integration . As substantively, sustainability has to do with three major concerns: environmental, economic and social and implies a concern for long term policy effects we can conceive of sustainability as a form of inter-sectoral and inter-temporal integration .

Lafferty (following others) suggests three criteria for integration of policies: comprehensiveness, aggregation and consistency (2002:23-24). In the context of sustainability the criterion of comprehensiveness implies that sectoral policies programs should reflect environmental, economic and social concerns (cross-sectional comprehensiveness). In this context, aggregation

refers to the (ex ante) evaluation of the policy from an integrated (cross-sectional) perspective reflecting the various substantive concerns. The comprehensiveness and aggregation are also furthered by adopting a long-term perspective (inter-temporal comprehensiveness and aggregation).
Finally, consistency pertains to the consistency of the different components: are the various elements of a comprehensive policy in accord?
A third approach (Denters et.al, 2003) to measuring sustainability employs procedural criteria. As before, the key question in sustainability is whether environmental, economic and social concerns are geared to one another. Whereas the concept of integration refers to the substance of a program and its effects (the results of a policy process), we use the term co-ordination. From this procedural perspective it is important to inspect the patterns of involvement in the policy arena: the presumption here is that a higher degree of co-ordination is achieved when at the political, the administrative and the policy network level all three types of interests (economic, social and ecological) are being represented. In fact, this is the procedural equivalent of comprehensiveness (as a sub-dimension of integration).

Drivers for the transition

System changes
First drivers for the transition towards a new way of water management are changes in the water system itself and pressure on the water system. These changes and pressures lead to more complex problems and intensification of problems. Changes in the societal system are urbanization, population rise, economic growth and globalization. Changes in the physical system are the eexpected climate change and its negative impact on the environment. These changes in the system make it necessary to make use of integrated water management, because traditional water management has shown in practice not to be able to solve these complex problems.

Policies and laws
We can ask ourselves the question if policies and laws are only the result of the transition in water management or part of the transition process itself. For instance in the Netherlands term IWRM well known following the publication in 1985 of the report Living with Water; Towards integral water policy, and in 1989, IWRM became national policy (Ministerie van Verkeer en Waterstaat 1985, 1989).
On the European level the Water Framework Directive (WFD, 2000/60/EC) can be seen as an overall framework for integrated management and a driver for the transition in Europe. Integration is a key goal of the WFD. The main purpose of the WFD is to promote sustainable water use. Protecting and

improving the water environment means achieving an appropriate balance between protection and use. The provisions for protected areas integrate EU conservation policy (Natura 2000) into water management. Integration works two way because **t**he WFD does not impose fixed objectives for the water environment it provides Member States with the flexibility to set objectives that reflect environmental, social and economic needs and priorities. This flexibility means the needs and priorities of other policy areas can be taken into account in water management decisions. This has to take place both on the European, national level and the river basin district level. Within water management the WFD framework has to be coordinated with other water uses like flood defense, hydropower and navigation in setting objectives for the water environment. And EU flood defense policy, energy policy and navigation policy have to accommodate other environmental, social and economic considerations. The other way around, for instance EU agricultural policy and cohesion policy have to take account of water management objectives. Other policy areas have to take account of the protection for instance avoid the need for particular water uses in locations where those water uses would cause deterioration or land use planning policies restricting development on floodplains and hence the need for flood defense or setting flood embankments back from the edge of the river to make more space for the river to flood

Conferences

The efforts of a number of international organizations and a series of conference led to the evolution of and recommendations about IWRM and to commitment of governments, stakeholder organizations and donors to the concept of IWRM.

Already at the United Nations Conference on Water in the Mar del Plata (1977), IWRM was the recommended approach to incorporate the multiple competing uses of water resources. Although in the 1980s, water disappeared, for the most part, from the political agenda, the situation changed in the 1990s, thanks to the efforts of a number of conferences and international organizations. Efforts such as the International Conference on Water and Environment (1992), Second World Water Forum (2000), International Conference on Freshwater (2001), World Summit on Sustainable Development (2002) and Third World Water Forum (2003) collectively led to breakthroughs that thrust IWRM onto the political agenda.

Sustainability of new water management approaches and it's dilemma's

It is difficult to state that new water approaches are per definition more sustainable than the traditional water management approaches. But we can

ask the question inn how far these new approaches match the sustainability criteria and what are the dilemma's in the sustainability of these new approaches. Important here are the drivers for the transition in water management.
We have to look at the various sub-dimensions of sustainability. Our main dimensions are:

- a concern for long term policy effects;
- inter-sectoral and inter-temporal integration

We will illustrate that the different drivers for the transition in water management can lead to dilemmas on the integration of policies if we assess them against Lafferty's criteria comprehensiveness, aggregation and consistency.
The general substantive criterion for a more sustainable water management is that contributes to economic prosperity, ecology and social cohesion
Are the new water management approaches likely to contribute to the achievement of long term objectives of economic growth, social welfare and ecological objectives?

Lafferty's criteria we use here are about the ssubstantive integration in terms of:
Comprehensiveness (both sectoral and inter-temporal) in water policies
Does the new water management approach lead to an assessment of the immediate effects of the policy programme on environmental, economic and social concerns?

Aggregation (both sectoral and intertemporal) in water management
Are the presumed environmental, social and economic consequences of water management aggregated into the overall evaluation of the water policy alternatives?

Consistency of policy program
Are the economic and social; economic and ecological; social and ecological objectives in water management and the instruments for achieving both in accord?

Whereas integration refers to the results of the process; co-ordination refers to processes and procedures. Were integration can lead to a comprehensive representation of interests in the water policies, coordination can lead to comprehensive representation that interests play in water management processes.

Coördination

Does procedural co-ordination in new water management approaches lead to a comprehensive representation of interests in water management processes at the political, administrative and policy network level?

Expected sustainability

Are the new water management approaches likely to contribute to the achievement of long term of economic growth, social welfare and ecological objectives?

The new water approaches presume integrated multiple objectives, so are also more likely to contribute to different objectives given by the three dimensions of sustainable development. A command and-control paradigm requires that system behavior is be highly predictable. A long term perspective is inherent in a system approach to water problems were we not think in terms of certainty and control but in terms of uncertainty and unpredictability. For the later we need a long term analysis. The WFD as driver for the transitions in water management stimulates such a long term perspective

The purpose of IWRM is to achieve ecological sustainability (Rahaman & Varis, 2005). In other words, current water use should be managed in a way that does not prevent future generations from obtaining the same quality of life from the same resource. This is accomplished by achieving an appropriate balance between using the water for livelihoods and conserving the resource to sustain its functions and characteristics (GWP, 2000).

Bressers and Kuks (2004) assume that the sustainable use of water systems requires an optimum distribution of use options among present and future users and use functions. An example of distribution of use options is the distribution between upstream and downstream users. An activity that pollutes water upstream (using a stream to discharge waste or waste water) could interfere with the downstream use of that stream for drinking water supply. Or an upstream weir could impede the downstream flow and flow dependent use options. Such rivalries not only exist between different (heterogeneous) use types, they may also appear among homogeneous uses (uses of the same type). In arid areas farmers may feel the need to co-ordinate the water use for irrigation. Or in the field of fisheries, quotas may be used as an instrument to prevent the depletion of fish stocks.

Comprehensiveness

Do the new water management approaches lead to an assessment of the immediate effects of the policy programs on environmental, economic and social concerns?

New water approaches look at a wider range of problems. A coordinated development and management of water, land and related resources in

principle could lead to maximizing the resultant in economic and social welfare without compromising the sustainability of the environmental system.
The dilemma is that the need to deal with interdependent problems leads to complex water projects with boundary issues and administrative coupling problems. Further integration can create some confusion because it defies neat administrative organization. Rivers do not stop at borders and transboundary problems arise when the analysis and management (Lulofs and Coenen, 2007). Institutional challenges can restrict the usefulness of integrative management approaches.

Aggregation

Are the presumed environmental, social and economic consequences of water management aggregated into the overall evaluation of the water policy alternatives?

Increasing awareness of complexity is a necessary but not a sufficient condition for changing water management practices. If the environmental, social and economic consequences get the right place in the evaluation of water policy alternatives depends on what happens in the in the head and mind of people and if they are really prepared and able to integrate different concerns (Pahl-Wostl, 2007). Many water planners and managers – in political positions, the private sector, non-governmental and governmental organisations, and funding agencies – remain focused on opportunities for technical solutions and supply development. As a result, substantial tensions exist between those advocating management solutions designed to increase the efficiency, equity and sustainability of water use, and those who still see additional (infrastructure) development as the best solution to water problems (Moench et al, 2003). This tension is compounded by questions of control. Many water managers still think in terms of hierarchy, control and blue print planning (Coenen and Lulofs, 2007).

Consistency

Are the economic and social; economic and ecological; social and ecological objectives in water management and the instruments for achieving both in accord?

There is a tension between an economic market oriented approach in water management and social goals. The application of economic principles concerns the allocation of water and the development of water services in a more efficient way. However when water is only treated as a market oriented commodity it threatens domestic use for very basic needs (Gunatilake & Gopalakrishnan, 2002), particularly for people in extreme poverty. This is basically leads back to the discussion whether water is a common or an

economic good. Water is a basic human need and access to minimum quantities of safe water (20 liters per person per day) is a basic human right. Lack of access to safe drinking water, sanitation, and irrigation is directly related to poverty and poor health (Millennium goals)
There is a tension between economic and ecological options because of the stress on privatization and public-private partnership. This is linked with the driver conferences. These concepts were extensively disseminated at water conferences like the Hague forum, the Bonn conference, and the WSSD summit. Privatization threatens the ecological system side of water management because it may encourage fragmentation. Privatization of the marketable aspects of water may result in single-purpose planning and management, instead of ecosystem conservation.
Finally there is a tension between water objectives and social goals. It is important that integrated water management not only deals with water supply and wastewater treatment, but combines many other functions, including flood control (safety for people), poverty alleviation, food production, drought management (Rahaman & Varis, 2005).

Coordination

Does procedural co-ordination in new water management approaches lead to a comprehensive representation of interests in water management processes at the political, administrative and policy network level?

Coordination is important for integration because water management often involves conflicting objectives an interest. The reason for multiple objections and interest is caused by competition for water and by complex institutional constraints Coordinating mechanisms can be formal, such as intergovernmental agreements, or informal, such as voluntarily local watershed groups meeting.
The expansion of the participants in water management who have other multiple (and potential conflicting) objectives potentially leads to legitimize and knowledge claim dilemma's. Accommodating the views of governments and special interest groups is a challenge in integration because they have different perspectives. Intergovernmental relationships between government agencies at the same level include regional, state-to-state, and interagency issues. Relationships between different levels of government include, for example, state–federal and local–state interactions. Special interest groups range from those favoring development of resources to those favoring preservation. In many cases, conflicts arise between the same types of interest groups, as, for example, between fly fishers and rafters on a stream. Involving many participants makes the decision-making process often lengthy and costly.

Discussion: the limits of integration

Many of discussions about new water management hold the implicit hypothesis that new water management also means more sustainable water management. In this paper we discussed the characteristics of old or traditional water management and new water management.

We discussed that integrated water management approaches automatically leads to sustainable developments if we define sustainable development in terms of policy integration, but we face a number of dilemmas. The growing popularity of integrated water management approaches, particular Integrated Water Resource Management (IWRM) has not occurred without criticism

Integrated water management is important for sustainability because it brings in the long term perspective and the system perspective necessary to solve complex problems involving all three dimensions of sustainable development.

Although integrated water management leads to coordinated integrative development and management of water along the lines of all three dimensions of sustainable development (*comprehensiveness*) it also complex water projects with boundary issues, administrative coupling problems and institutional challenges including cross border problems.

The real integration of environmental, social and economic consequences of water management aggregated into the overall evaluation of the water policy alternative (*aggregation*) depends on the preparedness and ability of water managers to really integrate different concerns and leave there predominance with technical solutions.

There are tensions in reaching the different objectives of the sustainability dimensions in accord (*consistency*). Between economic (water as a economic good) and social (water as a basic need) objectives. And between economic (single purpose) and ecological (system perspective) objectives. And finally between social (social functions of water) and ecological objectives.

Finally the expansion of the participants in water management (*coordination*) who have other multiple (and potential conflicting) objectives potentially leads to legitimize and knowledge claim dilemma's and lengthy and costly procedures.

That dilemma's in integration can lead to less emphasize on integrated water management approaches is illustrated in the Netherlands, a pioneer in integrated water management (Van Leuseden, et al, 2007)

The integrated water management approach has been used for more than two decades in the Netherlands. Conceptually it was developed in national policy documents, best described as memorandum or notes on water management. These were written by the involved 'water' Ministries with responsibilities for Public Works, Agriculture/Nature and Environment/Spatial development. These policy documents were discussed and accepted in Parliament. Particular since the Third National Policy Document on Water Management

in the Netherlands in 1989, the concept of 'integrated water management' has become very popular. The reason for the introduction of the concept was that the existing policy concepts were no longer powerful enough to solve the problems of modern water management and achieve a sustainable development. The integrated water management concept is spread to at all levels of government: national, provincial, by the water boards and municipalities.

In recent years the IWM approach lost much of it's shine. Although new 'integrated' water law is being prepared (2006) replacing separate laws on flood defense, quantity, quality, groundwater, etc. We see clear signs that the enthusiasm for IWM is on it's return. Were the 4th Policy Note (1998) still mentions IWM explicitly as guiding principle, at the national level in recent documents IWM is hardly mentioned any more. For instance in last policy note the word 'integrated' is only used once and the 'Commission on Integrated Water Management', a symbol of the area of IWM, is dissolved and replaced by a 'Advisory Commission on Water'.

Another clear sign of the decline of the IWM concept is that the attention mainly goes to specific sectoral policy themes and issues:

- flooding: space for water (rivers, drainage) and drought both in relation to possible change in climate and climate variability
- water quality / ecology (WFD)
- GGOR (preferred groundwater table)
- urban water management.

Of course this does not mean that the Netherlands completely left the IWM concept. Also in this themes IWM managed to emphasize certain important aspects and IWM concepts have in some respect been 'internalized' in water management in the Netherlands. But other themes captured the political agenda. Especially the WFD is taking up a lot of time. Were IWM approach is rather fuzzy and does not appeal to stakeholders, these thematic approaches (flood, drought, pollution) are easier to understand and accepted by the stakeholders. This is partly caused by the dominance of the theme 'risk of flooding'. Climate change reintroduced the issue of flooding on the political agenda, being situated in a low lying delta, the fight against water and flooding forms a narrative throughout Dutch history. In a large policy program called WB 21 the focus is on creating space for water by creating retention areas and other measures.

But the most important explanation for the retreat of the IWM concept lies in the ambition of the concept itself. Although at regional level the concept is still often used, especially at the regional and local levels the support for a pragmatic issue related approach is growing. This pragmatic approach is a reaction to and an effort to overcome problems with the IWM concept.

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