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Value chains in water cycles
Innovations in water governance

Jacko van Ast and Jan Jaap Bouma

Water management deals with great challenges regarding the demand for the many valuable functions water systems provide. The objective of optimization of the benefits related to the different values that are generated by water systems takes place in an international context with a crucial role for infrastructures. Institutional arrangements are needed to include the values that are related to the assessment of the functions of water systems in decision-making processes. Instruments like (societal) cost benefit analysis and participation of stakeholders and public could enhance this optimization, resulting in a more sustainable water management. The concepts of value-based governance and covaluation are presented, that enable value chains to provide the highest collective benefit to society. These insights are to some extent reflected by the theoretical approach of Elinor Ostrom (1990) towards common pool resources management. The different theoretical insights and approaches to water management are confronted with managing of water system in practice. Further exploration requires extended research about how the valuation process should be institutionalized, about which values are to be included in the value concept and about which variables are relevant for value-based governance.

Water management and managing river basins evolved from an engineering dominated approach towards a more multiple, ecosystem oriented approach. This modern approach is known as 'adaptive management' where water managers continually adjust their actions in response to monitoring data and insights that inform about changes in the characteristics of a river and its catchment area, economic conditions and social preferences. Besides, water resource agencies no longer dominate the decision-making process related to managing the flow of the river, its quantities and quality. These agencies become more and more focused on providing technical support to actors within the process of participation. Herein the costs and benefits among the different stakeholders in water systems could be distributed and become acceptable to the stakeholders. Adaptive and participative water management can be characterized as interactive water management (Van Ast

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2000).

However, in practice here the implementation of innovative water management project often strands. Looking closely at the current management approaches there is a need for insights into the processes of valuation by these stakeholders and how processes of these values are and can be institutionalized. It considers the impacts of relevant mechanisms of the processes of institutionalization (DiMagio and Powell 1983) and is based on the general notions on the role of institutions in the coordination mechanisms in infrastructures (Williamson 1979, 1998; North 1990). A theoretical framework will be used to provide insight into the role of institutionalized valuation processes in the field of the coordination of goods and services of water systems. The framework builds upon other valuation concepts such as co-valuation (van Schie and Bouma 2008) and insights into the role of cost benefit analyses and assessment methods in water management (Schuijt 2003; Bouma et al. 2008; van der Veeren and van Cleef 2008; van Ast and Bouma 2008). Illustrations are given by the regional implementation of the European Water Framework Directive (wfd) and the valuation processes in the Dutch regional planning case of Arnemuiden.

The basis of the theoretical framework starts at a physical layer (the physical water system) and the mapping of the different stages of a value chain. Figure 14.1 presents this in a simple way, indicating how several actors are involved that have different stakes in the outcomes of the interventions in the physical water systems. These actors may be motivated to participate in the governance of the water systems because of numerous concerns and values.

In this chapter, firstly a theoretical framework for the governance of water systems is presented. This framework should help to map the valuation of effects of an intervention in a water system, in an integrated governance approach. The framework is confronted with the insights obtained from Elinor Ostrom (1990), leading to lessons to be learned from Ostrom's approach. In the second part the theoretical framework is illustrated with the implementation of the Water Framework Directive (wfd) in a regional setting. Finally, some conclusions are presented and suggestions are given for the design of institutional arrangements to further integrate and facilitate the process of valuation into the governance of water systems.

Value chains, water cycles and valuation instruments

The concept of value chain refers to the order of different activities, starting with resource generation and ending after production and consumption with the disposal phase of the product or service. The analytical concept of a value chain provides insight into the competitive position of a firm in the life cycle of products. The vari-

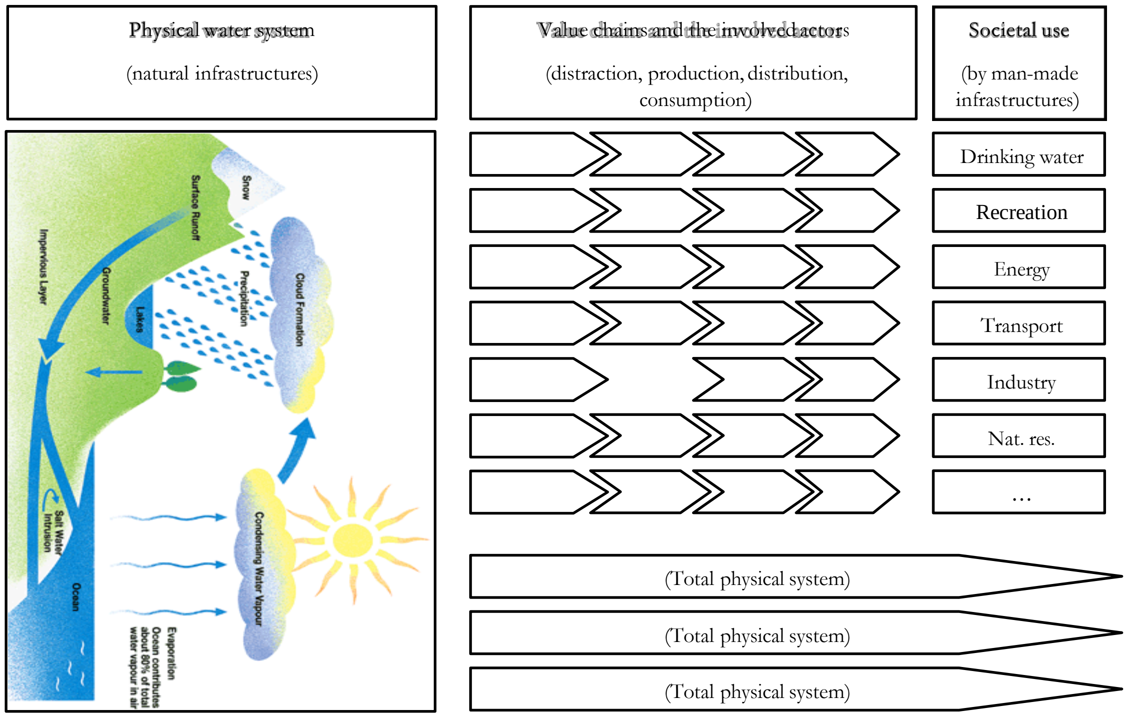

Figure 14.1: Multiple value chains in using the physical water system

ous uses of water systems and their institutional coordination show that many value chains are involved in the governance of these systems. Goods and services of water systems have different values in the different chains and in the different phases of the chains. It is clear that no single price for water or water systems services exists. Traditional value chains related to fresh water systems are related to drinking water, sanitation, energy, navigation and the production of various industrial and consumer products. More recently the generation of values related to recreation and ecology are increasingly important.

The analytical concept of a value chain provides insight into the competitive position of a company in the life cycle of products (Porter 1990). As far as the main good of a water system is concerned, water, in almost all value chains it is extracted as a natural resource. However, the life cycle of a specific product may also start with the re-use of disposed or recycled water. This means that the start and finish of the value chain are connected. In fact, the governance of water systems implies the management of water cycles. The water cycle concept takes the water system as a starting point and incorporates the ecosystem approach and the river basin approach. Similarities with the environmental policy concept cradle to cradle can provide more lessons for sustainable water management (Braungart 2007).

The aim of sustainable governance, including water management, can be considered to be directed towards optimization of the total value of the concerned systems. Both traditional economic values and more recently accepted social and ecological values are included. Various instruments can add to this overall aim. For example an innovative approach like the concept of virtual water or water footprint analysis could make important contributions (Hoekstra 2009). Virtual water calculations make it possible to allow trade in products based on their use of water during production. Optimization could be reached when products that do not use much water are produced in water rich areas where products that do not demand much water are produced in the dryer zones of our planet. Concepts such as virtual water are not yet worked out to an extent that they can be implemented in real life policy contexts for the coordination of value chains. There is a strong need for institutional design of the organization of water allocation where the water related infrastructures manage the flows and stocks of water. This is a process of constant change that is boosted by far-reaching threats related to climate change and economic developments. The driver behind these changes can be framed as conflicts between natural and man-made infrastructures (for example the issue of flooding) or between actors who compete for water to be used in different economic value chains. The conflicts themselves are not necessarily perceived as threats but instead can be regarded as opportunities for further institutional innovations that increase or sustain welfare.

Another way of dealing with this kind of issues is by introducing market mechanisms. The role of the market however is subject to an ongoing debate. Some services of water systems are perceived as pure private goods, while other services may be regarded as purely public services. Between the value chains, actors can compete for accessibility to the water systems. In this respect, different value chains may be organized in different ways under different market conditions. The overall coordination of the relevant value-chains connected to water system is regarded as problematic.

In order to realize sustainable development of water systems, the value chains should be organized in a way that the value can be optimized. This requires the design of institutional arrangements that facilitate the coordination mechanisms that allocate the use of water systems. Alternative adaptation strategies for policies within water management and related infrastructures are assessed on their robustness, effectiveness and economic efficiency. This provides insight into system efficiency and the added value of adaptive water strategies that are based on the idea of multiple value chains of water systems in an international context. The focus is on the water domain, specifically the institutional coordination of water infrastructures and on the accounting of different values related to water systems that are embedded in the governance of these systems. Currently these institutional arrangements are lacking. However, the on-going process of the implementation of the Water Framework Directive (eu 2000) may help to overcome this lack.

An example in the line of economic instruments to support decision-making is based on a confrontation of costs and benefits. Important decisions require in many countries an explicit overview of all costs and benefits that are caused by a project or decision. Especially related to infrastructures, cost benefit analysis (cba) appears to be a dominant assessment tool in modern decision-making. The design of this kind of institutions provides rules of the game in the valuation process of water management. This can be considered as an important dimension of value based governance. The simple use of a Societal (including non-financial values) Cost Benefit Analysis is clearly not enough for the water sector (van Ast and Bouma 2008). Many conflicts in the water sector are related to the distributional effects of interventions in the water systems. New ways for participation of stakeholders in the valuation processes seem to be necessary. A modification of a method such as the societal cost benefit analysis (scba) does not provide a final answer to these issues.

In addition public and stakeholder participation can be established in order to include all concerning values. In terms of Ostrom (1997), participation is recommendable in the context of self governed common-property arrangements. In this view, the rules of the game concerning how values are to be integrated should be designed by the participants of the decision-making on interventions in water systems themselves. Also, the compliance to these institutions should be organized by the participants themselves. This perspective on the integration of values is reflected to a great extent in the concept of covaluation, meaning a combination of the instruments of scba and participation (Van Ast and Bouma 2008). In the regional planning process in the area around Arnemuiden the covaluation procedure has been described the following:

> the early and continual involvement of interested parties and individuals in the valuation and weighing of subjects (in the context of an interactive decision making process), in which values attributed by parties and individuals involved are inventoried and arranged in their respective unities and are involved in the formal weighing and decision making procedures', aiming at consensus on the values that are to be involved. (van Schie and Bouma 2009).

When we perceive a water system as a social-ecological system, the multitier framework presented by Ostrom (2007) clarifies how different concepts of values are embedded in variables. These variables can be reflected in property-rights systems, collective-choice rules, constitutional rules, formal regulation, economic value and in the set of habits and norms. The interactions between these variables produce outcomes. It is a challenge to many policy makers to capture the different stakes and values of stakeholders in the process of formulating interactive water strategies, in order to deal with potential conflicting value-concepts of actors and the costs and benefits in a national and international context.

With respect to the most effective management of common pool resources in the sense that values are protected, Ostrom (2007) warns that there are no panaceas. Every type of resource has its own value chain(s) and institutional setting, which makes one solution for all situations unlikely to exist. Sometimes liberalization or privatization could bring improvements, other times regulation or the introduction of property rights could be of help. In order to identify guidelines for such solutions, modelling could contribute considerably to the tracking down of applicable institutional arrangements for common pool resources management. In the following we focus on river basins as an example of a partial common pool resource.

River systems and common pool resources

In general many different types of non rival and non excludable goods and services, common pool resources (cpr) do exist, like the air or the oceans. Water systems also provide non excludable goods and services to human societies, of which (raw) water is the most important.

Of all world's water only 2.5 percent is fresh and since most of it is stored as ice, only a small part is liquid fresh water. From this fresh water reserve, only the water in the hydrological cycle can be used in a sustainable way. But, since nearly all water is ground water or lake (reservoir) water, not more than 0.02 percent of all fresh water is at any moment part of river systems (Saeijs 1995). This global run off water can be considered to be a common pool. In terms of Ostrom (1990) a cpr situation is a natural or man-made resource system that is sufficiently large as to make it costly, but not impossible, to exclude potential beneficiaries from obtaining benefits from its use. These common goods and services are rival but non excludable. Most river basins, geographical areas within which waters of natural origin (rain, groundwater flow, melting of snow and ice) feed a certain river (un 1978), fit with this definition. This makes river basins to suitable study objects for cpr management.

River systems are complex systems in terms of variables that play a role in their functioning and in their management (Teclaff 1996). Especially transboundary river basins are difficult to manage, not in the last place because they cover different types of country related institutional settings. Nearly half of the world population lives in the 214 larger transboundary river basins (un 1978). In order to exclude complexity related to land management, an advantage would be to replace the river basin by the less complicated concept of river system. This can be understood as the set of watercourses that collects water in a certain geographical area, together with the connected physical, chemical and biological factors (Van Ast 2000: 61). Sustainable water management has to deal with the governance of the values of these more than two hundred large transboundary common pool resources situations. The value chain in cpr can be understood as the meaning of the resource for the different activities, starting with resource generation and ending with the consumption and disposal phase of the product or service.

Water systems, including rivers, are more than just streams of water; other physical, chemical and biological functions also form part of river systems. Rivers are natural allocation systems; they form natural infrastructures that sometimes are reshaped by human interventions. These interventions, generally aimed at enlarging the total value of the system, in many cases lead to pollution, scarcity and physical damage, with degradation of the total system value as a tragic result. However, according to Ostrom, a tragedy is not unavoidable. In many cases, as she proofs, management systems developed that were able to keep the systems sustainable for many years.

In terms of Ostrom (2007) we need to take a diagnostic approach for analyzing the social economic system (ses), so including the social and the physical system. In our research we try to contribute to the search for variables that are important for models that sustain the common pool resource, and a range of questions comes to the surface. In the first place, different theories can play a role here, but which theory fits with the aim of modelling the valuation process? Secondly, the values, or outcomes in Ostrom's (2007) framework, can be expressed in many ways. For example if we take the status of a water system, the outcome is the sum of all value chains. Different activities starting with resource generation and ending with the consumption and disposal phase of the product or service for which the water system serves as input should in this case be taken into consideration. The aim here is to see what we can learn from Ostrom's approach regarding the design of a multiple framework for value based government.

Towards a framework for value-based water management

Ostrom argues that in the case that a water system manifests itself as a cpr this should be governed by means of self governed common-property arrangements if possible. In that case rules are designed and modified by the stakeholders themselves and also enforced by them. Such a situation is referred to as common pool resource situation (cprs). Ostrom defines it as a natural or man-made resource system that is sufficiently large as to make it costly, but not impossible, to exclude potential beneficiaries from obtaining benefits from its use. Ostrom addresses the difference between the resource system and the flow of resource units produced by the system. This unit is referred to in Figure 14.1 as service or good. Clearly the dependence from the one can be framed in different ways; but in our theoretical framework, this dependence is presented as a value chain (see Figure 14.1). Resource systems are like stock variables that are capable under favorable conditions of producing a maximum quantity of a flow variable without harming the stock or the resource system itself. Resource units are what individuals appropriate or use from resource systems (Ostrom 1990: 29–30). Stakeholders enjoy the goods and services these systems provide. Depending on how water systems are governed and what interventions are acceptable or not, they may be provoked to establish activities like free-riding. Resulting in related problems of overuse and crowding out may occur. Shared norms with respect how the water system could be used. These norms may be very context specific and Ostrom states that therefore individuals should adopt contingent strategies instead of independent strategies (Ostrom 1990: 33–6).

Ostrom suggests two theories that could be further developed to tackle problem of adopting contingent strategies. One theory is dealing with the firm. Here the individual is represented as entrepreneur (the supplier of the service or good of a water system to the end-user. In the other theory the individual represents the ruler who has the responsibility of designing and supplying the needed changes in institutional rules to coordinate activities (Ostrom 1990: 39–41). In this respect three main problems occurring due to a collective-action problem. In this context the essential problems are related to designing the appropriate new set of institutions (1). How can these institutions become creditable to the stakeholders concerned (2) and how can they be monitored (3) in order to ascertain the compliance to the new rules of governing the water system. In order to have a clearer view on what rules are to be redesigned, Ostrom mentions the operational, collective and constitutional choice rules. It is focussed by Ostrom on the fact that these rules are interlinked (see Figure 14.2).

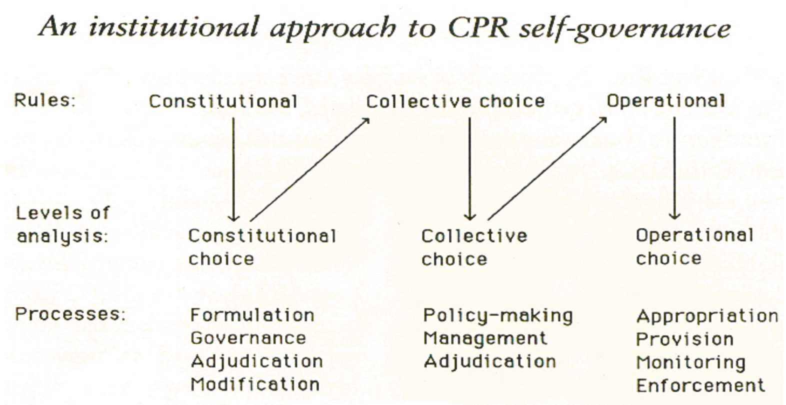

Figure 14.2: Linkages among rules and levels of analysis (*Source:* Ostrom 1990: 53)

In theory, Ostrom shows a way to imply values in decision-making processes that can lead to sustainable management of (water) systems. In the following an illustration of the value based governance approach in a regional context is given.

The development of value based governance and the implementation of the EU Water framework Directive in Flanders, Belgium

In this section the implementation of the wfd is briefly mapped by using the presented framework together with insights of Ostrom. Some conclusions will be drawn on how the problem of multiple uses of water systems is addressed in the implementation trajectory in Belgium.

In December 2000, the wfd was issued. It came in place of seven old directives and should streamline the European water legislation. By means of this institutional arrangement the European Parliament provide its selves an approach that generates other new institutional arrangements at the lower administrative levels that are all involved in managing its water resources at a river basin level, to:

> pursuit objectives of preserving, protecting and improving the quality of the environment, in prudent and rational utilisation of natural resources, and to be based on the precautionary principle and on the principles that preventive action should be taken, environmental damage should, as a priority, be rectified and the polluter should pay. (eu 2000).

The implementation of the wfd should be coherent between the different member states. For this reason guidelines and requirements are described in the common implementation strategy (cis) (May 2001). This may look like a diversion from what Ostrom calls a contingent strategy but in fact it is not. The wfd is concerned with developing common methodologies and approaches and sharing experience and information. The crucial elements of the wfd are to reach a good chemical quality of all European and surface water; a good ecological surface water quality; and a good quantity of ground water by the year 2015. The wfd wants to mitigate the consequences of floods and droughts and secure the European water supply. Furthermore, its aim is to calculate and charge correct prices of fresh water by 2010. Revenues of water collection, treatment and supply are often not covering the costs. More adequate pricing should work as an incentive to more sustainable use of water in order to enable a long–term protection of available water resources. Finally, information, consultation and involvement of the public are also emphasized. The interest of the different stakeholders should be balanced and the transparency in a way that allows citizens to influence the behavior of their government. The European wfd says that 'decisions should be taken as close as possible to the locations where water is affected or used' (ec 2000).

In Flanders (a region of Belgium), this resulted in a breakdown of the administrative levels in accordance with the guidance the eu provides for this. The guidance implies for Flanders for each of the international river basins (Scheldt and Meuse) to design the appropriate coordination scheme (organization and planning of the achievements of the wfd objectives). Each international river basin is divided into (international) River basin districts (in total four: IJzer, Scheldt and Maas, Brugse polders). International river commissions are installed (the International Scheldt and the International Maas Commission) that develops its 'Coordinating section river basin management plans'. At the level of Flanders, a Coordination Commission Integrated Water Policy (ciw) is installed that formulated Flemish river basin management plans and the water policy note. Furthermore the river basin districts are divided into 11 basins and 103 partial basins. Each basin has a basin administration, basin secretary and basin council. The partial basins have their water boards that formulate partial basin management plans. A study concluded that in Flanders, all regulations and subsidiary incentives did not result in concrete ecological returns yet (Vanhulle 2009):

> Local water managers more and more signal that apart from purely financial resources, they also need exact stimuli, deadlines, standards and support to realize the ecological objectives in practice. (Vanhulle 2009: 13)

It can also be concluded that the wfd specifically addresses the demands put on the water systems as a result of the activities related to the drinking water sector, sewage water treatment sector and the set of environmental stakeholders with an explicit ecological quality standard in mind. Also, the water system and its degree of flood protection is regarded as a specific service of the system. Measures are to be developed to achieve objectives that are function specific. However, to coordinate and assess the measures at a meta-functional level is not clear. The use of a societal costs benefit analysis is stimulated. However, how specific functions should be valued is still unclear. When prices for the specific goods and services related to these functions exist, they could be integrated into the scba. Still for many services and goods no market prices are available. The participation of the stakeholders related to these non-prices services and goods is in itself not a guarantee for the facilitation of all those functions of a water system in a degree that is favoured by all stakeholders of river basin.

Concluding remarks

Governing the value chain, or Value-based Governance, implies the incorporation of socioeconomic and ecological values. Tools and methods are for example monetarization tools like 'artificial pricing' for cba or institutional arrangements like participation of public or stakeholders. A closer look at the implementation of the wfd shows that there is a lack of coordinating institutional arrangements for the governance of the different value chains that are related to the use of the water systems at a river basin level. The invisible hand of the market system is not to be relied upon since many of the goods and services are not coordinated by the market system but the government. This currently undergoes a drastic change in the eu-member states due to the implementation trajectory of the wfd.

This chapter underpins that governing transboundary river systems implies the coordination of a large number of stakeholders and confrontation of many values. Every local entity has its own values and on the inter-state level upstream and downstream values in many cases are opposite. This means that the level of scale of the process in the river system is crucial for any institutional improvement. When integrated decision-making about economic, social and ecological values is at stake, analyzing the role of the different institutional arrangements in the context of value-based governance could optimize functioning of a ses.

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