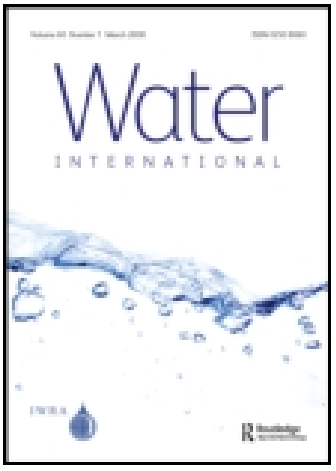

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Ten building blocks for sustainable water governance: an integrated method to assess the governance of water

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Ten building blocks for sustainable water governance: an integrated method to assess the governance of water

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A three-step interdisciplinary method to assess approaches to water shortage, water quality and flood risks is presented. This method, based on water system analysis, economics, law and public administration, seeks to create common understanding based on newly developed concepts and definitions. First, generating content knowledge about the water system and about values, principles and policy discourses. Second, providing an organizational process with sufficient stakeholder involvement, insight into the trade-off between social objectives, and attribution of responsibilities in addition to regulations and agreements. Finally, implementing the agreed service level through adequate infrastructure, enforcement and conflict resolution.

Keywords: water management; water governance; integrated water resources management; interdisciplinary assessment method

Introduction

Well-managed water resources can be a significant driver for growth and can generate huge benefits for human health, the environment and the economy. On the other hand, badly governed water resources can significantly hinder growth, reduce opportunities for further development, put ecosystems at risk, cause societal disruption, create political instability and impose economic costs (IPCC-WGII, 2007).

Due to the complex nature of water systems (multilevel, multi-scale and multi-actor), a water governance approach is needed in which different values, interests and uses of water are interconnected so that water policy and measurements are developed and implemented with the support of different stakeholder groups (Edelenbos, Bressers, & Scholten, 2013; Pahl-Wostl 2006; Tortajada, 2010; UNESCO, 2006). This governance perspective is also sometimes referred to as polycentric approaches. Polycentric governance systems are defined as systems in which 'political authority is dispersed to separately constituted bodies with overlapping jurisdictions that do not stand in hierarchical relationship to each other' (Skelcher, 2005, p. 89).

The importance of water governance is growing as changes in population, diet, land use and economic activities exacerbate competition between water users to access the resource they need (Edelenbos et al., 2013; OECD, 2011). Moreover, climate change

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generates uncertainty about water availability and safety in the future. Finally, water resources touch upon issues of land use, such as economic and urban development, ecology, nature development and agriculture (Tortajada, 2010). Water governance assessment methods explicitly deal with this multifaceted and integral aspect of water resources in countries and regions (OECD, 2011, 2014).

Integration in water management and water governance is widely acknowledged. The concept of integrated water resources management is therefore warmly embraced by many disciplines and in theory as well as practice. The definition of the Global Water Partnership (2003) is most commonly used: 'Integrated water resources management is 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.' However, it has become clear that this concept is broad, all-encompassing and impressive, but also has little practical resonance now and in future water management practices. It leaves too many questions unanswered and is therefore fashionable but unimplementable (Biswas, 2005, p. 323). As Biswas (2005) states, there is a need to develop an objective, impartial and undogmatic assessment of the applicability of integrated water resources management.

Although it is presumed that it is not possible to use a concept practically – and a related assessment method – that covers developed and less developed countries, countries with different physical, hydrological and climatologic circumstances, countries that have different cultures and values and different institutional, legal and environmental regimes (Biswas, 2005, p. 335), a start will be attempted here. The proposed assessment method is built in a multidisciplinary way, although it is realized that not all relevant disciplines are yet included explicitly. However, the method is based on many scientific background papers that have been written with other disciplines as well. The method can be broadened with and used by other disciplines such as psychology, history, political science, sociology, geography and so on, but at this moment we chose to stick to those fields of which we have expertise and knowledge, trying not to make the same mistakes as have been made previously, developing a multidisciplinary method without having the appropriate knowledge available.

Because water is an integral issue, it touches upon different fields and disciplines, such as water system analysis, economics, water law and public administration, which all need balanced attention and scrutiny in the assessment approach. At this moment assessments are often fragmented and mono-disciplinary in nature and do not deal with this integral aspect of water resources. However, an increasing amount of integral assessment approaches appear, but these approaches often lack scientific substantiation and grounding (OECD, 2011, 2014). The information and knowledge base on which they rely can be very weak and fragmented. Integral and interdisciplinary assessment methods are scarce, partly for the reason that such integral and interdisciplinary assessments are particularly complex to develop and implement. It is argued that more knowledge and experience are needed in developing and implementing such integral assessment methods.

The main objective of this study is therefore to develop an interdisciplinary method and approach grounded in the scientific literature and which can approach water issues in a holistic and integral way. The developed method is of a diagnostic nature. It will create the opportunity to identify strengths and especially weaknesses in water governance capacity that need further attention in enhancing water governance in order to deal with water issues in an efficient, effective and legitimate way. Various disciplinary methods (Arts & Leroy, 2006; Perry, 2003) have been reviewed and expert knowledge of various disciplines, respectively water system analysis, economics, law and public administration, has been used to arrive at shared values and assessment criteria.

Beyond the conventional discussions about water governance, this paper sheds light on the interdisciplinary nature of water governance in particular (Brouwer, 2013; De Vries, Zonneveld, & Buijze, 2014). The integrated method to assess the governance of water management is presented in the second section. The 10 building blocks to assess weaknesses in water management and governance are discussed in detail in the third section. The fourth section concludes and shows that expert knowledge from various disciplines is required for water governance assessment. Finally, an appropriate role of various disciplines in this debate is suggested.

Integrated assessment method

The strength of water management and governance can be judged on the basis of the assessment method shown in Figure 1. It has been developed to assess the main gaps in the (1) knowledge base, (2) weaknesses in the organization process, and (3) problems that may arise when implementing the agreed service level. The proposed interdisciplinary method consists of 10 building blocks and is of a diagnostic nature.

Sound water management requires knowledge about the water system in time and space and about values, principles and policy discourses. This knowledge is required for the organizational process to come to an agreed service level. The organizational process requires sufficient stakeholder involvement, insight into the trade-off between social objectives, attribution of responsibilities, authorization and the associated means as well as regulations and agreements. Finally, the agreed service level has to be implemented, which requires engineering of infrastructure, enforcement and conflict resolution.

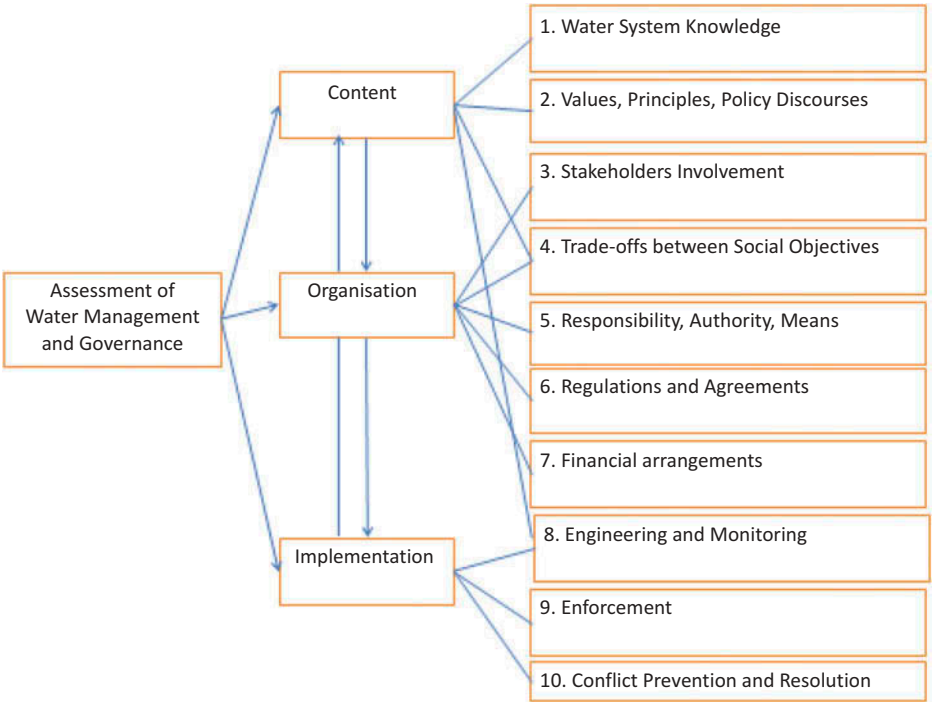

Figure 1. Multiple dimensions of water management and governance.

The assumption is that water governance is sound when all three main dimensions and corresponding 10 building blocks are dealt with. The sequence and interdependence among these dimensions and elements have important implications. Sound water management and governance will only eventuate when there is congruence between these dimensions and corresponding elements. For example, implementation without attribution of responsibilities is, for instance, doomed to fail, and enforcement only can take place as regulations and mutual agreements are in place. This illustrates the integral and interdisciplinary aspect of the assessment method. Finally, Figure 1 illustrates the cyclic aspect of the method. Once the agreed service levels have been implemented, the loop might go back to the content as it can have consequences for the state of the water system, or when monitoring shows the need for revision of one of the building blocks. The building blocks are the result of a two-year collaboration project on interdisciplinary approach of water governance in which the authors participated. First, the researchers developed building blocks from their own specific discipline and research, and subsequently the buildings blocks were merged and interrelated in various interdisciplinary workshop meetings, of which Figure 1 was the result. New wordings for shared concepts were developed to avoid a too strong focus on one of the individual disciplines, which often leads to misunderstandings when using the method.

Building blocks to assess the governance of water

Each of the 10 building blocks is described below. A criterion to judge the strength of each building block is defined. For example, whether there is sufficient knowledge with regard to the water system or sufficient institutions in place depends on the kind of problem. So the judgment is case specific.

Water system knowledge

The water system is defined as the combination of natural physical resources (such as rivers, rainfall, seas, lakes) and man-made infrastructure (such as canals, pumping stations, reservoirs, flood defences). The system supports societal functions, such as domestic and industrial water use, irrigation, shipping, hydropower, safety, etc., and includes the ecosystems related to water. Knowledge of this system refers to knowledge of the natural processes, but also knowledge of the properties of the infrastructure. In order to know the water system, it is essential to measure the important characteristics. For example, in order to assess the availability of water, the precipitation at several locations in the river basin has to be measured. And to assess the risk of flooding, water levels and changes in the topology in rivers and seas have to be known.

The necessary knowledge of the water system depends on its societal functions. These functions often change in time, and hence the requirements of the water system will also change. Moreover, changes in the natural environment will also influence the performance of the water system. It is important to know the impact of these changes, and to support decisions by showing the impact (e.g. with respect to costs, economic benefits and risk) of these decisions. Because these future impacts cannot be measured, it is important to have mathematical–physical models in order to assess the impact of relevant measures. Water systems show a high natural variability. Uncertainties include not only this natural variability, but also the epistemic uncertainties. For example, an uncertainty analysis of emergency areas along the River Rhine in the Netherlands shows that this measure is not

effective when all (knowledge) uncertainties are taken into account, where this measure is effective in the world without uncertainties (Kok, Stijnen, & Silva, 2003).

Water resources involve the demand, supply and quality of fresh water. Green growth requires that water allocation is framed by the amount of water that is available within sustainable limits at a specific time. This requires good knowledge of water availability and water uses, and their interactions. The linkage between upstream consumption and downstream availability calls for a basin approach. Water accounting and hydrological modelling are suitable analytical tools in this respect. Remote sensing is a consistent method to provide impartial data on actual evapotranspiration, i.e. water consumption and biomass production and hence differences in water productivity. Besides knowledge about the water system in time and space, insight is also required into the impact of investments in water resources development on water availability. This knowledge is required to frame the organization process. In many places, water is currently over-allocated and heavily polluted, i.e. more entitlements have been issued for a system than can be sustained.

Flood risk involves the assessment of risk: the probability of failure and the consequences of failure (such as casualties and economic losses). Recent examples are the catastrophic flood of New Orleans in 2005, the tsunami in Japan in 2010, the extensive river floods in Thailand in 2011, Sandy hurricane in 2012 and the floods in the Balkan region in spring 2014. Flood risks can be mitigated in many ways and knowledge of these risks is essential in order to implement measures that do mitigate these risks. Measures include land-use planning, building requirements, flood defences, evacuation planning and taming rivers along waterfronts.

> *Assessment criteria*: Is there sufficient knowledge of the existing water system in order to deliver the required service level of societal functions? If not, what are the gaps; is sufficient knowledge available to assess the impact on the water system because of changes in environment and societal functions?

Values, principles and policy discourses

Water issues touch upon different values, principles and narratives, and water management has a normative dimension that is often neglected (Driessen & Van Rijswick, 2011).

Values

Values may differ per country or society, and depend strongly on historical, cultural, normative and political views. Notwithstanding the existing of different values, it contributes to good water management and governance which are based on shared values because this enables the finding of legitimate solutions that are easier to implement (Ambrus, Gilissen, & Van Kempen, 2014; Bressers & Kuks, 2004). Trust in the integrity of partners involved and the aim to find solutions that are accepted by all is a crucial factor in good water governance. Common interests may play a positive role in finding shared values. Well-known values are the recognition of human rights, equity, human dignity, justice, trust and solidarity or self-determination. Values can also be more specified for the water domain like flood protection for all against acceptable societal costs, or the availability of sufficient and clean (drinking) water, an equitable, sustainable and fair use of resources or the value that no significant harm should be done to others (Warner & Van Buuren, 2009). Values can be further elaborated in principles.

Principles

Principles are also of a more general character and should not be confused with rules and regulations. Several groups of principles can be distinguished, such as (1) institutional principles, among others decentralization, subsidiarity, river basin management, or integration; (2) principles of good governance, proportionality and public participation; (3) specific environmental principles, e.g. the precautionary principle, the polluter-pays principle, the prevention principle, the principle that pollution should preferably be tackled at the source; and (4) technical principles, e.g. from global design to detailed design (see the eighth building block). Values and principles play a guiding role in enhancing creativity by developing new alternatives in policy development and decision-making (Keeney, 1992).

Narratives

The content of a water problem is shaped in different policy discourses. An example of two different and opposing policy discourses in the Netherlands is protection against extreme water events (dams, dikes) and living with water (providing more room for the river, for example). Policy discourses can be considered different ensembles of actors with specific story lines, frames, values and principles that emphasize certain aspects of water problems and policy measures.

> Discourses frame certain problems; that is to say, they distinguish some aspects of a situation rather than others. [...] As such, discourse provides the tools with which problems are constructed. Discourses at the same time from the context in which phenomena are understood and thus predetermines the definition of the problem.
>
> (Hajer, 1993, pp. 45–46)

By constructive dialogue a process of social learning is established (Mostert et al., 2007; Pahl-Wostl, 2006). In dialogue mutual understanding is realized about the stakeholder's interests, values and viewpoints (Meijerink, 2008). Some explicitly speak of *adaptive* water governance in order to stress the need for using adaptive management approaches to deal with complex water issues (Huitema et al., 2009). These approaches can be characterized as flexible, learning and reflexive and are needed to take into account the true complexity of water systems (Brunner & Steelman, 2005; Folke, Pritchard, Berkes, Colding, & Svedin, 2007).

To understand the content of a water issue one needs to understand not only the facts (as under the first building block), but also the values, cultural, social and political background, and images that actors have developed in the course of time dealing with water issues. Water issues are oftentimes approached from highly institutionalized angles and discourse that predetermines certain courses of action, and excluding certain viewpoints, contents and courses of action at the same time. This is also called framing. Framing is a three-fold process of selection, focusing and embedding (Dewulf, Mancero, & Cardenas, 2011). People frame issues by bringing certain aspects of a complex problem domain into the picture (a process of selection), by putting certain aspects on the foreground and others on the background (a process of focusing) and by using certain aspects as the overarching elements within which the rest fits (a process of embedding). In practice different discourse coalitions (Bulkeley, 2000; Dewulf et al., 2011; Hajer, 1993) emerge that often fight with each other in order to becoming dominant (opposed to recessive) policy discourse coalitions in determining what the exact problem is (and

sometimes ignoring the actual state of the water system) and which type of solutions seem appropriate in handling water issues.

> *Assessment criteria*: Is there sufficient knowledge of shared or conflicting values, viewpoints and principles (represented by different policy discourse coalitions) for water issues and their consequences for facing water management issues?

Stakeholder involvement

Water management and governance can be considered complex processes in which various actors with different and oftentimes opposing values, viewpoints and interests discuss, deliberate and negotiate problem analysis and solution-finding to water issues. Water governance points at situations where decision-making and implementing take place in networks of public, private and semi-private actors and where governments increasingly use horizontal forms of steering to achieve results within these actor networks (Edelenbos & Teisman, 2011). Governments are often dependent on many stakeholders with different resources (knowledge, money, etc.). In this context, governments sometimes deliberately, sometimes forced by circumstances, give more room to stakeholders to influence decision-making and implementation.

The deliberate attempt by governments to include stakeholders can be found in many countries and is described under many labels like public participation, interactive decision-making, consumer panels, public–private partnerships, stakeholder charters etc. The assumption is that the involvement of stakeholders in general enhances the content of policy proposals (because more knowledge becomes available) and creates more support legitimacy for water policy measures. Stakeholder involvement would improve the quality of decision-making by opening up the decision-making process and making better use of the information and knowledge that is available in society. Moreover, it would improve public understanding of the management issues at stake, make decision-making more transparent, and might stimulate the different government bodies involved to coordinate their actions more in order to provide serious follow-up to the inputs received. Water policy measures can become less controversial and implementation of decisions can be much smoother.

Inspired by Dahl's 'preconditions for a polyarchy', Berry et al. (1993, p. 55) formulated two dimensions of participation that are important for a system of *strong participation*. These are *width* and *depth* of participation, which together determine the strength of stakeholder involvement. The width of participation is the degree to which each member of a community is offered the chance to participate in each phase of the (water) policy process. This is also referred to as inclusiveness (Young, 2000). However, the inclusion of stakeholders in not without problems, as often usual suspects get involved in integrated water management processes as they got the skills, education and knowledge to become dominant in these kind of processes. As a result, the representativeness or broad inclusion of stakeholders is often not realized in water management projects (Sabatier et al., 2005; Van Buuren, Klijn, & Edelenbos, 2012).

The *depth* of participation is determined by the degree to which stakeholders have the opportunity to determine the final outcome of the governance process. In the analysis of width and depth of participation, it is important to distinguish the process on the one hand and the final outcomes of that process on the other. The realized depth of participation is often a problem as it stresses the aspect of power and authority in water management; often responsible government agencies want to stay in charge (Edelenbos & Teisman, 2011; Sabatier et al., 2005).

In the analysis of width of participation, we consider how governments have opened up the process for representation and participation by various stakeholder groups, like NGOs, citizens, private companies, farmers, etc. In short, what opportunities for stakeholder have been made available? An evaluation of the width of participation during the governance process is focused on the articulation of interests. The analysis of the depth of participation in the outcome is focused on the degree and type of influence stakeholders have had in shaping opinions and the realization of outcomes. In what way did the stakeholder have meaningful participation and did they have a say (voice) in the analysis of the (water) problem and the search for finding solutions for that problem?

Assessment criteria: Are all relevant stakeholders involved? Are their interests, concerns and values sufficiently balanced considered in the problem analysis, solution search process and decision-making?

Trade-offs between social objectives: service-level agreements

Allocation

The economics of water management is about the allocation of scarce resources, which can be water quantity, water quality as well as safety against flooding. The water and safety allocation process is a political bargaining process, where pros and cons of several sharing options between legitimate claimants at a specific time are weighted, and winners and losers make their case heard (Backes & Van Rijswick, 2013; Van Rijswick, 2008). It is often not clear what objectives, such as food security and food self-sufficiency, guide allocation decisions and how the principles of equitable access, economic efficiency, sustainability and customary norms and values can be reconciled. To support this process, insight is required into various social (potentially conflicting) objectives and into the trade-offs between the impacts on various objectives of alternative measures. What are, for instance, the foregone benefits or opportunity costs of allocating water to ensure food self-sufficiency instead of allocating water in the most productive manner? Hydro-economic models can provide insight into the trade-offs of various between social objectives.

Reallocation

Many countries recognize the need for reforming their water allocation. The implementation of new water-allocation mechanisms will have various implications. For instance, changes in water allocation can have an impact on the competitiveness of some industries; their costs can be unevenly distributed across social groups. Such considerations can make the political economy of the reform of water policies complex. In practice, the transition of existing service levels towards new agreed service levels will take place when the gains will outweigh the transaction costs of the reform and the difficulties related to challenging the beneficiaries of status quo.

Allocation mechanisms

The service-level agreements have to be translated into rules, regulations and procedures, such that the water service delivered to each user is specified under different hydrological circumstances, as will be elaborated in the sixth building block. The service-level agreements can be achieved by way of water-allocation mechanisms (e.g. rationing, pricing or markets), as well as by water quality and safety standards (e.g. norms) combined with the

instruments needed to achieve these standards (Jolink, 2010; Van Rijswick, 2008, 2011; Van Rijswick & Havekes, 2012). The suitability of certain rules depends on the time and geographical scales over which they have to operate. For instance, formal water entitlements provide holders with a secured right to water for many years; they are generally set at national, state or basin level; temporary water reallocations generally apply at a yearly basis only, and at a very local scale.

Assessment criteria: Are agreed service-level decisions based on trade-offs of costs, benefits and distributional effects of various alternatives?

Responsibility, authority and means

Property rights

The identification of responsibilities and authorities with respect to water starts with the determination of property rights. Property rights can be understood as social relations that define the titleholder with regard to water resources in relation to all others. Such rights only have an effect when there is some authority system that agrees to defend a rights holder's interest (Bromley, 1991). Four traditional types of ownership are identified in the literature (e.g. Ostrom, 1990): *private property* (the exclusive property title is in the hands of private individuals or corporations); *common property* (to be seen as the groups' private property, access by others can be excluded); *state (public) property* (ownership and use control is in the hands of the state, individuals and groups may be able to make use of resources, but only at the forbearance of the state, public agencies have the right to determine use or access rules, individuals have a duty to observe these rules); and *no property* (*res nullius*, the access to resources is not based on formally regulated property rights).

At the same time, property rights always include restrictions on the use of property by owners themselves, and such restrictions become more extensive in modernized and densely populated societies (Young, 1982). In general, a strongly increased complexity of bundles of property rights can be noticed as well as a strongly evolving *public domain* in terms of a communalization of water ownership and use rights. Bottom-up-organized common property arrangements exist for drainage and irrigation, often already for centuries. In the first half of the 20th century a growing concern for public health and sanitation results in the development of infrastructure for water supply and sewerage (Kissling-Näf & Kuks, 2004).

Allocating authority and responsibilities

To restrict property rights, the public domain needs authority at various administrative levels (central/decentral), needs to assign responsibilities to public and non-public actors, and creates *means* to empower authority (Van Rijswick & Havekes, 2012; Van Rijswick & Tappeiner, 2014). The authority should be able to guide stakeholder processes, to guide the process that should lead to powerful collective choices, to guide other relevant public authorities, to guide redistributions of property rights, to control progress and to take the right measures for effective operations.

Means: participative capacity

The participative capacity of the public domain refers to the input structures of the policy process on which it depends if all water uses have an equal opportunity to become

expressed and recognized. Decentralization and strong local communities are seen as a favourable condition for participation, which is especially the case in countries that have adopted subsidiarity, a multilevel governance structure. *The integrative capacity* of the public domain refers to intra-policy coordination (i.e. the internal integration of the water policy field), to inter-policy coordination (i.e. the cross-sectoral integration of water policy with related policy fields), and to external coordination between water policy institutions and non-governmental actors, including consultations with target groups (Jänicke & Weidner, 1997).

Assessment criteria: Are authorities, responsibilities and means well-organized to deal with water issues at the appropriate administrative scale(s) in a participative and integrative way?

Regulations and agreements

Regulations and agreements can be considered pivot points between the first five building blocks of the assessment methodology and the last four blocks and more specifically between content and implementation. There are several ways to translate the service-level agreements that have been made as trade-offs of the social objectives in rules, regulations, agreements and procedures (De Burca & Scott, 2006).

Appropriateness

The appropriateness of rules and agreements will depend on actual circumstances, depending on the cultural, political, institutional and economic circumstances (developing/developed countries, rural/urban areas, religion, political/philosophical traditions); the legal traditions (common/civil law/traditional/indigenous law systems); the governmental organization (centralized/decentralized/river basin management approach); the parties that are involved (agreements between states, regulations of governments within a country to protect and develop public works, to protect ecosystems, to regulate private activities that have an impact on water systems, agreements between market parties, public–private partnerships, involvement of NGOs and citizens); the leading values and principles upon which the bargaining is based (see the second building block); the relevant and local water system characteristics; the actual water problem that has to be solved; and last but not least, the intention of the parties. The main assessment criterion of regulations and agreements is *legitimacy.*

Legitimacy

However, legitimacy has several aspects and is a concept that is used in several disciplines (Van Buuren, Driessen, Teisman, & Van Rijswick, 2013). It is related to the following aspects:

- Based on shared or agreed values and principles including those who refer to vulnerable values and groups in society to enhance effectiveness and to avoid conflicts (Addink, Anthony, Buyse, & Flinterman, 2010; Misiedjan & Gupta, 2014).
- In conformity with the rule of law (Hayek, 1973–1979; Brunnée and Toope, 2010).
- Offering (legal) certainty with regard to rights, duties and accountability to provide a base for action (Fuller, 1964; OECD, 2014; Van Holten & Van Rijswick, 2014; Van Rijswick & Salet, 2012).[1]

- Formulated in a way that they are enforceable and effective (able to achieve the intended goals) (Backes & Van Rijswick, 2013; Bardach & Kagan, 1982; Buijze, Salet, & Van Rijswick, 2014; Coglianese & Kagan, 2007);
- Decision-making at the most appropriate level and based on transparent rules, sufficient and relevant information and taking all interests that are at stake into account (also vulnerable and minority interests) (Howarth, 2009; Curtin & Meijer, 2006).
- Offering the right mix of public and private instruments for the objective at stake (Bardach & Kagan, 1982; Coglianese & Kagan, 2007; Diver, 1983; Mees et al., 2014).
- Taking distributional effects into account to avoid damage to the water system, other interests and policy fields, and in this way avoid conflicts (Lindhout & Van den Broek, 2014; Van Doorn-Hoekveld, 2014).

Legal certainty and adaptiveness

Regulations and agreements can be based on a procedural, a substantive or a combined approach, depending on the need for flexibility and adaptability on the one hand and (legal) certainty and an enforceable protection level on the other. Flexibility and adaptiveness can be achieved by open (less detailed) norms (that can be further substantively developed in mutually communication and interaction), the use of principles and duties of care, while certainty on duties, rights and accountability can better be achieved by substantive norms and standards and a clear allocation of responsibilities (Westerman, 2007a, 2007b). Regulations and agreements should be based on a right balance between adaptivity and flexibility on the one hand and legal certainty at the other (Green, Garmestani, Van Rijswick, & Keessen, 2013; Keessen & Van Rijswick, 2012).

Assessment criteria: Are regulations and agreements legitimate and adaptive, and if not, what are the main problems with regard to the above mentioned legitimacy aspects?

Financing water management

Empowerment with financial means is needed and a crucial element for good water governance. Without discussing the ways water management is financed, a sustainable and equitable financing of water management may hamper reaching the service-level agreements (SLAs) that have been agreed upon or may lead to instability because of equity concerns (Lindhout, 2012; Lindhout & Van den Broek, 2014). There are several ways to finance water management or principles upon which to base the financing system. One can think of cost recovery through a solidarity principle, which means that the costs of water policy are recovered from the national budget or budgets of decentralized authorities. One can also think of cost recovery through a profit principle, which means that those who have an interest in water services and profit from it also pay for it. Last but not least, is the finance system according to international agreed principles as, for example, the polluter pays principle?

Assessment criteria: Is the financial arrangement sustainable and equitable?

Engineering and monitoring

The design and management of the existing infrastructure may not be suitable to fulfil the societal functions. For instance, the capacity of irrigation canals may be insufficient, flood

defences may not be strong enough, water rights can only be traded between interconnected basins, and volumetric pricing only operates where water use is metered.

Improving water infrastructure

SLAs are used to determine whether the existing infrastructure needs to be improved, and which improvements are needed. These SLAs are determined by the responsible authorities and agencies after consultation of stakeholders, and are among others based upon the trade-offs between (competing) societal objectives.

Often, the SLAs can be implemented in many different ways, using different technologies, different materials and resulting in different (ecological and spatial) consequences. Focusing on only one alternative does not represent the interests of the people involved. In engineering textbooks, a 'from global to detailed' principle is often used: first a global design, then a detailed design and next the implementation. Such principles are important, since it makes efficient use of available resources and does enable involvement of the relevant authorities and stakeholders.

Economic analysis has a role to play in assessing the returns on investment in constructing infrastructure To what extent does the present value of future benefits exceed the present value of current fixed and future variable costs of investments (and what discount rate is used)? It also has a role to play in assessing the cost-effectiveness of alternative infrastructural measures. An important issue here is to include the maintenance actions in the design, and to make the trade-off between less investment costs or less maintenance costs, because less investment costs often results in high maintenance costs.

Monitoring

Monitoring of the water system is needed in order to assess whether the system meets the agreed SLAs (Beijen, Van Rijswick, & Tegner Anker, 2014). Monitoring can be done in many ways, and can be available online, but that is not necessary. However, monitoring is not a goal in itself, but the data have to be used in order see whether the (water) system meets the requirements.

> *Assessment criteria*: Are SLAs sufficiently available (implicit or explicit) in order to redesign the existing infrastructure? Are the design and consequences of different alternatives sufficient available? Is there sufficient monitoring of the system and are the data analysed?

Enforcement

Enforcement as an often forgotten critical issue in the policy process

Water management and water governance assessments often focus mainly on the beginning of the policy process. There is ample attention for public participation, formulating goals, rules and standards, and the process of decision-making. However, good water management and governance should pay attention to the whole policy process from goal-setting to the actual achievement of goals. Therefore more attention is needed for the implementation of regulations and agreements and the possibilities to enforce the agreements that have been made. A lack of enforcement will hamper the effectiveness of water management and governance and may in the end lead to conflicts and decreasing legitimacy.

Enforceability of rules and agreements

Enforceability of agreements starts right at the beginning of the water management process and will be influenced by all prior blocks of the assessment methodology. Regulations and agreements that cannot be enforced will suffer from a lack of credibility and, in the end, legitimacy. This is only different in case the intention of the parties involved is not focused on achieving the objectives upon which they agreed.

There are several ways to improve the enforceability of rules and agreements. It is argued that rules and agreements that are based on shared values and principles will be easier to enforce because parties have the strong conviction that they should behave in conformity with the rules (Buijze et al., 2014; Van Rijswick & Salet, 2012). Nevertheless, there will always be the risk that in an individual case it will be more profitable not to comply with rules and agreements. Furthermore, it is not always possible to make regulations and rules that fully fit with the values of all parties, which is reflected in the need for bargaining.

In general, clear substantive norms and standards as well as clear process norms and standards regarding allocation of responsibilities and resources are useful when it comes to enforceability and in the end the effectiveness of water management (Bardach & Kagan, 1982; Coglianese & Kagan, 2007; Van Rijswick & Salet, 2012). Especially in cases, parties want clarity on their rights and duties because they want to protect their interests and know who is accountable for achieving the goals set. Enforceability will be an important issue. The same applies in cases where vulnerable values (water and ecosystems and the rights of vulnerable groups) are at stake. In case vulnerable values are at stake, their role should be recognized, their interests should be sufficiently protected and there should be ways for enforcement. More procedural and open norms are often used when the interests at stake are hard to agree upon, or in case agreements are made with regard to long-term and more general formulated objectives or in cases of large uncertainties with regard to system knowledge or social, economic, technical or physical developments.

Public and private enforcement

Depending on the regulations and agreements (public, private or a mix), enforcement can be undertaken by public or private parties. In general, private agreements and regulations will be enforced by private parties, but public regulations can be enforced by both public and private parties. Important with regard to enforcement are the available remedies to achieve the objectives.

> *Assessment criteria*: Are regulations and agreements enforceable by public and/or private parties, and are there appropriate remedies available?

Conflict prevention and resolution

Conflict prevention

Shared waters can be either a source of conflict or they may offer opportunities for cooperation, prosperity and stability. It is therefore important to identify the potential economic, social and political benefits of cooperation. The concept of 'water valuation for water dispute resolution' shows the advantages of 'benefit-sharing' rather than 'water-sharing'. This approach involves *thinking about water in terms of its value*, rather than

just in terms of its quantities, quality and ownership. By focusing on the value of water, all benefits (private as well as socio-political) to be obtained from water can be explicitly optimized by reallocating water from low- to high-value usage. Such powerful information can be used by the parties to negotiate about the best water allocation and about benefit-sharing. This alternative form of dispute resolution will lead to cooperation and confidence-building, which is beneficial for all. If disputants think about water allocation in a cooperative manner, then the risk of violent conflict about water can be considerably reduced. Furthermore, from the above-described building blocks it follows that conflicts can be prevented by clear norms, standards, responsibilities and enforceable rules, standards, instruments and agreements.

Conflict resolution

In case conflicts do occur, parties need an independent mediator, arbiter or court to decide on the conflict and who is able to force parties to act in conformity with the final ruling. Conflicts can be prevented or solved in a proper way if stakeholders have formulated mutually accepted rules and procedures that prescribe how to handle or follow procedures in the case conflict of interests arise in water governance and management. Moreover, conflict resolution and mediation focused on positive-sum solutions are often stressed to find ways out of conflict as people are stimulated to connect and combine different concerns and interest (Wolf, 1997).

> *Assessment criteria*: Are there sufficient conflict prevention and resolution mechanisms in place?

Conclusions

Developing integrated and sustainable water governance is a complex challenge that needs the input of all interested stakeholders. Moreover, the knowledge and experiences of several disciplines is needed. A one-dimensional approach, which only focuses on, for example, technical, or legal, or economic or public administration aspects to achieve good water management will not bring the integrated protection of the world's water resources, equitable access to clean water and sanitation, protection against flooding, the protection of vulnerable ecosystems and the necessary economic sustainable development. In our method we combined knowledge from several disciplines and combined this knowledge in an integrated way. The method makes clear that most building blocks are based on the knowledge of several disciplines, which all play their particular role in developing sustainable water management and which all should be taken into account. It is this integrated approach within each building block and between the several building blocks that can contribute to the development of sustainable water management. Of course, each river basin, region, country or water problem asks for tailor-made solutions. There is no 'one size fits all solution', but discussing the criteria set out in the several building blocks, in which insights and knowledge from technical, legal, economic and public administration perspectives are combined, helps to obtain a clear overview of the problems, challenges, pitfalls and success factors, thus enabling the development of sustainable water management.

We developed building blocks that were elaborated from simultaneously different disciplines, water systems analysis, economics, law and public administration. Table 1

Table 1. Relationship between the building blocks and disciplines.

	Water systems analysis	Economics	Law	Public administration
1. Water system knowledge	×	×		
2. Values, principles, policy discourses	×	×	×	×
3. Stakeholders involvement		×	×	×
4. Tradeoffs between social objectives	×	×		
5. Responsibility, authority and means			×	×
6. Regulation and agreements			×	×
7. Financial arrangements	×	×	×	×
8. Engineering and monitoring	×	×		
9. Enforcement			×	×
10. Conflict prevention and resolution		×	×	×

shows the relationship between the 10 building blocks discussed and to what extent different disciplines contributed to its developed and formulation of assessment criteria.

We believe that the added value of this interdisciplinary work is that building blocks have been identified that transcend and align different disciplines in developing meaningful interdisciplinary and integral assessment of water management praxis. From this, criteria are developed that are both underpinned in theoretical literature and operationalized to be used in many concrete water project and programme assessments in the last years, ranging from several projects in Europe, Asia, Africa, South America and Australia and from flood risk issues to water quality and water scarcity issues.[2] These criteria and corresponding building blocks offer the opportunity to monitor constantly the content, organization and implementation of water management projects and programmes and make appropriate adjustments to water governance in order to realize sustainable water management.

However, we want to stress that the method needs fine-tuning to specific water management situations and contexts. Every water challenge is a unique combination of history, climate, social and economic pressures, resource endowment, trading opportunities, and so on. To this extent, water management and governance must be uniquely designed and implemented. It is important that a water governance assessment tool will recognize the unique and situational aspects of water governance processes in different projects, processes and programmes in various countries, river basins and regions, and at the same time give clear meaning and provide critical assessment of the content, organization and implementation of those water governance processes. This paper develops a framework to achieve these aims.

Notes

1. Fuller developed the following criteria for proper law-making being generality, promulgation, non-retro-activity, clarity, non-contradiction, not asking the impossible, durability, and congruence between rules and official action.
2. See http://www.watergovernancecentre.nl and http://ucwosl.rebo.uu.nl/.

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