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The global policy network behind integrated water resources management: is it an effective norm diffusor?

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ABSTRACT. Integrated water resources management (IWRM) has been recognized by many actors as the appropriate approach to respond to challenges in water resources management in a sustainable way. The main players in developing and diffusing the IWRM concept have included expert groups, international organizations, and multistakeholder platforms, which cooperated in various activities promoting the IWRM concept, such as knowledge generation and sharing, capacity building, and monitoring. A loose network of these actors has actively shaped and engaged in a global discourse on sustainable water resources management and managed to authoritatively shape the IWRM concept. The processes behind the spread of the IWRM concept can thus be conceptualized as development and diffusion of norms through a global policy network. Although this process has changed the discourse on water resources management and established IWRM principles as a global set of norms, national policies and regulations reflect these norms only to a limited extent and new policies lack implementation. IWRM norms have been developed and spread by a network of nonstate actors, which might have contributed to its diverging influence in global discourse on the one hand and national policy implementation on the other. We present an analytical framework to assess effects of IWRM norm diffusion and network structures that support norm development and spread through global policy networks. We also provide an exploratory analysis of the main global policy network involved in development and diffusion of the IWRM concept, including its key actors, relationships across the network, and network outputs.

Key Words: *integrated water resources management; nonstate actors in global governance; norm diffusion; policy network; social learning*

INTRODUCTION

Calls for a global governance framework to address water-related issues are intensifying as ecological, social, and economic interdependence on the global level increases. However, the currently existing global water governance system consists only of loosely institutionalized transnational relations, and its effectiveness has repeatedly been called into question (Conca 2006, Pahl-Wostl et al. 2008). At the same time, integrated water resources management (IWRM) has developed into an internationally institutionalized discourse (Conca 2006, Mukhtarov 2009).

The concept of IWRM emerged over the 20th century. Some authors trace its development back to the 1950s (Biswas 2004), others even to the 1930s (see Snellen and Schrevel 2004, Mukhtarov 2008). Conca (2006:138) states that “by the late 1980s, IWRM was a well-established concept in some key journals and at the meetings of water policy professionals but it had yet to appear as the dominant framework for discussing water issues.” The year 1992 marked a milestone in IWRM concept development and its recognition in the international policy arena. First, the International Conference on Water and the Environment held in Dublin adopted a statement that included four guiding principles for IWRM, i.e., the Dublin principles. The second IWRM milestone event in 1992 was the United Nations (UN) Conference on Environment and Development in Rio de Janeiro. At this conference, the governments of the world adopted Agenda 21 and with this committed to an “integrated management and development of water resources” (United Nations General Assembly 1992, chapter 18, programme area A). This commitment was confirmed at the World Summit on Sustainable Development in 2002 (Rio+10) in the Johannesburg Plan of Implementation (JPOI), which called for the development of “integrated water resources management and water efficiency plans by 2005” (United Nations 2002:21).

Debate continued, however, on the definition of IWRM as well as on fundamental issues like what elements should be integrated and through which processes. Strongly divergent perceptions remain of what IWRM is or ought to be: a management tool, a framework concept, and so forth (see, e.g., Jeffrey and Gearey 2006, Molle 2008). Although the conceptual approach remains fuzzy, central elements related to IWRM typically include (1) a combined consideration of all water uses, including social, economic, and ecological dimensions; (2) cross-sectoral water management based on integrated planning; and (3) participation and good governance. In the scientific sphere, several definitions for IWRM have been developed (compare Jonker 2007, Medema 2008, Mukhtarov 2009). An early attempt to clarify the concept and its implications for policy making goes back to Koudstaal et al. (1992), but because no formal international regulatory framework for IWRM exists, the concept underwent a process of continued redefinition and expansion (see Snellen and Schrevel 2004).

Over the past decades, IWRM has been conceptualized and promoted on the global level by expert groups, international organizations, private-sector representatives, and other nonstate actors. These players have engaged in and shaped a global discourse in events such as the World Water Forums and the Stockholm World Water Week, and several of them have joined in international multistakeholder platforms such as the Global Water Partnership (GWP) and the World Water Council (WWC). Several of the major players got explicitly involved and consistently cooperated in developing and promoting common IWRM norms at the international level. This loose network around GWP managed to authoritatively shape the IWRM concept: Today, most political statements on IWRM make reference to the definition given by the GWP Technical Advisory Committee (2000:22):

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IWRM is a process which promotes the co-ordinated 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

Although IWRM is thus defined as a process, this definition comes along with an adapted version of the Dublin principles, the Dublin-Rio principles, as the GWP calls them^[1] (see <http://www.gwp.org/en/The-Challenge/What-is-IWRM/>):

1. Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.
3. Women play a central part in the provision, management, and safeguarding of water.
4. Water is a public good and has a social and economic value in all its competing uses.
5. Integrated water resources management is based on the equitable and efficient management and sustainable use of water.

These principles represent a set of norms, in the understanding of norms as a “practices and rules defining appropriate behavior for specific groups of actors in specific situations” (March and Olsen 1998:948). Although March and Olsen use this definition for institutions, Finnemore and Sikkink (1998:891) point to the fact that “whereas constructivists in political science talk a language of norms, sociologists talk a language of ‘institutions’ to refer to these same behavioral rules.” We use the term “norms” here because it is more often used in research on nonstate actors in international policy.

For the purpose of this paper, the Dublin-Rio principles are conceived as the prevalent IWRM norms. We did this without any value judgment about these norms but rather with the aim to study a phenomenon in global water policy: the normative force of the GWP-IWRM network, which becomes apparent in the wide adoption of the GWP’s IWRM definition and concept by international organizations, donors, and nongovernmental organizations (NGOs). Nevertheless, in view of the remaining challenges in implementing and institutionalizing IWRM at the national and local levels, the practical value of IWRM has been questioned by many. Furthermore, there has been critical debate on the normative content of IWRM and the dominance of certain actors in the process of norm development and diffusion (see, e.g., Biswas 2004, Goldmann 2007, Jonker 2007, Medema et al. 2008, Dobner 2010, Muller 2010).

In this paper, we explore whether explanations for the diverging influence in global discourse on the one hand and national policy implementation on the other could lie in the main governance structure involved in norm development and diffusion. Although a multitude of individual actors and partnerships of different sorts have been involved in the IWRM debate and in implementing projects at various levels, we focused our analysis on those that actively engaged in promoting the prevalent IWRM

definition and norms at the international level. We conceived these actors and partnerships as forming a global policy network, which for the purpose of this article we called the GWP-IWRM network. We address the following research questions: (1) What are the success factors for norm development and diffusion through global policy networks? (2) Who are the main actors involved in the prevalent global policy network behind IWRM, i.e., the GWP-IWRM network? (3) Does this network meet critical success benchmarks for effectiveness in norm development and diffusion?

THEORETICAL BACKGROUND: NORM DIFFUSION AND POLICY NETWORKS IN GLOBAL GOVERNANCE

In studying the influence of the GWP-IWRM network in norm development and diffusion, several theories are relevant. Related theories in international relations, which try to explain how norms influence actors’ behavior in world politics, can be categorized in two main strands: (1) rationalism and (2) social constructivism. Rationalist theories face problems in explaining the emergence of international norms (Deitelhoff 2006). Social constructivism focuses on the role of actors and is thus better suited to address the research questions in this paper. The IWRM norms, however, have not been developed by nation states within international negotiations but rather through interaction of expert groups, international organizations, multistakeholder platforms, and others. In studying the process of IWRM norm development and diffusion, literature on nonstate actors in global governance and policy networks in general has to be taken into account. The study of policy networks, and their performance in particular, can further benefit from examining network theories.

Constructivist approaches to norm diffusion through actors in international policy

When trying to explain what mechanisms are at work in norm development and diffusion, constructivism, in contrast to rationalist theories, emphasizes the role of actors and their capacity to redefine interests and references. Finnemore and Sikkink (1998) argue that norms evolve in a patterned “life cycle.” New norms emerge when norm entrepreneurs, i.e., actors who have strong notions about appropriate or desirable behavior, use organizational platforms to present new ideas as potential norms. Working from their platforms, norm entrepreneurs aim to convince other actors to adopt the new ideas. In the stage of norm emergence, entrepreneurs largely rely on persuasion to get the norms they advocate on the agenda and to encourage a critical mass of states to embrace the new norms (Elgstrom 2000). Once a critical mass of norm followers has been reached, the cycle enters the second stage: norm cascading. Norm cascading occurs when a larger number of states adopt the global norm through a process of socialization by external actors, e.g., in the form of diplomatic praise or censure, reinforced by material sanctions or incentives (Finnemore and Sikkink 1998). Various types of actors such as international organizations, NGOs, and transnational advocacy networks can exert “moral influence” on state interests and contribute to major changes in norms and behavior (Elgstrom 2000:459; see also Stone 2004). Constructivists emphasize the role of argumentative persuasion and social learning among political leaders in the process of international norm development and diffusion. Stone (2004) shows how international organizations as well as several nonstate actors use expertise and information to

change the behavior of states. However, in environmental affairs, it is typically not sufficient for political leaders to be persuaded of the appropriateness of a norm for it to alter the behavior of a particular state (Cass 2007). The norm must be thoroughly integrated into domestic political discourse and eventually be incorporated into the domestic policies of the state (Cass 2007). According to many constructivists, the influence of a norm on national policies also depends on intrinsic qualities of the norm itself, mainly on its resonance with existing standards of behavior and its specificity. Norm specificity refers to how precisely a norm distinguishes appropriate from inappropriate behavior, and how well the norm is thus understood by norm targets (Legro 1997, Finnemore and Sikkink 1998). On the other hand, an ambiguous formulation of a norm can support norm emergence processes: Actors with different interests could all agree to a norm that is formulated in a sufficiently vague manner to allow for interpretations that meet diverging actor's agendas (Kowert and Legro 1996).

Nonstate actors and policy networks in global governance

Several authors have studied the processes and roles of nonstate actors in global policy development and diffusion (compare for example, Haas 1992 on epistemic communities, Keck and Sikkink 1998 on transnational advocacy networks, Khagram et al. 2002 on transnational social movements, Beisheim et al. 2008 on public-private partnerships, Biermann and Siebenhüner 2009 on transnational bureaucracies). Often, actors join in networks around a specific topic, which include public and private organizations as well as civil society organizations (CSOs) or other NGOs. Such global policy networks can perform different functions in global governance (see Reinicke and Deng 2000, Dingwerth 2004), including pursuing a global agenda setting, developing standards, coordinating knowledge dissemination in a given area, establishing market correcting initiatives, supporting compliance with international initiatives, and increasing public participation in global politics.

The concept of policy networks has been widely used as an analytical tool to describe different kinds of actors and their relationships within networks. Throughout the literature, the common understanding of policy networks is that they include a range of state and nonstate actors who, through longer term cooperation, pursue a common interest and/or promote common norms with regard to a specific policy. A policy network consists of a number of relatively stable relationships that are nonhierarchical and independent. Actors use relationships within the network to exchange material and ideal resources (compare Börzel 1998, Partzsch 2007, Jakobi 2009).

Relatively little attention has been paid to researching the effectiveness of policy networks and their impact on policy outcomes (compare Daugbjerg 1998, Nölke 2003, Sandström and Carlsson 2008). More recently, several studies have referred to concepts and tools of formal network analysis to fill this gap. These studies mainly identify structural characteristics of networks, i.e., relational patterns between actors, as relevant for network performance, but also point to the importance of actor representation and distribution of power (see, e.g., Bodin et al. 2006, Adam and Kriesi 2007, Sandström and Carlsson 2008). Several authors use the concept of social capital to explain why

certain network structures might be more effective than others (see, e.g., Burt 2000, Newman and Dale 2007, Sandström 2008). There are primarily two propositions about how networks can increase social capital (see, e.g., Burt 2000). (1) The network closure argument proposes that the more dense and closed a network is, the more communication channels, trust, and incentive for collective action it provides (see, e.g., Bodin and Crona 2009). (2) The structural-hole argument states that the more bridging ties that span otherwise-disconnected actors or subgroups, the more access a network has to diverse knowledge and other resources. Empirical research, however, has shown that the right balance between network closure and bridging ties can be expected to perform best (see, e.g., Burt 2000, Newman and Dale 2007). Moreover, different balances in network structures seem to be beneficial for different phases of the governance process (Sandström 2008, Bodin and Crona 2009).

EFFECTIVENESS OF GLOBAL POLICY NETWORKS IN NORM DEVELOPMENT AND DIFFUSION

When seeking to explain success and failure of the GWP-IWRM network in norm development and diffusion, researchers must first assess the effects of the diffusion process, i.e., the dependent variable. In a second step, possible explanatory factors for influence in norm diffusion need to be identified. Building on existing theories, we assumed an actor-centered diffusion process with the GWP-IWRM network as the main norm entrepreneur, and focused our analysis on the structure of this network as an important explanatory factor for effectiveness in norm development and diffusion.

Assessing influence of norms

Three types of effects should be distinguished when looking at how IWRM norms influenced water policy at various levels (compare Scott 1995 and Pahl-Wostl 2009).

- Regulatory effects encompass changes in the regulatory framework, including formal legislation as well as quasi-formal standards of practice and behavior such as formalized business standards or professional codes of conducts.
- Normative effects relate to changes in informal standards of behavior and legally nonbinding rules that are shared by society. Normative effects can be detected in changes in societal values and perceptions of what should be done, what is right, and what is wrong.
- Cultural-cognitive effects are changes in belief systems and the discourse on a policy problem. Cultural-cognitive effects can be identified in changes in the understanding and conception of problems and solutions or in the emergence of new ideas in the discourse.

Similar categorizations were also introduced by Dingwerth and Pattberg (2007) to assess the effects of transnational regimes and by Biermann and Siebenhüner (2009) to assess the influence of international bureaucracies. Note that in analyzing norm diffusion, we did not include the influence on financial flows and the actual effect on water resources management practice at national and local levels, i.e., enforcement of and compliance with new policies and regulations. That would have required in-depth

Table 1. Indicators of single- to triple-loop learning with regard to cultural-cognitive, normative, and regulative aspects (see also Pahl-Wostl 2009).

	Single Loop	Double Loop	Triple Loop
Regulative effects	Existing regulatory frameworks (international and national) are not changed but need for integrated approach only mentioned in interpretation of existing rules and regulations.	Existing regulatory frameworks are called into question and need for change is expressed. Single regulatory or policy instruments are changed without changing the overall framework.	National policy and regulatory frameworks for water resources management are substantially changed to reflect integrated water resources management (IWRM) concept and new frameworks are implemented.
Normative effects	Informal standards of behavior, such as funding requirements are not substantially changed but need for integrated approach only mentioned.	Existing informal standards of behavior are called into question.	Informal standards of behaviour and societal perceptions of what should be done have radically changed and reflect IWRM concept.
Cultural cognitive effects	Discourse in water policy remains in established paradigms that are only refined, e.g., need for integration mentioned but without calling into question the existing approach.	Existing paradigms are called into question, discourse changes in isolated groups, mentions IWRM.	Discourse dominated by new paradigm, IWRM is prominent in public and scientific discourse.

case study data and was beyond the scope of our study. Factors beyond the global policy network, e.g., domestic interests, likely are more decisive at this level of effects.

As mentioned above, social learning processes play an important role in norm diffusion, but learning may have different levels of intensity. The concept of triple-loop learning allows us to further distinguish the extent to which change has taken place in regulative, normative, and cultural-cognitive terms (Pahl-Wostl 2009). Building on the literature of organizational theory and management theory (Argyris and Schön 1978, Hargrove 2002), the triple-loop learning concept acknowledges that institutional change is most appropriately described as an evolutionary search process rather than a process of rational design. Pahl-Wostl (2009:359) describes this concept as follows:

- Single-loop learning refers to “a refinement of actions to improve performance without changing guiding assumptions.”
- Double-loop learning refers to “a change in the frame of reference and the calling into question of guiding assumptions.”
- Triple-loop learning refers to “a transformation of the structural context and factors that determine the frame of reference.”

A similar and very influential model was developed by Peter Hall (1993) to describe different levels of policy change through social learning. Hall’s model of first-order to third-order learning largely corresponds to the triple-loop learning concept and has been applied by various researchers to study policy change (see, e.g., Brown 2006, De Lovinfosse 2008, Hall 2011). Table 1 provides an overview of indicators for single-loop to triple-loop learning with regard to cultural-cognitive, normative, and regulative effects.

Success factors for norm development and diffusion through policy networks

When trying to understand why the GWP-IWRM network might have been influential in changing the discourse and informal standards on water resources management, one can learn from research carried out throughout the last years on the effectiveness and legitimacy of different kinds of partnerships and networks in global governance (see, e.g., Dingwerth 2003, Wolf 2006, Partzsch 2007, Beisheim et al 2008), as well as on performance of social networks (Sandström 2008, Bodin and Crona 2009, Newig et al. 2010). Several factors have been identified that relate to networks’ effectiveness in developing and diffusing policies or norms. Based on the assumption that the governance structure has a strong influence on social learning processes and the outcomes of collaboration (compare Bodin and Crona 2009, Pahl-Wostl 2009, Newig et al. 2010, Galaz et al. 2012), we focused on success factors that are grounded in the structure of the network, i.e., composition and relationships within the network. Examples of other factors determining norm influence relate to procedures for norm development, formulation and substance of the norm itself, the resonance of new norm with existing standards of behavior, and the costs of compliance and monitoring. The focus on the structure of the main global policy network behind IWRM also is responsive to the ongoing scholarly discussions on the need for and design requirements of a global water governance regime (see, e.g., Conca 2006, Dellapenna and Gupta 2008).

Based on the literature (see especially Beisheim and Dingwerth 2008, Börzel and Heard-Lauréote 2009, Biermann and Siebenhüner 2009, Schäferhoff et al. 2009, Kalfagianni and Pattberg 2011), we identified three main success factors relating to the structure of the network: (1) ownership of the norm development process and its outcomes based on inclusion of all relevant stakeholders, (2) diverse expertise based on involvement of diverse stakeholders and production of a body of shared

Table 2. Indicators of network structures facilitating norm development and diffusion through policy networks.

Success factor	Indicators
Inclusion of relevant stakeholders	- Relevant interest groups are included in the network and are represented by legitimate representatives.
Diverse expertise and joint knowledge	- Heterogeneous actors are linked through strong relational ties. - Experts representing different disciplines, regions, opinions are included in the network.
Communicative action in a nonhierarchical environment	- Network actors cooperate in producing knowledge and information providing an interdisciplinary/cross-sectoral perspective. Joint knowledge and lessons learned are disseminated and shared through publications (e. g., reports, policy briefs, assessments) and conferences. - The network provides room for interaction and deliberation between different network members, such as through regular meetings and dense relationships. - The network has an informal character without hierarchies (no central position of any actor) and no formal prescription of rules for the network.

knowledge, and (3) deliberation based on room for communicative action in a nonhierarchical environment.

Inclusion of relevant stakeholders

Inclusion of relevant stakeholders in the process of developing norms is expected to increase the likelihood that these norms will be adopted and adhered to by the actors targeted by the norm (Pahl-Wostl et al. 2007, Beisheim and Dingwerth 2008, Börzel and Heard-Lauréote 2009). Inclusion of stakeholders also supports the legitimacy of decision-making processes. Mere inclusion of relevant stakeholders, however, is not enough to increase legitimacy and norm adherence; stakeholders also must have equal or at least fair opportunities to participate and those who participate must be perceived as “legitimate representatives of their constituencies” (Beisheim and Dingwerth 2008:13).

Participation of diverse sets of stakeholders might, on the other hand, also come at the cost of more difficult and longer decision-making processes. Network literature points to the need for relational ties among heterogeneous actors to coordinate interests and to facilitate consensus building and joint action (see Sandström 2008, Bodin and Crona 2009). However, when heterogeneous actors with widely diverging interests are involved, actors might find it difficult to agree on policies and norms, which can lead to outcomes based on the lowest common denominator rather than the best solution to the problem at hand (see van de Kerkhoff 2006, Börzel 2011).

Diverse expertise and joint knowledge

One of the main arguments put forward by proponents of increased nonstate actor involvement in global governance is that these actors could bring in the diverse expertise that is necessary to find solutions for the complex problems in a globalized world (see, e.g., Reinicke and Deng 2000). Knowledge and information from different sources, including different disciplines, regions, and opinions, should feed into the norm development process. Empirical research supports the belief that organizations that integrate different sources of expertise and provide for knowledge generation and dissemination have more influence in global environmental politics such as rule-setting processes (Biermann and Siebenhüner 2009). Pahl-Wostl (2009) points to joint knowledge products and a body of shared knowledge as factors that support social learning and thus increase the potential for norm diffusion. Therefore, by implication, the network that uses

the different types of expertise included in the network by pooling knowledge and creating synergies adds value to the aggregated know-how and information of single-network actors (Pahl-Wostl et al. 2007).

The network literature suggests that existence of relational ties can increase the overall level of knowledge and further promote innovation. Overly high density of network ties can, however, lead to homogenization of information and knowledge that limits innovative capacity (see, e.g., Sandström and Carlsson 2008, Bodin and Crona 2009)

Communicative action in a nonhierarchical environment

A network structure that provides room for communicative action and deliberation is expected to promote social learning and diffusion of norms. Norms that emerge from rational arguing have better chances to be accepted because actors targeted by the norms can recognize them as reasonable rather than as results of a bargained compromise (Beisheim and Dingwerth 2008, Schäferhoff et al. 2009). A precondition for deliberation is nonhierarchy among participants in a discourse (Risse 2000). Arguing based on truth-seeking behavior is further facilitated by “relations enabling dense interactions in informal, network-like settings” (Risse 2000:19). Pahl-Wostl (2009) also emphasizes the important role of regular meetings and interaction in informal settings for enabling social learning. Such settings provide a more open negotiation space and allow actors to move away from entrenched positions. In network terms, deliberation is facilitated by dense relationships that create trust among actors, whereas centralized network structures hinder deliberation because of the power imbalances they produce (Crona and Bodin 2006, Newig et al. 2010). The indicators listed in Table 2 can be used to study whether crucial success factors are present within the GWP-IWRM network and may thus have contributed to the success and failure of the norm development and diffusion process.

INFLUENCE AND STRUCTURE OF THE MAIN GLOBAL POLICY NETWORK BEHIND IWRM

The state of diffusion of IWRM norms is briefly summarized below. The focus of this paper, however, is on the independent variables and more specifically on this question: Does the structure of the GWP-IWRM network support norm development and diffusion?

Methodology

In our exploratory analysis we assessed the dependent variable, i.e., the influence of IWRM norms in regulative, normative, and cultural-cognitive terms, through an analysis of publicly available documents and existing literature. For analysis of the independent variable, i.e., the structure of the network of main actors promoting IWRM, we first had to define the network boundaries for the purpose of our study. This is not a straightforward task because what we call the GWP-IWRM network is not defined by membership, and global water governance is characterized by a multitude of actors and initiatives that have, in one way or the other, contributed to conceptualizing and disseminating IWRM. We limited our analysis to the most influential corporate actors in global water governance that committed themselves and substantially contributed to conceptualizing, promoting, and diffusing the prevalent IWRM norms on the international level. We conceptualized multistakeholder platforms such as GWP or WWC as corporate actors that are members in the larger IWRM network. Although GWP and WWC each could be conceived as a network, we focused on the meta-level network in which GWP and WWC are network actors along with others.

Varady and Iles-Shih (2009) have identified the 30 most influential intergovernmental and nongovernmental global water initiatives. To form the GWP-IWRM network, we selected corporate actors from these initiatives who substantively contributed to IWRM norms diffusion through agenda setting, knowledge generation and sharing, capacity building monitoring, and so forth. The resulting set of actors was cross-checked with literature on the global water governance system (especially Conca 2006, Baumgartner 2010, Schmidt 2011) and main IWRM publications, so that relevant IWRM actors that were missing could be added. In a second step, we carried out an exploratory qualitative analysis based on the success factors described in Table 2. The data and information for this qualitative analysis were obtained from publicly available documents and information on each corporate network actor, such as statutes, member lists, annual reports, composition of steering committees and boards, conference reports, and press releases, as well as secondary literature.

Diffusion of IWRM norms

Cultural cognitive effects

When analyzing the effects of IWRM norms, it can be observed that IWRM has had significant influence on discourses and thus significant cultural-cognitive effects. IWRM is omnipresent in international scientific and political forums such as the Stockholm World Water Week and UN-level meetings as well as in scientific journals, political programs, and public media (compare also Jeffrey and Gearey 2006, Mukhtarov 2009). A paradigm shift has taken place in scientific and policy discourse, which moved away from supply-driven water resources management based on engineering solutions toward more holistic approaches to solving water problems, i.e., triple-loop learning with regard to cultural-cognitive aspects. IWRM norms eventually became “the dominant international language of water” (Conca 2006:161), or as Helen Ingram puts it, IWRM “attained practically the status of lingua franca among water resources scholars and practitioners” (Ingram 2011:246).

Normative effects

Normative effects can be observed, for instance, in the various policy statements of international organizations and especially the nonbinding UN Conference on Environment and Development statements, such as Agenda 21 in 1992 and JPoI in 2002. A total of 193 countries agreed to the JPoI, in which Article 26 calls for the development and implementation of IWRM and water efficiency strategies, plans and programs at national and at regional levels, with national-level IWRM plans to be developed by 2005 (United Nations 2002). Although JPoI is not legally binding, the monitoring process established through the UN water IWRM status reports can be seen as an important step toward institutionalizing IWRM norms. Thus, we observe triple-loop learning in normative aspects.

Regulatory effects

Effects on formal regulatory frameworks only occurred to a limited extent. Many donors included IWRM in their funding requirements and thus created quasi-obligatory standards. However, at the national level, the UN *Status Report on the Application of Integrated Approaches to Water Resources Management* (UNEP 2012) shows that out of 133 countries surveyed, 64% have developed integrated water resources management and water efficiency plans as called for in JPoI and 34% reported an advanced stage of implementation. Moreover, the UNEP/UN water survey relied mainly on self-assessment by national governments, i.e., on questionnaires filled by the respective national ministry/agency responsible for water resources policy. Data robustness is thus questionable, and in-depth country studies would most likely reveal even lower levels of implementation. Even the GWP considers this to be limited success, lamenting “implementation is slow and difficult with only 34% reporting significant progress” (GWP 2012:4).

Thus, only double-loop learning can be observed with regard to regulative aspects, because the need for a change in national policies and laws has been recognized but changes in regulatory frameworks have taken place only to a limited extent and new policies are not yet being implemented. This discrepancy between official national policies and corresponding activities and institutional reforms is a common phenomenon in international norm diffusion processes (compare Finnemore and Sikkink 1998, Jakobi 2012).

Actors involved in GWP-IWRM network

A set of corporate actors were identified to form the GWP-IWRM network. These actors are described in Table 3. Main network relationships, major knowledge products, and most relevant forums for meeting and interaction are shown in Figure 1. Main actors in the network are linked to each other through a dense net of institutionalized relationships that does not show a central position for any of the actors.

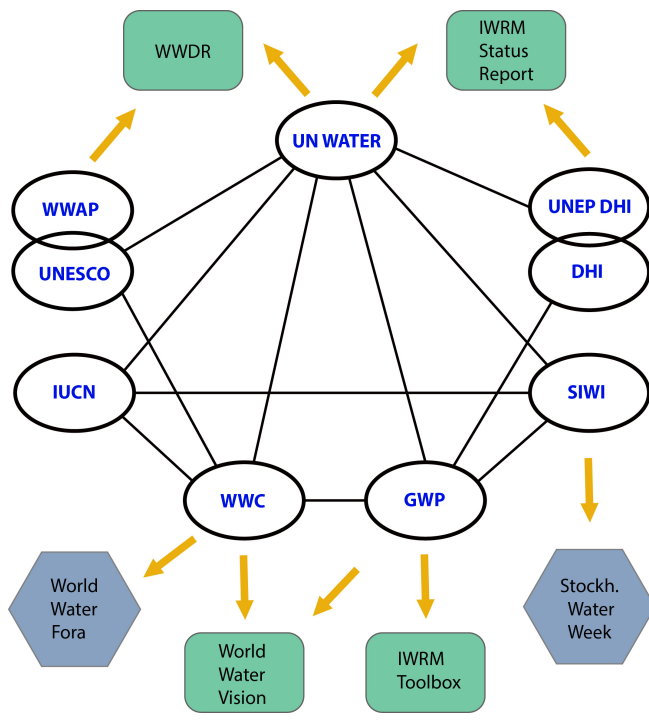
Analysis of success factors

Inclusion of relevant stakeholders

Looking at the inclusion of relevant stakeholders in the global GWP-IWRM network, it can be observed that the public sector is well represented in the form of international organizations, whereas national governments play a limited direct role in the global network, apart from being involved in the negotiations at

the UN Commission for Sustainable Development and ministerial declarations at the World Water Forums. Representatives of governmental organizations are, however, regularly represented in steering committees and boards of the WWC and GWP (see Appendices 1 and 2). The private sector is well represented in the board of governors of the WWC and also to some extent in the steering committee of the GWP. Research institutions and international professional associations play a major role in technical advisory committees and boards throughout the network, which provides the network with access to expert knowledge. On the other hand, CSOs and NGOs apart from the International Union for Conservation of Nature are barely represented in the network. Although multistakeholder partnerships such as GWP and WWC can formally be conceived as NGOs, their representativeness of different stakeholder interest has been debated (see, e.g., Bäckstrand 2006, Pattberg 2010). In our analysis of representation of different interests, we therefore looked at the different stakeholder groups represented in the GWP and WWC steering committees.

Fig. 1. The global policy network behind integrated water resource management (IWRM), its main actors (ovals), joint knowledge products (rounded squares), and fora (hexagons) for meeting and interaction, as well as main lines of institutionalized cooperation. For explanation of acronyms see Table 3.



Diverse expertise and joint knowledge

The global GWP-IWRM network has produced a considerable number of knowledge products on IWRM, including toolkits, case studies, and policy briefs that synthesize scientific findings for policy making. The UN World Water Development Report (WWDR) and other assessment programs have provided a

comprehensive knowledge base on water resources, and the UN water-monitoring programs allow evaluation of progress in achieving the IWRM-related JPoI goals. Main network actors have regularly cooperated in producing knowledge and information. The GWP toolbox, for example, is produced together with network actors including UNESCO, the UNEP-DHI Centre for Water and Environment, WWC, the Stockholm International Water Institute, and others. Likewise, GWP has been involved in the World Water Vision exercise and preparation of the WWDRs. As a result, a cross-sectoral approach for the generation of integrated knowledge is provided to a certain extent. However, it might well be that the close cooperation in knowledge production might have contributed to a homogenization of knowledge and information because of an overly high density of network ties. Moreover, given the limited CSO and NGO representation in the network itself, their perspective is missing in many of the knowledge products. The World Water Vision exercise as well as the first editions of the WWDR, for example, have been heavily criticized for not adequately reflecting environmental, social, and gender perspectives (Conca 2006). Although the World Water Assessment Programme has adopted a participatory process to develop WWDR contents, a closer look at its lead authors and technical advisory committee again reveals limited CSO and NGO representation (see Appendix 3). Looking at the representation of different disciplines, the technical advisory committees of the WWDR again show a bleak picture of male engineers and few natural scientists, with hardly any representatives from other disciplines. The GWP technical advisory committee that signed as responsible for the well-known IWRM definition provides a more diverse perspective as it included, besides a majority of engineers, sociologists, economists, and representatives from other disciplines (see Appendix 4).

Communicative action in a nonhierarchical environment

The network has an informal character, with loosely defined borders as well as a dense pattern of relationships among actors. It does not show a central position for any of the actors and supports a nonhierarchical environment that can facilitate deliberation. The GWP-IWRM network further provides room for dense interaction between different members. Besides the annual Stockholm World Water Week and the World Water Forum, where many network representatives meet and discuss IWRM-related issues in joint sessions, several network actors sit on each other's steering committees, boards, and so forth, and have institutionalized partnerships and cooperation in specific fields of action. Although these dense relationships can create trust and allow for a better coordination of activities and regular exchange, they limit the inclusion of organizations and individuals from outside the core network.

One may thus argue that the GWP-IWRM network runs the risk of evolving into a closed club of central actors that lacks bridging ties to and input from diverse outsider perspectives. Such closed clubs have a reduced capacity for critical reflection; nevertheless, collaboration networks commonly develop that way. Galaz et al. (2012) describe a similar evolutionary pattern for the network features of what they call "stronger" and "strong polycentric order." According to their description of generic processes in polycentric systems, relatively loose collaboration networks need

Table 3. Main actors of the global policy network promoting integrated water resources management (IWRM).

Organization	Description	Main IWRM related outputs
Global Water Partnership (GWP)	Nonprofit, multistakeholder platform, founded in 1996 with the aim to foster IWRM; Over 2800 partner organizations in 169 countries; partners include national government institutions, agencies of the United Nations, bi- and multilateral development banks, professional associations, research institutions, nongovernmental organizations (NGOs), and private sector organizations.	GWP-Technical Advisory Committee developed the most wide-spread definition of IWRM; IWRM toolbox that comprises an organized collection of policy tools to support IWRM processes, case studies, reference documents, etc.; several background papers and policy briefs on different aspects of IWRM; Capacity building and support to countries in preparing IWRM plans.
World Water Council (WWC)	International multistakeholder platform founded in 1996 with the mission to promote awareness, build political commitment, and trigger action on critical water issues; About 340 member organizations from 60 countries; members include intergovernmental organizations, government and governmental authorities, enterprises and facilities, civil society organizations (CSOs), and water user associations, professional associations, and academic institutions.	World Water Forum, the largest international event in the field of water, which has taken place every three years since 1997; commissioned the production of the World Water Vision, a reference publication on global water challenges that was presented at the 2nd World Water Forum in 2000.
World Water Assessment Programme (WWAP)	A joint program of water related UN agencies and bodies, hosted and led by UNESCO. WWAP monitors freshwater issues to provide recommendations, develop case studies, enhance assessment capacity at a national level, and inform the decision making.	World Water Development Report (WWDR) published every three years.
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Specialized agency of the United Nations (UN) with several water related activities and centers most importantly: International Hydrological Programme (IHP), an intergovernmental program of the UN system devoted to water research, water resources management, and education and capacity building.	IWRM Guidelines at River Basin Level to help practitioners implement IWRM at a river basin level in line with their own circumstances; HELP program, that deploys hydrological science in support of improved integrated catchment management.
UN Water	The UN interagency coordination mechanism for all freshwater related issues, formally established in 2003; Comprises 29 UN Members and 25 other international partners, including international professional associations, NGOs, GWP, WWC, etc.	First formal exercise to monitor the status of national IWRM plans, and thus of progress toward the Johannesburg Plan of Implementation goal. The first Status Report on Integrated Water Resources Management and Water Efficiency Plans was published 2008, the second in 2012.
UNEP-DHI Centre for Water and Environment	A United Nations Environment Programme (UNEP) center of expertise hosted by DHI, an independent, international consulting and research-based not-for-profit foundation.	Main author of UN Water IWRM status reports (see above); capacity building on IWRM and technical support to national governments in IWRM planning processes; DHI has also been closely involved in development of the IWRM concept as one of the GWP resource centers at the time.
Stockholm International Water Institute (SIWI)	A Stockholm-based policy institute that generates knowledge and informs decision making toward water wise policy. Founded in 1991, SIWI performs research, builds institutional capacity, and provides advisory services.	SIWI is the host and organizer of the World Water Week in Stockholm, an important annual networking event on the implementation of international processes and programs in water and development.
International Union for Conservation of Nature (IUCN)	Founded 1948 as the world's first global environmental organization; IUCN is a membership organization made up of more than 1000 organizations, as well as 10,000 individual scientists.	IUCN's Water and Nature Initiative (WANI) comprised several IWRM demonstration projects focusing on an ecosystem based approach and produced a collection of toolkits, case studies, and policy briefs on IWRM related themes.

to develop into denser and stronger relations among a core of actors to be able to coordinate activities and to solve internal problems and conflict (Galaz et al. 2012).

CONCLUSION

The emergence and spread of IWRM norms can be conceptualized as norm development and diffusion through a global policy network. Building on literature on international relations, global governance, policy networks, and network

theories, a framework has been developed to study whether the structure of the global policy network promotes IWRM-supported development and diffusion of norms. Based on an exploratory qualitative analysis, we conclude that the structure of the GWP-IWRM network seems to fulfill important success factors for norm development and diffusion through policy networks, but also has important drawbacks. More precisely we can assume that:

- Deficits in involvement of relevant interest groups can explain some of the limitations in IWRM norm diffusion. Especially the limited direct involvement of national governments, which are main targets of the IWRM norms, might have hampered regulative effects and implementation at the national level. Narrow participation of CSOs and NGOs in the network is likely to have amplified the controversies that have been going on for many years, for instance, over the economic perspective of IWRM. Limited inclusiveness of the network further limits the democratic legitimacy of the norms developed.
- On the other hand, the GWP-IWRM network provided for collaboration of experts and representatives of various societal sectors in development of IWRM norms and related knowledge and information. This collaboration is likely to have contributed to the fact that IWRM has been so broadly approved as an appropriate approach to the complex problems of water resources management. Moreover, the joint production of a shared knowledge base might well have contributed to social learning and thus diffusion of the IWRM norms.
- The nonhierarchical structure of the network, as well as the various opportunities for frequent and informal interaction between network actors, represents a framework conducive for deliberative processes supporting social learning and norm diffusion. The dense net of relationships among the diverse network actors may further have facilitated consensus building and joint action of the network.

The aim of this paper was to contribute to better understanding of the network's success and failure in developing and diffusing the IWRM concept. The results of our exploratory analysis allow us to put forward the following hypotheses: (1) The diverse expertise and joint knowledge products of the GWP-IWRM network, as well as the room for deliberation it provided, have facilitated its normative and cultural-cognitive influence. (2) The limited inclusiveness of the GWP-IWRM network has contributed to reduced regulative effects of the IWRM norms.

More in-depth analysis of the GWP-IWRM network along the lines of the developed assessment framework as well as of the processes of IWRM norm development and diffusion will be carried out to more thoroughly test these hypotheses. Moreover, future research will also look at other factors influencing diffusion of international norms. These include the foremost intrinsic qualities of the norms themselves, such as their substance and formulation. Research has shown that the specificity or ambiguity of norms can have significant effects on norm emergence and diffusion, respectively (compare Kowert and Legro 1996, Finnemore and Sikkink 1998). Indeed, the IWRM concept has often been criticized for being vague (see, e.g., Biswas 2004), and

its vagueness has allowed multiple actors to pursue their traditional agendas under the name of IWRM (Conca 2006, Molle 2008).

Linking the informal GWP-IWRM network to formal policy processes could probably increase national governments' ownership of the IWRM norms and thus support regulative effects and implementation. On the other hand, our results suggest that stakeholders' ownership in the process is less important for cultural-cognitive and normative effects. This points to an important question for further research: What degree of formality or linkage to formal policy processes is conducive for norm development and diffusion at what stage of the process? Some authors have indicated that informal multistakeholder networks might be better suited for the stage of developing new norms because of their ability to include diverse knowledge and perspectives, and to generate innovative ideas. More formal processes might be required to translate these ideas into effective regulation and implementation (compare Dubash 2009, Pahl-Wostl 2009, see also Pahl-Wostl et al. 2013). The results of our analysis support this assumption.

With regard to design requirements for a global water governance regime, our analysis suggests that the existing governance system is well equipped to provide expertise, information, and monitoring capacity to assess the current state of water resources and to develop solutions to problems. However, more attention needs to be given to ensuring that knowledge and information are validated and legitimized by stakeholders and to preventing homogenization. Although we looked at the global phenomenon of diffusion of IWRM norms without discussing the content of the norms, one should not forget that water resources management is a highly political issue. A few studies have already attempted to critically scrutinize whose interests dominate decision making and knowledge production in global water governance (see, e.g., Goldmann 2007, Dobner 2010). An important research topic continues to be an in-depth study of the interests involved in the GWP-IWRM network and how they have contributed to framing the IWRM discourse.

Responses to this article can be read online at:

<http://www.ecologyandsociety.org/issues/responses.php/6827>

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Appendix 1:

Composition of the Global Water Partnership's Steering Committee as of 2000 and of 2012

The GWP Steering Committee acts as a Board of Directors and meets twice a year.

GWP Steering Committee as of 2000		
Name	Affiliation	Sector
Catley-Carlson, Margaret	Chairperson	
Khan, Shoaib Sultan	Aga Khan Foundation	Civil society and non-governmental organisations
Dillon-Ridgley, Dianne	World YWCA (Young Women's Christian Association)	Civil society and non-governmental organisations
Garrido Raymundo , Jose Santos	Dept. Gestao de Aguas Federais de Meio Ambiente. Secretaria de Recursos Hidricos [SRH-MMA).	Government and governmental authorities
Schreiner, Barbara	Department of Water Affairs and Forestry, RSA	Government and governmental authorities
Zupan, Martina	Agency for the environment, Republic of Slovenia	Government and governmental authorities
Lum, Ken	Commonwealth Science. Council. Secretariat. UK	Intergovernmental organisations
Abdel-Magid, Isam Mohammed	Sudan University of Science and Technology	Research institutions
Van Koppen, Barbara	International Water Management Institute	Research institutions
Flor, Mai.	Lyonnaisse des Eaux.	Private
Diwan. P.L.	Water and Power Consultancy Services. Public Sector Enterprise. Former deputy director with Central Water Commission, India	Private non-profit
Forde, Lester	Trinidad Water and Sewage authority.	Public utility
Khatib, Hisham	World Energy Council	Other

GWP Steering Committee as of 2012		
Name	Affiliation	Sector
Laetitia Obeng	GWP Chairperson	
Alice Bouman-Dentener	Netherlands Council of Women.	Civil society and non-governmental organisations
Elisa Colom	Technical Secretariat of the Cabinet on Water of the Government of Guatemala	Government and governmental authorities
Kenzo Hiroki	Science and Technology Bureau, Cabinet Office, Japan	Government and governmental authorities
Stanley Dhram Ragh Rampair	Ministry of Agriculture, Jamaica, Chief Executive Officer at the National Irrigation Commission,	Government and governmental authorities
Gangyan Zhou	Yangtze Water Resources Commission, China.	Government and governmental authorities
Eugene Stakhiv	UNESCO International Centre for Integrated Water Resources Management (ICIWaRM).	Research institutions
Meera Mehta	Professor Emeritus at CEPT University, India	Research institutions
Shaden Abdel Gawad	Governmental Research Center	Research institutions
Dorothy Manuel	Earth-Solar Sustainable Communities, Inc. in Washington, D.C	Private
Jean-François Donzier	International Office for Water	Private non-profit
Ramon Alikpala	Metropolitan Waterworks and Sewerage System, Manila	Public utility

Appendix 2: Composition of the World Water Council's Board of Governors as of 2000 and of 2012

WWC Board of Governors as of 2000			
Name	Function	Affiliation	Sector
Ger BERGKAMP		World Conservation Union - IUCN	Civil society and non-governmental organisations
Mahmoud ABU-ZEID	President	Ministry of Water Resources and Irrigation, Egypt, Founding Member	Government and governmental authorities
Olcay UNVER	Treasurer	Southeastern Anatolia Project, Turkey	Government and governmental authorities
Ahmed Mohamed ADAM		Ministry of Physical Planning & Public Utilities, Sudan	Government and governmental authorities
Mohamed AIT-KADI		General Council for Agricultural Development, Morocco	Government and governmental authorities
Dogan ALTINBILEK		State Hydraulic Works – DSI, Turkey	Government and governmental authorities
Mokhtar BZIOUI		Ministère de l'Aménagement du territoire, de l'eau et de l'environnement -Secrétariat d'état chargé de l'eau	Government and governmental authorities
Thomas F. CAVER		U. S. Army Corps of Engineers Civil Works, USA	Government and governmental authorities
Mona EL-KADY		National Water Research Center, Egypt	Government and governmental authorities
Leonor PINTADO CORTINA		National Water Commission, Mexico	Government and governmental authorities
Ingvar ANDERSSON		United Nations Development Program	Intergovernmental organisations
John BRISCOE		World Bank	Intergovernmental organisations
Andras SZÖLLÖSI-NAGY		UNESCO Division of Water Science	Intergovernmental organisations

Pierre-Frédéric TENIERE- BUCHOT		United Nations Environment Program	Intergovernmental organisations
Avinash TYAGI		World Meteorological Organization	Intergovernmental organisations
Gourisankar GHOSH		Water Supply and Sanitation Collaborative Council	Other
Maria Concepcion DONOSO		Executive Committee Inter-American Water Resources Network	Other
Aly SHADY		Founding Member	other
William COSGROVE	Vice-president	Ecoconsult Inc, Canada	Private
Loïc FAUCHON	Special adviser to the president	Groupe des Eaux de Marseille, France	Private
René COULOMB		SUEZ, France, Founding Member	Private
Yumio ISHII		TI Engineering Co. Ltd, Japan	Private
Ceylan ORHUN		Tüstaş Sınai Tesisler A.S., Turkey	Private
Yutaka TAKAHASI		Construction Project Consultants Inc., Japan	Private
Kuniyoshi TAKEUCHI		International Association of Hydrological Sciences	Professional association
Benedito BRAGA		International Water Resources Association	Professional association
Raymond LAFITTE		International Hydropower Association	Professional association
Jacques LECORNU		International Commission on Large Dams	Professional association

Paul REITER		International Water Association	Professional association
C. D. THATTE		International Commission on Irrigation and Drainage	Professional association
Pierre-Alain ROCHE		Seine-Normandy Water Agency, France	Public
Vaijayayanti Milind BENDRE		Central Water and Power Research Station, India	Research institutions
Atef HAMDY		Istituto Agronomico Mediterraneo – CIHEAM, Italy	Research institutions
John PIGRAM		Centre for Ecological Economics and Water Policy Research, Australia	Research institutions
Maarten BLOKLAND		International Institute for Infrastructural, Hydraulic and Environmental Engineering (IHE Delft - UNESCO - IHE), the Netherlands	Research institutions

WWC Board of Governors as of 2012			
Name	Function	Affiliation	Sector
Loic FAUCHON	President	Société des Eaux de Marseille, France	Private
Benedito BRAGA	Vice President	Polytechnic School of the University of Sao Paulo, Brazil	Research institutions
Iman ABDEL AL		Association of the Friends of Ibrahim Abd El Al, Lebanon	Civil society and non-governmental organisations
Jean-François LE GRAND		Cercle Français De L'eau, France	Civil society and non-governmental organisations
Karin KRCHNAK		The Nature Conservancy, USA	Civil society and non-governmental organisations
Mark SMITH		International Union For Conservation Of Nature, International	Civil society and non-governmental organisations
Tomoo INOUE		Japan Water Forum, Japan	Other
Akif ÖZKALDI		General Directorate Of State Hydraulic Works, Turkey	Government and governmental authorities
Ali FASSI FIHRI		Office National de l'Eau Potable, Morocco	Government and governmental authorities
Guy FRADIN		Agence de l'eau Seine-Normandie, France	Government and governmental authorities
Hyeong-Ryeol KIM		Ministry of Land, Transport and Maritime Affairs, Korea	Government and governmental authorities
Paulo VARELLA		National Water Agency, Brazil	Government and governmental authorities
Jerome DELLI PRISCOLI		US Army Corps of Engineers Civil Works, USA	Government and governmental authorities
Zhiguang LIU		Ministry Of Water Resources, China	Government and governmental authorities

Abdel Fattah METAWIE		Permanent Joint Technical Commission for Nile Waters, Middle East	Intergovernmental organisations
Bert DIPHOORN		UN Habitat, International	Intergovernmental organisations
Pasquale STEDUTO		Food and Agriculture Organization of the United Nations, International	Intergovernmental organisations
Viktor DUKHOVNY		Scientific Information Center, Interstate Water Coordination Commission of Central Asia, South Asia	Intergovernmental organisations
Andras SZOLLOSI-NAGY		United Nations Educational Scientific and Cultural Organisation, International	Intergovernmental organisations
Antonio IBANEZ		Asociación de Fabricantes para Agua y Riego Españoles, Spain	Private
Hachmi KENNOU		Société Méditerranéenne pour l'environnement, Tunisia	Private
Irfan AKER		Dolsar Engineering Limited, Turkey	Private
Kuen-ho KIM		Korea Water Resources Corporation, Korea	Private
Masato TOYAMA		CTI Engineering Co., Ltd., Japan	Private
Patrick CAIRO		United Water, USA	Private
Roberto OLIVARES		Asociacion Nacional De Empresas De Agua Y Saneamiento De México, A. C., Mexico	Private
Haluk BUYUKBAS		Turkish Contractors Association, Turkey	Professional association
Jinsheng JIA		International Commission on Large Dams, ICOLD	Professional association

Jun XIA		International Water Resources Association, International	Professional association
Kenneth REID		American Water Resources Association, USA	Professional association
Soontak LEE		Korea Water Resources Association, Korea	Professional association
Dogan ALTINBILEK		International Hydropower Association, International	Professional association
David CADMAN		ICLEI - Local Governments for Sustainability, International	Public
Jean-Claude GAUDIN		City of Marseille, France	Public
Daniel LOUDIERE		French Water Academy, France	Research institutes

Appendix 3:

Lead authors and composition of the Technical Advisory Committee (TAC) of the World Water development Report (WWDR)

A Technical Advisory Committee “of 11 prominent individuals from around the world with water sector expertise and broader policy-making experience in their countries and internationally” (WWDR 2009) was established to promote broader input to the 3rd and 4th WWDR. The TAC provided insight and expertise for the WWDR production team. Earlier WWDR editions had mainly been prepared by UN Organisations and their staff.

Lead authors and content coordinators for 3 rd and 4 th edition (2009 and 2012)		
Name	Educational background	Comments
William (Bill) Cosgrove	Engineer (Civil/sanitary)	WWDR Content Coordinator 2009/senior adviser 2012 Independent Consultant, WWC president 2003-2004 (before: vice president), ex- World Bank (1973-1989), also lead author of World Water Vision (Director World Water Vision Unit, World Water Council)
Olcay Ünver	Civil Engineer	WWDR Content Coordinator 2012 WWAP Coordinator (since 2007), ex. Univ USA, ex GAP president, Board Member and the Treasurer of the World Water Council (1995-2003)
Richard Connor	Biogeochemist	WWDR Lead Author 2012 Chief Scientific Officer at Unisféra International Center, Montreal, Canada, a non-profit research and educational organization. Has held various positions at WWC, and was Coordinator / Author of North American Regional Vision (World Water Vision)
Daniel Pete Loucks	Engineer	Contributing Lead Author 2012 Prof Emeritus

WWDR TAC for 3rd and 4th edition (2009 and 2012)		
Name	Educational background	Comments
Uri Shamir, (chair)	Civil engineering	Prof Emeritus Technion, President International Union of Geodesy and Geophysics
Dipak Gyawali, (deputy chair)	Hydroelectric power engineering and political economy	Nepal Academy of Science and Technology (NAST) and Research Director of the non-profit Nepal Water Conservation Foundation, ex Minister of Water Resources
Fatma Attia,	Civil engineering, PhD in groundwater hydrology	Professor Emeritus in the National Water Research Center, Ministry of Water Resources and Irrigation
Anders Bertell,	Biology	Stockholm International Water Institute, ex Ministry of Environment
Elias Fereres,	Agricultural engineering, Ph.D. in Ecology	Professor University of Cordoba, Spain,
M. Gopalakrishnan,	No information available	Secretary General of the International Commission on Irrigation and Drainage (ICID), Governor of the World Water Council during 2003-06, ex member Central Water Commission and other positions in Gol water management,
Daniel Pete Loucks,	Environmental Engineering	Professor Emeritus Cornell University
Laszlo Somlyody,	Civil Engineering	Professor Budapest University of Technology and Economics
Lucio Ubertini,	Engineering, Hydrology	Italian Research Council (CNR) Professor, University Rome, President of the Italian IHP Commission
Henk van Schaik,	Sanitary Engineering	Programme Coordinator Co-operative Programme Water and Climate (since 2001)
Albert Wright	Civil Engineering	Independent Consultant, ex-Professor at University in Ghana, ex senior staff at WorldBank,

Appendix 4:

Composition of the Global Water Partnership Technical Advisory Committee (GWP TAC) 1996-1999

The widely accepted definition of IWRM as a “*a process that 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*” goes back to a paper prepared by the GWP TAC in 2000 (“Integrated water resources management” TAC Background Paper No. 4. GWP, Stockholm, Sweden.)

The paper states that it “represents the “corporate view” of TAC on integrated water resources management and has been authored by all members of TAC in the period 1996 through 1999.” ... “The paper is the sole responsibility of TAC, but it has been developed in a joint process involving TAC members, Regional TAC Chairs, professional TAC-support staff at DHI Water and Environment and GWP Secretariat staff. Based on TAC’s deliberations on the subject over its course of time, Mr. Henrik Larsen, DHI Water and Environment, provided a first draft and has functioned as the chief editor of the paper.”

Composition of GWP TAC 1996-1999 as mentioned in the paper		
Name	Educational background	Comments
Miguel Solanes	M.A. water resources management	Water and law advisor for the United Nations system since 1984. Based in New York until 1994 before being seconded to Santiago, in Chile, at ECLAC
Albert Wright	Civil Engineer	Professor at University in Ghana, senior staff at WorldBank, later became member of the Technical Advisory Committee of the World Water Assessment Program, and a member of the Expert Group on Indicators, Monitoring, and Databases for the Third World Water Development Report
Paul Roberts	Engineer	Deputy Director General of the then Department of Water Affairs and Forestry, RSA
Mohammed Aït Kadi	PhD Irrigation Engineering	Professor in the Department of Equipment and Hydraulics and President of the General Council of Agricultural Development in Morocco. He was member of the founding committee of the World Water Council and initiated the process of hosting the first World Water Forum in Marrakech, Morocco, and was president of its organising committee.
Ivan Chéret	Engineer	Formerly head of the water division of Lyonnaise des Eaux, and Chairman of their waste management subsidiary. Between 1960 and 1970, as Rapporteur of the Water Commission in France, he took an active part in setting up their River Basin Agencies after having gained ten years working experience in Africa.

Anil Agarwal	Engineer, Journalist,	Director, Centre for Science and the Environment, an Indian NGO
Malin Falkenmark	Professor of Applied and International Hydrology	Senior scientific adviser at SIWI, as Chair of the Scientific Program Committee (1991- 2003) helped establish the annual the Stockholm Water Symposium/World Water Week in Stockholm. Rapporteur General of the United Nations Water Conference Mar del Plata (1977), Executive Secretary of the National Committee for UNESCO's International Hydrological Decade
Fernando Gonzalez Villarreal	Hydraulic Engineer,	Researcher at the Instituto de Ingeniería de la Universidad Nacional Autónoma de México
Janusz Kindler	Engineer	Professor Warsaw University of Technology / Research Committee on Water-Related Security Issues at the Presidium of the Polish Academy of Sciences, various research and consulting assignments
Judith Rees	Geographer	Professor of Environmental and Resource Management Department of Geography and Environment, London School of Economics and Political Science.
Peter Rogers	Environmental Engineering	Professor of Environmental Engineering, Division of Engineering and Applied Sciences, Harvard University
Torkil Jønch-Clausen	Hydrology, PhD in water resources	DHI (TAC Chair 1996-2003)
Marian S. delos Angeles	Environmental economist,	female, Senior Research Fellow of the Philippine Institute for Development Studies, a government think tank, during 1983-1999 (from 2001-2004 World Agroforestry Centre (ICRAF) a CGIAR Consortium Research Center. at WB Institute since 2004)
Ramesh Bhatia	Economist	President of the Resources and Environment Group (REG), Delhi, India (ex World Bank Water Specialist, ex IWMI)
Sonia Davila-Poblete	Sociologist,	member of Social Participation Team, at the Mexican Institute of Water Technology (Instituto Mexicano de Tecnología del Agua). has also worked with different nongovernmental organizations in Mexico and Bolivia, conducting adult-education and capacity-building programs, and developing agricultural projects for peasants, indigenous populations, and women's organizations