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Integrated Water Resources Management: A Comparative Laboratory for Water Governance

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In this article the special issue on Integrated Water Resources Management is introduced. This special issue aims to add substantially to comparative cross-country knowledge building. The paper builds upon the insights gained from the various contributions to this special issue, coming from 13 different countries spread across the globe. The concept of IWRM is discussed from the angles of the Rio-Dublin principles, Global Water Partnership definition and concepts and ideas from adaptive governance. Furthermore, integration is discussed as the core of IWRM: functional, societal and institutional integration. Based on the insight gained from the range of contributions from this special issue, we argue that IWRM needs more systematic and comparative approaches from both administrative (de)centralization and economic development points of view. Moreover, in our comparative study we found trade-offs between the three identified forms of integration. We argue that a perspective of an adaptive walk is required that tries to gain more understanding in specific decentralization-centralization configurations per case/country/region leading to (misfits in) functional, societal and institutional integration regarding IWRM.

Keywords: integrated water resources management, functional, societal and institutional integration, adaptive governance, (de)centralization, economic development.

1. Introduction

Integrated water resources management (IWRM) has become a core concept in water policy and governance (White, 1964; 1977; 1998; Borchadt et al., 2011; Biswas, 2004; Hering and Ingold 2012; Margerum, 1999; Lubell and Lippert, 2011). IWRM can be considered a response to several sources of fragmentation in water governance systems (Sabatier et al., 2005). Functional fragmentation occurs when a variety of government and private organizations have different functional responsibilities for interdependent aspects of water (e.g., flooding, water supply, etc), as well as other environmental and economic issues that affect water (e.g., land-use). Societal fragmentation occurs when different water management interests fail to communicate, and the broader public is disconnected from

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government decisions. Institutional fragmentation occurs when different water management authorities fail to coordinate within and across levels of government. This fragmentation cannot be completely 'solved'; it 'is here to stay' and needs constant counter-pressure in bringing different fragmented pieces together and organizing integration and interconnection (Edelenbos et al., 2013). The main goal of IWRM is to facilitate cooperation, joint responsibility and integration within fragmented governance systems (Edelenbos and Teisman 2011).

IWRM is currently being used throughout the world in both developed and developing countries (Biswas 2004). Unfortunately, research on IWRM has lagged behind application especially in developing a comparative understanding of how IWRM works in different contexts. Different researchers apply a diverse set of definitions of IWRM. The often vague and abstract nature of the definitions makes it easy for any country or group of water management stakeholders to adopt the label of IWRM to describe what they are doing—it is a "trendy" and "elastic" term, a "nirvana" concept (Molle 2008). This is a particular problem given the variety and complexity of water management contexts (Medema et al., 2000), which raises doubts about whether it is possible to consider IWRM an universal framework that is equally applicable to various physical, economic, social and cultural conditions (Biswas, 2004). As Ostrom points out, there is "no panacea"; institutional improvements should reflect the demands of local contexts.

For these reasons, it is of significant value to research and compare IWRM as it is being implemented in different local contexts. IWRM should not be considered a fixed end state to be achieved. Rather it should be approached as a process of experience building, policy learning, and adaptive improvements applied by different actors in a specific place. The resulting institutional diversity is not a problem that has to be solved; rather the principles generating the diversity need to be understood.

1.1. Growing attention for IWRM from a social science research point of view

While biophysical sciences like civil engineering and hydrology have paid a lot of attention to IWRM (cf. Medema, 2008), the attention from social science (policy science, political science, public administration, etc.) needs to be strengthened. Social science approaches view IWRM as an experiment in governance and a rethinking of existing coordination processes and institutional arrangements that shape collective action about watershed resources (Sabatier et al., 2005; Edelenbos and Teisman, 2011). Hence, it is crucial to understand the political, economic, and social forces that drive decision-making and how those decisions are ultimately linked to the use of water resources over time.

The idea of IWRM is a subset of an extensive social science literature on collaborative policy, consensus, and conflict resolution. Some of this literature analyzes the "watershed approach". Other research focuses on the broader ideas of community-based environmental protection, ecosystem management, and collaborative governance (cf. Margerum, 1999). A good deal of the existing literature is based on a small number of quantitative or qualitative case studies within a single country. Comparative research on

IWRM across countries is just beginning to emerge (Medema et al., 2008; Hooper 2009; Tortajada 2010).

This special issue aims to add substantially to comparative cross-country knowledge building. It presents the evolution of IWRM in the following countries:

- Argentina (by Berardo, Meyer and Olivier),
- Australia (by Marshall, Connell and Taylor),
- Czech Republic and Poland (by Kowalczak, Matczak, and Slavikova),
- England and Wales (by Fritsch and Benson),
- Hungary (by Borsos and Sendzimir),
- Luxembourg (by Maganda),
- Netherlands (by Verkerk and van Buuren),
- Singapore (by Tortajada and Joshi),
- South Africa (by Claassen),
- Sweden (by Gooch and Bagget),
- United States (by Layzer and Schulman, and by Hoornbeek and Hansen).

Although this is not a random sample of countries or a quasi-experimental design, the cases come from all six settled continents, and represent a range of political institutions and levels of economic development. This collection provides insight in the often unique evolution of IWRM across the globe, the sometimes rather specific way of analyzing IWRM, as well as an increasing dialogue among the scientific community in search for convergence in approach and models.

1.2. The focal points in this special issue regarding IWRM

We asked each team of authors to answer the following basic questions about IWRM in their country of study:

1. What is the history and extent of IWRM in your study country?
2. To what extent has integration occurred (functional, societal, institutional), and what variables drive success and failure?
3. What theoretical frameworks and concepts are most useful for analyzing IWRM, in particular for identifying variables linked with effectiveness?
4. What is the institutional structure of IWRM in your specific case, and more generally in the country?
5. What country-level variables might affect IWRM, in particular political culture and the structure of macro-political institutions?

The variation in the ways and degrees each contribution pays attention to these questions reflects the diversity of theoretical perspectives and country-specific characteristics where research is occurring. Social science research on IWRM remains at an early stage of development, and there is continued need for more communication across disciplines and contexts to develop a common knowledge base. This introductory chapter seeks to highlight some emerging themes from each of the case studies, on which to build a comparative, cross-country research agenda.

2. Defining Integrated Water Resources Management

Roughly speaking, the collection of case studies in this special issue considers three related definitions of IWRM: the Rio-Dublin Principles, the Global Water Partnership, and/or theories of adaptive governance. Table 1 provides a paraphrased summary of the three views. As Biswas (2004) noted, the definitions have some elements of abstraction and vagueness, giving room for specific applications in terms of practice as well as research. All applications however tend to pay attention to matters of coordination and participation.

The definitions vary in terms of the mix of normative goals (like participation and water is a public good with economic and social values) versus more practical or analytical statements (like the adaptive view which stresses constant learning and reflexivity in implementing water resources management). The Rio-Dublin Principles, which emerged from a series of international conferences in 1992, is the most normative perspective and contains little information about how the principles should be achieved. Some authors have argued that the Rio-Dublin principles are vulnerable to conceptual "stretching" to fit the political purposes of specific communities and contexts.

The Global Water Partnership (GWP) is internationally recognized as being the primary non-governmental organization advocating for IWRM across the globe, at different scales of decision-making. GWP defines IWRM as "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" (GWP-TAC, 2000). The GWP developed their definition of IWRM to operationalize the normative goals of the Rio-Dublin principles. Still the GWP definition contains a number of abstract and "amorphous" (Biswas 2004) concepts.

The adaptive governance perspective (Folke et al., 2005; Pahl-Wostl, 2007; Scholz and Stiftel 2005) is the most recent approach to IWRM, and linked to terms like collaborative

Table 1
Overview of IWRM Definitions

Rio-Dublin Principles	Global Water Partnership	Adaptive Governance
• Fresh water is a finite and vulnerable resource • Water development and management should be based on a participatory approach • Women play a central part water management • Water is a public good with social and economic values • Equitable and efficient management and sustainable use of water.	• Coordinated development of water, land use, and natural resources • Maximize social and economic welfare • Equitable distribution of resources • Maintenance of ecosystem services	• Water management is a complex and compounded system • Institutional analysis of rules governing resource decisions • Stakeholder cooperation over time • Feedback and adaptation between social and physical system • Policy change in response to new information • Linking science to policy decisions • Participation in policy decisions

policy, adaptive management, and ecosystem management. Adaptive governance takes a holistic approach to water issues, which recognizes the interdependence among multiple, cross-cutting, and often conflicting resource uses (Edelenbos et al., 2013; Margerum 1999; Born and Sonzogni, 1995) The holistic approach is rooted in ecosystem management (Rogers et al., 2000; Meffe et al., 2002), which aims to manage whole ecosystems in a coherent and coordinated way.

The adaptive governance approach highlights facets of water management like institutional flexibility and learning that go beyond the more standard definitions (Mitchell, 2005). This generates a new focus on effective water management: it requires adjustment to new knowledge and insights gained in monitoring of the biophysical system and learning processes (Medema et al., 2008). Adaptive governance therefore acknowledges collaborative challenges, such as including scientists and stakeholders in networks of decision-making. The "adaptive" part of the concept recognizes that water management is a complex system that changes over time, such that policies must adjust to new information about dynamic social and ecological processes.

The case studies reveal three paths by which the principles and ideas of IWRM emerge into water policies in different countries. In the United States, policies usually only implicitly reflect IWRM principles instead of using them as the initial basis for policy formulation. For example, national policies like the Clean Water Act's Total Maximum Daily Load Program and collaborative watershed partnerships like the Chesapeake Bay Program (Hoorbeek and Hansen, Layzer and Schulman, this issue) rely on IWRM principles like adaptive management and stakeholder participation. Many of the collaborative watershed partnerships that have emerged in the United States since the early 1990s (Lubell et al., 2002) implicitly reflect IWRM principles to varying degrees, for example by including strong mechanisms of stakeholder participation. More recently, ideas about IWRM have become more explicit in US policy dialogue (USACE 2010). California has explicitly embraced the concept, calling it Integrated *Regional* Water Resources Management (IRWM); note the switched positions of the "R" and "W" (Lubell and Lippert 2011).

In Europe, IWRM has been strongly introduced via the 2000 European Union Water Framework Directive, where the Rio-Dublin Principles are conspicuous characters in the legislative history of the WFD (Fritsch and Benson, this issue), and the document itself makes explicit use of the words "integrated" and "integration". The WFD essentially blends some of the normative goals of the Rio-Dublin principles, while building on the administrative model of the United States' 1972 Clean Water Act (with individual countries expected to meet the guidelines of central EU legislation), but with an emphasis on ecological criteria as the basis for watershed planning.

However, direct reference to IWRM is less evident in the implementation of WFD in specific countries, because the transposition of the WFD into domestic institutions focuses on the compliance points of the WFD. The expression of the WFD principles depends heavily on the domestic political institutions and culture of a particular country. In Poland and Czech Republic for example (Kowalcak et al., this issue) the focus is less on stakeholder participation as a process to come to clean water. In the Netherlands, the WFD is being

institutionalized at the national level in the National Water Plan and the Delta Programme, which both explicitly refer to concepts of integrated and adaptive management. However, this does not guarantee the implementation of these principles in practice (Verkerk and van Buuren, this issue). In Sweden, the WFD is implemented in the context of a tradition of "administrative pluralism", where local government authorities have substantial authority for policy implementation (Gooch and Bagget, this issue). In England and Wales, the idea of integration is expressed more implicitly via the visible use of WFD concepts in river basin planning. Progress towards use of WFD concepts is less complete in countries like Luxembourg, Poland and Czech Republic, and Hungary, which are continuing to focus on the process of "Europeanization". The comparison indicates how policy contexts of countries mediate the relationship between IWRM and WFD implementation.

In developing countries, IWRM has been promoted by international organizations. The Global Watershed Partnership (GWP), World Bank, and other international NGOs and donors take an active role in shaping water development decisions. The development of the 1998 National Water Act in South Africa illustrates this specific evolution of concepts (Claasen, this issue; also DWAF 2007; http://www.dwaf.gov.za/Documents/Policies/nwpwp.pdf). It was partially funded by international donors and directly informed by the international dialog on IWRM. International organizations also triggered the consideration of IWRM in Argentina about 10 years ago (Berardo et al., this volume), although currently the international organizations do not have as a direct role because Argentine government actors have taken more responsibility.

Singapore is similar to the United States in developing water management institutions without explicit reference to IWRM as a framing concept. However, the United Nations was involved with the early development of Singapore's policies (Tortajada and Joshi, this issue), similar to current developing countries where international organizations play an important role. In contrast to the United States and Australia, Singapore's top-down planning procedures and centralized governance institutions are guiding water management projects. Hence, the relationship between the level of centralization-decentralization and integration is complex and potentially mediated by other variables.

3. Dimensions of Integration in IWRM

The IWRM literature considers three dimensions of integration: (1) functional, (2) societal, and (3) institutional (Lubell and Lippert 2011; Margerum 1999; Edelenbos and Teisman, 2011). *Functional integration* means decisions that account for interdependency and interconnectedness between watershed functions, such as flood management, water supply, water quality, biodiversity, and land-use. *Societal integration* refers to civic engagement through public participation, as well as collaboration among stakeholders with different preferences. It focusses on the accountability and legitimacy of IWRM policies. *Institutional integration* refers to coordinated decision-making among different geographical, hydrological and jurisdictional scales. Institutional integration encompasses

vertical coordination between levels of government at different geographic scales (e.g., from the local to the international), as well as horizontal integration within levels of government at the same geographic scale (e.g., multiple local governments)

3.1. Functional integration: preliminary findings from the cross-country comparison

The contributions of this special issue show a variety of results regarding functional integration. Several examples from this special issue show how the classic technocratic approach to water management, with its sole focus on civil engineering and hard infrastructure, can block functional integration. The clearest examples come from Poland and the Czech Republic (see contribution by Kowalczak et al.) which exhibit the tensions between re-naturalisation of rivers and ecological/environmental issues and the 'hydraulic mission' of resource extraction and infrastructure development that often characterizes earlier stages in the evolution of water management institutions. Water engineers are often reluctant and lack the expertise to tackle social and governance issues that fall outside the technical field of water management. Even integration between functional aspects of a watershed stays problematic: rivalry and competition over limited resources between the ministry (of Agriculture) responsible for water supply and the ministry (of Environment) responsible for water quality hamper functional coordination and integration. So, interests and values that are highly institutionalized in organizational structures and cultures often block processes of functional integration.

However, functional integration does take place to some extent in various countries. Verkerk and Van Buuren (this volume) provide a historical analysis of how water safety, transport, ecology, housing and recreation, agriculture and fresh water are increasingly functionally integrated in the Netherlands. But this does not imply that there are no problems with functional integration. Water safety is still a dominating perspective in Dutch water management leading to strong institutional resistance to functional integration. This is exacerbated by the interference by national government, which since the 19th century has made water safety a national responsibility and created a strong path dependency that is a barrier to integrating other issues and functions.

Overall, the cross-country comparison indicates that functional integration is difficult to realize as the water development and infrastructure framework is at best slowly adaptive to other domains and functions. Water development is positioned as a core value, with other functions as secondary issues and values. This is especially true in developing countries that are in the early stages of economic development of natural resources.

3.2. Societal integration: preliminary findings from the cross-country comparison

With respect to societal integration, stakeholder participation in water management can create conflicts between democratic values and technocratic decision-making. Sometimes there is simple reluctance among water management experts to actively involve non-technical experts in integrated approaches. The long-existing technocratic approach

in water management is based on professional norms that can hamper the mobilization of citizen expertise and local knowledge. As will be discussed later, such technocratic decision-making is more prevalent in centralized and state-centered countries. Meaningful stakeholder participation is often not required by laws such as the WFD (Article 14), which only contain vague procedural requirements for government authorities to provide information and receive and respond to comments. In the United States context, such "notice and comment" rulemaking has long been criticized as achieving primarily process-based goals, rather than substantively influencing actual decisions.

A lack of meaningful participation is not entirely the fault of legal institutions or government authorities. Claassen (this volume) argues that South Africa has sufficient legal instruments that promote interactive processes and stakeholder participation in the management of natural resources, but lacks a high enough level of civic competency, experiences and innovation to take advantage of participation opportunities. Maganda (this volume) underscores this as she reports levels of awareness and participation in WFD public consultations in Luxembourg and the overall EU (Figure 1 below). The lack of awareness and interest suggests a combination of a disinterested public and that EU governments are not adequately promoting participation. Berardo et al. also stress that the unequal levels of mobilization in Argentina contributes to unbalanced representation in water management. The lack of interest in water management may be linked to a public perception that participation is unlikely to make a difference, as pointed out in the Poland case where stakeholders were disappointed by a lack of accountability between stakeholder engagement and authoritative decisions.

Furthermore, the studies in this issue suggest a link between participation and levels of decentralization in a country. Sweden has a tradition of "administrative pluralism" with active local governments and public consultation taking place mainly through interest-group associations, instead of through direct citizen participation. In the US, the culture of democratic participation extends into even regulatory processes like TMDL, which combines citizen participation with elements of command-and-control regulation (see contributions by Hoornbeek and Hansen and by Layzer and Schulman). In Czech and Poland, a communist history and tradition of strong central government appears to limit stakeholder participation. Key elements of IWRM definitions are consistent with administrative decentralization, as this form deals explicitly with how authority is transferred to lower levels of government. IWRM emphasizes polycentric collaboration among actors at

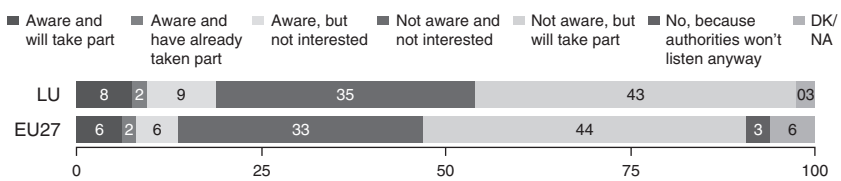

Figure 1. Participation in Luxembourg and EU (Source: European Commission Flash Eurobarometer, *http://ec.europa.eu/environment/water/participation/pdf/eurobarometer_summary.pdf*)

the local, regional or catchment scales, such that local governments, NGOs, local interest groups, etc. are able to reflect unique aspects of social-ecological systems.

Decentralization encourages the empowerment of people to participate in decision-making and development, under the assumption that citizen input improves government effectiveness (Helmsing, 2002; Cheema and Rondinelli, 1983). Stakeholder participation is an important corollary, because it provides a mechanism for integrating local knowledge and preferences as well as increasing legitimacy, accountability, and trust to support cooperation and policy implementation. Hence, decentralized countries are more likely to effectively implement the stakeholder participation and local collaboration aspects of IWRM.

Therefore, the nature and level of social integration is influenced by a number of factors, including the technocratic approach of water management, the democratic culture of political decision-making of a country, and the norms and civic capacity available to develop meaningful stakeholder participation. The case studies suggest that stakeholder participation is catalyzed by decentralized structures and organizations that are closer to local actor groups.

3.3. Institutional integration: preliminary findings from the cross-country comparison

The cases in this special issue reaffirm the difficulties in achieving institutional integration among actors at various scales and levels (local, regional, national). The nature of the conflict around institutional integration appears to respond to the overall level of decentralization in a particular country, which has become an important issue for every governmental system in the world (Larson and Soto, 2008; Larson and Ribot, 2004; Schneider, 2003; Rodden, 2004) and at the center stage of policy experiments in many developing countries. In more decentralized countries, IWRM often introduces an expectation for a new level of coordination among local and regional governance authorities. The first order response to this expectation is to rely on collaborative approaches, which emphasize voluntary cooperation without any requirement to share authority or compel decision-making. But in many cases voluntary cooperation was not forthcoming, prompting some countries to create more centralized institutions with more authority to shape the decisions of local actors (see contribution by Hoornbeek and Hansen, this special issue).

Several countries examined in this special issue illustrate the tension between decentralization and centralization for institutional integration. In Argentina, the Federal Water Council (COHIFE) provides a national venue where representatives from the provincial and national governments meet to discuss water-related issues. This is a response to the fragmented nature of the country's federal regime, with 23 provinces and an autonomous capital district (city of Buenos Aires) that maintain their own set of institutions and agencies to regulate water use. Complementing COHIFE is a large number of meetings at the regional and provincial level, which facilitate horizontal integration among local actors. However, COHIFE's coordinating capacity is impaired by constitutional rules that give provincial governments ownership of natural resources. The culture of *personalismo* in Argentina hampers integration as water management is greatly affected by the nature of

informal bilateral relationships between specific high level decision makers at the provincial and national level making informal and very specific deals. These bilateral relationships hamper the evolution of polycentric institutional arrangements that are needed to realize adaptive and integrate water resources management (Folke et al., 2005; Olsson et al., 2007; Ostrom, 1998; 2005; Betsill and Bulkeley, 2006; Edelenbos and Teisman, 2011).

In the Murray-Darling Basin in Australia, irrigation is primarily the responsibility of Basin states governments operating with a high degree of autonomy. The confederate arrangement of the Murray-Darling Basin Ministerial Council (MDBMC) sought to enhance intergovernmental collaboration, both horizontally between the Basin states and vertically between them and the Commonwealth. However, the culture of collaboration and cooperation broke down, underpinned by the Commonwealth arranging a series of bilateral funding arrangements with each of the states (Cullen, 2004). This overt top-down and strongly formalised coordination led to less meaningful interaction among the states and resulted in lesser institutional integration. Marshall and Conwell (this issue) come to the conclusion that central governments are no longer able to overtly coordinate the multiple government levels involved in the water governance process. They come to the insight that, due to the limited capacities of top down command and control, governance arrangements are needed that are capable of catalysing (via competitive rivalry or informal collaboration) the kinds of self-organising dynamics leading to functional integration.

Sweden is a decentralized government system, in which local and regional governments have primary responsibility for water management (Gooch and Bagget, this issue). Sweden has nearly 60 catchment-wide water management associations formed by local governments and local industries monitoring local water quality and environmental issues. Gooch and Bagget describe conflicts between local/regional and supra-regional levels that have increased in response to the implementation of WFD goals and that have hindered processes of vertical integration.

Singapore, seen as a more centralized country, appears not to experience these problems with institutional integration as severely. The history of water management in Singapore features central government agencies coordinating local implementation activities, and the idea of IWRM was incorporated into this existing institutional arrangement and political culture. But this comes with a trade-off because centralized institutions have more difficulty in achieving some of the other goals of IWRM, especially for public participation. This is apparent in the cases of Poland and Czech Republic, where the political transition into post-communist regimes is associated with a weak culture of civic engagement.

Hence there are important tensions between the different integration goals of IWRM, where functional and institutional integration are hard to accomplish without some exercise of central authority. More bottom-up aspects of IWRM such as societal integration are difficult to achieve in more centralized countries. Countries will manage these trade-offs in diverse ways that reflect differences in political culture and history. However, these trade-offs make clear that fragmentation is here to stay in IWRM, can't be 'solved' once and for all, and needs constant care and attention.

4. Integrated focus, economic development and (de)centralization

A key question for comparative analysis is what variables might affect the adoption, structure, process, and effectiveness of IWRM. The large literature of case studies on local water management institutions suggests a number of potential contextual variables that could matter for IWRM. However, the case studies presented here suggest two variables that may be useful for cross-national analysis: administrative decentralization and stage of economic development. The discussion below lays out some "conjectures" about how these variables might interact, with the goal of developing the theoretical basis—a "proto-theory"—for further research. The central argument is that these contextual variables influence the variation in how countries define and implement IWRM, and the ability to achieve IWRM goals.

4.1. Stages of economic development and IWRM

Analyzing the contributions to this special issue suggests that a country's response to integration depends partly on its stage of economic development. One could argue that there are four basic stages of water development that roughly track broader economic development over time: 1) local water needs; 2) hydraulic control; 3) water pollution; and 4) ecological function. The local water needs stage features local communities supporting human needs of water supply for drinking and irrigation and flood control at a limited geographic scope. Currently developing countries like South Africa (Claassen, this issue) are in this stage, reflected by the goals of international development NGOs and funding. National governments become more involved as economic development continues, at first assisting local communities then engaging in more large-scale "hydraulic control" projects such as multipurpose dams for hydropower, irrigation and flood control. The next stage focuses on "water pollution", when countries begin to recognize the negative externalities of economic development especially with respect to human health. For example, some regions of Argentina (Berardo et al., this issue) are now dealing with the water quality consequences of water infrastructure development. The final "ecological" stage recognizes the importance of ecosystem services and sustaining ecosystem function and biodiversity for anthropocentric and broader ethical reasons. The Netherlands and United States are examples of countries at this stage right now, although tradeoffs and competition between ecological and economic values and interests are present indicating that the stages need not be approached in a strict and sequential manner.

IWRM (and other collaborative approaches like ecosystem management) generally attempts to move countries towards this final stage of water development, reconciling the broader ecological goals with the economic development goals. IWRM builds on existing institutions that developed during earlier stages, which often have a more centralized, command-and-control structure. In developing countries, organizations like the GWP and other international efforts are seeking to accelerate or leapfrog this process by emphasizing from the outset the importance of meeting basic human needs without compromising

environmental goals. But countries like South-Africa, Czech Republic, Poland that are currently in the earlier stages of water development are more likely to resist the broader integrative goals, because their preferences are focused on the earlier stages. Hence, they are more likely to adapt IWRM in ways that support their current goals, for example by using international development funds to build more dams and other centrally managed infrastructure.

At the same time, IWRM plans and programs generally recommend some type of investment in infrastructure or other public goods, as well as institutional capacity to support plan implementation. The compounded and interdependent nature of water governance also increases the overall costs and capacity required to connect values, interests and viewpoints (Edelenbos et al., 2013). Developing countries often lack the resources to support plan implementation, even if their macro-political institutions and political culture are supportive of more integrative approaches.

4.2. Combining (de)centralization and economic development

Figure 2 shows 68 countries ranked by an index of administrative decentralization in 2003 (Schneider 2003) and GDP from 1999 (Triesman 2008). The administrative decentralization index is coded in such a way that zero equals the lowest level and one the highest level of decentralization. The horizontal line is the average level of decentralization, while the vertical line is the average 1999 GDP. The countries included in this special issue are labeled on the graph; note that Singapore is not included in the decentralization index but would appear as a centralized, developed country. While there is not any significant correlation between administrative decentralization and GDP, the countries included in the special issue occur in different regions of the graph.

To summarize the previous discussion, countries with low levels of economic development and high levels of administrative decentralization (Region A) are expected to agree with the stakeholder participation and local collaboration goals of IWRM, but unlikely to have high levels of implementation due to lack of resources and a preference for earlier stages of water development. Centralized countries with low levels of economic development (Region B) are more likely to ignore broader public input and rely on government actions, but divert the broader IWRM goals to focus on hydraulic development. International NGOs and aid play roles that are more important in developing countries, but face the challenge of synchronizing the goals of IWRM with country-level politics. Decentralized, developed countries (Region C) like Sweden and the USA are more likely to incorporate the stakeholder participation and local collaboration aspects of IWRM, but may lack enough centralized institutional authority to compel cooperation among recalcitrant bureaucratic actors and other stakeholders. Finally, centralized and developed countries (Region D) are likely to apply more symbolic methods of stakeholder participation, but have the financial and political resources to engineer functional integration into water systems in a top-down manner.

A number of important caveats to this argument should spark further comparative theorizing and research. This certainly does not exhaust the possible country-level

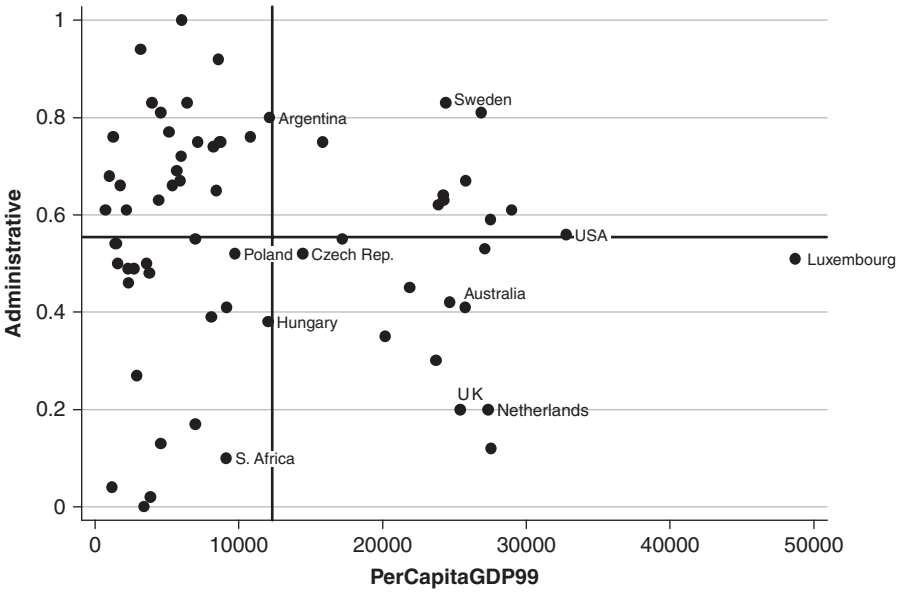

Figure 2. Decentralization and Economic Development

variables that might be important for analyzing IWRM implementation (for example, levels of corruption), and more data collection is needed to get a complete and recent global assessment. There continues to be debate in the literature about the best way to conceptualize and measure decentralization, and even the authors of this paper had discussions about the relative placement of different countries in Figure 2. This highlights the fact that the hypotheses and measurements discussed above are simplifications of the complex political realities and institutional diversity in different countries. More nuanced case analyses are needed to complement these types of quantitative approaches in order to reveal variation among major themes.

Furthermore, variables like the level of administrative decentralization change over time in response to political and economic forces. It is important to analyze more specifically the institutional arrangements of centralization-decentralization (especially in the middle of the decentralization axis) in different countries, and how these arrangements influence the development and implementation of IWRM. Different levels of decentralization entail different types of multi-level governance—how do these multilevel processes take place and in what way are they related to the development and implementation of IWRM?

The cases of Hungary, Poland, and Czech Republic provide indications of the importance of institutional change (Borsos and Sendzimir, this issue). These countries are changing from more centralized, communist regimes to more decentralized, democratic regimes. In Poland and Czech Republic, river basin bodies are established to provide vertical coordination. However, these institutions have limited power because existing national, regional and local agencies are maintaining fragmented authority within existing,

centralized administrative boundaries. At the same time, there is not a strong political culture of civic engagement to support stakeholder participation in water management. This emphasizes the importance of studying institutional change over time in terms of the relationship between macro-level politics and IWRM implementation, and in our view is an important element of a future research agenda for comparative research of IWRM.

5. Theoretical Approaches to IWRM: From Pragmatism to Collective Action

Our request to identify appropriate social science theories for analysis of IWRM produced two responses. The first one is that of a "pragmatic" discussion of potential benefits of integration and collaboration and assessing a country on achieving those goals. This approach considers the definitions and goals of IWRM as given. It traces the evolution of IWRM in a particular country, identifying to what extend these goals are met. The discussion is underpinned with evidence from case studies of one or more watersheds where IWRM is implemented. The pragmatic approach flows naturally from the more general dialog occurring in international forums and documents, and among water engineers who are less concerned with identifying underlying social forces. Most of the case studies in this issue adopt the more pragmatic theory approach.

The second category of response focused on IWRM as a manifestation of adaptive water governance. The strongest examples are Argentina (Berardo, this issue) and Australia (Connell et al., this issue). Connell et al., argue that collective action problems among interdependent actors are the core reason for the gap between the ambitions and practice of IWRM. In order to bridge the gap IWRM has to reduce the transaction costs of cooperation, for example by increasing trust among stakeholders and providing high quality scientific and socially robust information (Lubell et al. 2002; Edelenbos and Klijn, 2007). Berardo et al. discuss IWRM as a problem of institutional design for making adaptive decisions over time, in particular ensuring adequate representation of affected stakeholders, decision-processes that are fair to stakeholders, and leadership for common goals.

Interestingly, the concept of "social learning" was only implicitly and briefly discussed throughout these papers, despite playing a significant role in the water governance literature especially in Europe (Pahl-Wostl, 2004, 2007, 2009; also Ison et al., 2007). In a series of articles on natural resources management, Claudia Pahl-Wostl and her colleagues have argued about the importance of social learning as a process of "distributed" cognition, where policy actors develop a collective understanding of the social and ecological drivers of water management problems and potential solutions. Social learning is hypothesized to increase the adaptive capacity of a governance regime to manage uncertainty over time. The social learning perspective is mentioned indirectly in case studies in this issue. The contribution of Berardo et al. comes closest to an explicit reference to it. They refer to the workshops and meetings taking place in Argentina, focused on IWRM. At the same time they conclude that the outcomes of these meetings are not consolidated in the world of politics and policy-making.

There are important advantages to moving beyond the pragmatic approach to analyzing the more fundamental social forces at play in IWRM, as highlighted by the collective action and social learning perspectives. The broader theoretical perspectives point directly at issues of governance and decision-making, using IWRM as a research setting, with the recognition that the theory goes beyond water governance to many other types of policy issues. Paying attention to these more fundamental social issues promises the development of applied policy recommendations that have a stronger basis in social and economic behavior, although communicating the more abstract theory to policy stakeholders is always a challenge. Application of the more general theoretical approaches also allows the research to connect with the broader community of social scientists, which can enhance the scientific impact of the research that is focused on water governance.

6. Conclusions

This special issue was started by convening an international scientific community and exploring and developing comparative research on IWRM. The variety of IWRM approaches in the world clearly indicates the further evolution of water governance from simple local approaches to more joint approaches and from simple top down approaches to more mutual adjustment.

Currently scholars and practitioners still apply varying definitions of IWRM. The label is at risk of becoming a normative "nirvana" (contribution by Marshall and Conwell; cf. Molle, 2008) or an "elastic" concept (contribution by Fritsch and Benson; cf. Wesselink, 2007). This is not good for creating effective policies and establishing a common-knowledge basis for research. Further agreement on the definitions of IWRM are needed in order to develop reliable qualitative and quantitative methods to measure and observe the phenomena. Systemic comparative studies are still missing (Medema et al., 2008).

Most contributions in this issue refer to Rio-Dublin Principles, Global Water Partnership and/or theories of adaptive governance. There is agreement that functional, societal, and institution integration are key concepts. Our preliminary conclusion is that the dominant technical approach to water management frustrates functional integration. Functional domains represent interests and values that are institutionalized in organizational structures, cultures and routines. This creates a large amount of inertia and favours the status quo. In order to achieve the integration between functions, mutual adaptation from different domains (water, infrastructure, spatial/regional planning, nature and ecological development, economic development, etc.) is needed. The case studies have examples of the emergence of more centralized institutions when functional integration is not being achieved by voluntary cooperation.

Regarding societal integration, participation is the core concept. Participation is influenced by structural, procedural and legal aspects and by social aspects like organization and management skills, awareness of participation possibilities with the local stakeholder groups and preparedness of these groups to invest time and energy in IWRM processes. These conditions are important for *meaningful* participation beyond symbolic

use. In practice we often see this symbolic use in which participation is used for achieving process-based goals, rather than substantively influencing policy making and decisions. A preliminary conclusion is that stakeholder participation is implemented sooner and smoother in countries with decentralized government structures.

Institutional integration, we found, is highly problematic. Most contributors argue that institutional integration is needed to respond to the multi-layered governmental organization of each country. Water systems are multi-scale and transcend jurisdictional borders. The crucial question how to realize institutional integration however still is unanswered. Some contributions stress that centralized, top-down steering and management has to be replaced in order to realize integration. Countries with decentralized structures and bottom up self-organized processes however do face the same problem of integration. The only passable road seems to be the difficult combination of centralization and decentralization at the same time (Australia, United States, Netherlands). Decentralized, collaborative approaches to IWRM are supplemented with the establishment of central institutions with authority to compel multi-level cooperation. More in-depth research is needed to understand the specific different country and local circumstances related to vertical integration.

Our comparative analysis shows that the three forms of integration are interrelated and cause trade-offs between the three. The case of Singapore shows the use of political authority to compel integration among different actors and sectors. This might imply that centralized countries may be better at achieving "rational planning" goals like functional integration. However, these regimes may be less successful at encouraging societal integration via stakeholder participation and integrating local knowledge. More cross-country and qualitative in-depth insight is needed in the complex relationships between the three forms of integration and should therefore be placed high on the research agenda. Research then should focus on analyzing centralization-decentralization configurations, and how these configurations influence the development and implementation of IWRM.

The contributions to this special issue deliver an interesting relation between the orientation on integration and the stage of economic development. Glancing through the contributions four basic stages of development can be distinguished: 1) local water needs; 2) hydraulic control; 3) water pollution; and 4) ecological function. IWRM generally attempts to move countries towards this final stage of water development, reconciling the broader ecological goals with the economic development goals.Based on the examples from the case studies of this special issue, we conjecture that levels of economic development and administrative (de)centralization seem to be important dimensions influencing integration. In section 4 of this article we build a preliminary framework that offers a type of thinking and theorizing about comparative research that is needed to establish in order to improve our understanding of integrative management approaches.

7. Prospect: Integrated Resource Management; a next step in an adaptive walk

IWRM still is a viable concept in practice and theory. However, it needs further adjustments in order to meet the actual challenges of combined development strategies

on a multilevel basis. In this next generation perspective water is considered as one of the primary interests and values, but not as the prime organizing principle for integrated management. Water is one of several crucial resources (side-by-side with ecological, economic and social resources). So, the emphasis on water in IWRM is not needed, and we may depart more from integrated resources management (without the explicit and exclusive reference to water). This expresses more truly the integration and holistic approach, which is centrally aimed in IWRM approaches.

We don't want to launch another concept that causes more confusion than clarification. We want to stress that IWRM needs more systematic and comparative approaches from both administrative (de)centralization and economic development point of view, as we argued in this paper based on the insight gained from the range of contributions from this special issue. IWRM is implemented in different stages of development. It is not the ultimate stage that has to be reached. It is much more an important step in an adaptive walk in search for a more intense synchronizing between local water needs, hydraulic control, water pollution and socioeconomic and ecological function. We see a potential 'happy marriage' between IWRM and approaches of adaptive governance that stress that the path to integration in water management is all but a straightforward one, but an adaptive one.

A perspective of an adaptive walk requires that we gain more understanding in specific decentralization-centralization configurations per case/country/region leading to (misfits in) functional, societal and institutional integration. We witnessed trade-offs between the three forms of integration; for instance, that decentralization facilitates participation and societal integration but at the same time frustrates functional integration. Three-fold integration (societal, functional and institutional integration) is not materialized in clear and neat governance structures and processes, but is helped by 'smart blends' and fuzzy and sometimes messy governance structures and processes encompassing decentralization as well as centralization rationalities. In most cases, some mixture of decentralized collaborative approaches combined with more central authority to shape behavior and action is needed. But exactly what the optimal mixture might be will depend heavily on the social-ecological context of IWRM, and must change over time in order to adapt to dynamic parameters. This plural view and approach has to incorporated in future studies. IWRM research needs to be fine-tuned in this direction of really trying to understanding complex plural governance realities shaping IWRM in the future.

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