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Integrated Water Resources Management: Governance, Best Practice, and Research Challenges

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This collection of invited papers published in this issue of the *Journal of Contemporary Water Research and Education* examines the theme of governance in integrated water resources management (IWRM). Governance is a suite of procedures that use decision-making processes at different levels and among different sectors, stakeholders, and jurisdictions to enact, in this case, water resources management. Much has been said about governance in the water sector, with one foundational explanation provided by the Global Water Partnership (undated):

- Governments to establish water policies, laws and regulatory frameworks, devolve decision-making, and encourage better service delivery by autonomous public sector agencies and private sector operators.
- Governments to set policies and establish institutional structures for managing river basins and aquifers and processes to overcome conflict over water allocation.
- Governments to facilitate the realignment of economic and financial practices, including full cost pricing for water services—with appropriate mechanisms to protect the poor.
- Governments, with the help of international partners, to establish mechanisms for strengthening river basin management and establishing transboundary water agreements allowing for equitable utilization of shared waters.

This functionality emphasizes the role of the public sector and sees governance comprising the core elements of water policy, water laws, water pricing mechanisms, river basin organizations and international and intra-national (cross-jurisdiction, cross-boundary) agreements. These elements do not exist in an institutional vacuum, rather they relate to the broader democratic functions of government and civil society. Indeed, good governance occurs when societies establish democratic freedoms (free elections), robust economies, low unemployment, state-of-the-art technological development, financial and resource security, human rights, and lack of civil unrest. Poverty, insurgence and national security work against good governance and the way to implement IWRM in struggling economies will require the simultaneous elimination of civil unrest and poverty. These form the precursor to effective water governance. This expansive governance mandate, more than one focusing solely on the water sector, suggests a number of elements are required: transparency, accountability, anti-corruption, citizen participation, and a working judiciary.

Issue Outline

The papers are grouped into two themes: concepts and practices. The first theme comprises four papers that discuss the conceptual complexity of IWRM and its expression in emerging water policies. In a refreshing exploratory discussion, Cardwell et al. present an innovative framework, using the axes of time, space, institutions, and objectives, for examining the nature and degree of management integration relevant to water resources management, comparing this with both U.S. and international IWRM conceptualizations. They maintain the need for spatial, objective (goals),

institutional, and temporal integration. Mostert uses the experience of the Netherlands Third National Water Policy to explore the dimensions of IWRM, and how this has now been eclipsed by the EU Water Framework Directive that requires preparation of river basin management plans to reach a "good water status" of all EU basin waters by 2015. Ashton et al., working from South African experiences, explore the complex multi-dimensionality of water governance, calling for an approach that adheres to guiding ethics and values to incorporate the attitudes, values, and practices of society while also giving meaning to society's aspirations and objectives. Finally in this first theme, Dovers and Hussey outline new conceptualizations derived from Australian and European Union experiences. They discuss the new Australian water policy directions made explicit in Australia's (2004-2014) National Water Initiative which is a multi-component national-level policy framework.

The second theme of the issue is a larger group of papers that also provide a purposive sample of experiences in IWRM. Like the first theme, these experiences were selected based on the substantial degree of implementation that has occurred in the representative countries. By and large these experiences reflect increasing maturing of the water sector in each country. Mitchell's paper provides lessons learned from Canadian experience in IWRM implementation: the importance of a vision, the need for a tighter focus of an integrated interpretation, the importance of spatial scale (basin, sub-catchment, tributary, environmental site) and the role of partnerships. Genskow and Born examine the highly dynamic organizational character and functioning in time and space of IWRM, using U.S. watershed management examples. They call for a more expansive view of the organizational space in which integrated initiatives take place, one which requires understanding the contextual dynamics of the watershed management context. This is poorly understood and the authors call for further research in this arena.

Green and Fernández suggest that framing IWRM frequently occurs, meaning different processes in specific circumstances create an IWRM approach that is unique to its situation, such as conflict resolution, consensus building, future search, social learning, and learning alliances. As a result, they maintain that the success of evaluating IWRM must "focus upon process rather than outcomes, and the key process characteristic is change: the nature and extent of the changes, particularly in the understandings of each stakeholder of each other."

Ballweber compares U.S. and South African IWRM approaches. While the U.S. has emphasized a bottom-up approach through watershed initiatives, and no national consensus, South Africa's approach has been from a national framework coupled to local initiatives. From this review, he maintains that the process of IWRM is more important than the product, as both bottom-up and top-down approaches are fraught with danger. So it is not necessarily the framework rather than the procedural activities that enhance IWRM. One critical issue is to "market IWRM by having a successful IWRM institution that has measurably improved the local quality of life or brought in new economic development opportunities." Thus he recommends that IWRM actions be "boot strapped" onto water resources development projects.

Barreira's paper outlines the Water Framework Directive of the European Union. This includes the development and implementation of river basin management plans and of programs of measures as implementation tools. Her outline demonstrates the innovation of European work based on an IWRM approach. Davis and Threlfall outline the national implementation of IWRM in New Zealand, one largely controlled through national and regional policy statements, broadly similar to a "national framework" approach used in other countries. They show how this approach is worked out uniquely in New Zealand through regional councils that develop single (water) and multiple issue (water, air, land) plans. They claim that results have varied, due to lack of guidance through national water policy statements.

Van Steenbergen and Lamoree's paper is quite different to those already discussed. They focus on who finances IWRM. They challenge the notion of water as an economic good (use of markets and cost-recovery mechanisms) and call for a broader financial strategy for IWRM. They maintain that water has many aspects, functions and values, each of them important to a different set of legitimate

stakeholders, using case studies from around the world to illustrate their argument. They call for a "values and finances" framework. This will involve new efforts to quantify a broader set of values, extending the emerging research and practice in this field.

Bourget's paper reports the results of a national survey of training needs in IWRM in the USA, and progress in the development of the U.S. Army Corps of Engineers Advanced Degree Program in IWRM. The paper reveals the variety of IWRM experiences in USA, one in which there is quite disparate interpretations of IWRM, very different expectations of what is required from IWRM training, and the positives, negatives and ambivalent results of IWRM education and practice. An interesting finding is the comment that activist rather than rigorous scientific understanding characterizes some water resources management graduates' thinking today; while there exists a significant tension between constructivist and positivist paradigms. The paper calls for more work nationally to develop IWRM curricula.

Finally, in the second theme of this issue, McKay outlines paradigmatic development of the Australian water sector and comments on the most recent work of the National Water Initiative in that country.

This focuses on national water planning and calls for greater cooperation between national and State governments to achieve this end. In this paper, she also reports the results of a survey of CEOs' responses to changes in paradigms in recent Australian water policy.

Commentary

The strength of this issue lies is its diversity of representative IWRM experiences from the U.S., the Netherlands, South Africa, Australia, New Zealand, United Kingdom and the European Union. The weakness of this selection is the limited representation of substantial work in governance and water resources management of developing countries (Walmsley and Hasnip 1997, Rogers and Hall 2003, Saleth and Dinar 2004, Shah, Makin et al. 2004). It is difficult to capture in one journal issue the fundamental differences in water governance which occur in developing economies (Table 1), but van Steenbergen and Lamoree's paper flags an approach that could be applied beyond the context of these economies.

Another strength of this issue is the repeated

Table 1. Differences between developing countries and developed countries basin realities.

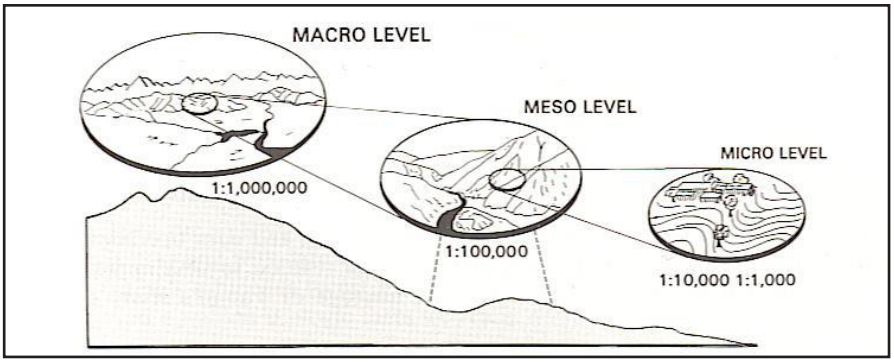
Developed Countries	Developing Countries
Temperate climates, humid, higher river-stream density	Rainfall low, climate extreme, higher mean temperatures, lower stream density, water scarcity an emerging constraint
Population concentrated in the valleys, downstream	Densely populated in both valleys and catchment areas; population high both upstream and downstream of dams
Water rights based on riparian doctrine and prior appropriation	Water rights based on rights to rainfall or ground water; people's notions of ownership relate more easily to rain than to large-scale public diversions
Focus on blue surface water: water found in rivers, and lakes	Focus on green water: water stored in the soil profile or blue water stored in aquifers
Most water users get water from service providers; most water provision is in the formal sector- making water resources governance feasible	Most water users get their water directly from rain and from private or community storage without any significant mediation from public agencies or organized service providers Because the bulk of water provision takes place in the informal sector, it is difficult to pass enforceable water legislation
Small numbers of large-scale stakeholders	Vast numbers of small-scale stakeholders
Low transaction costs for monitoring water use and collecting water charges	High transaction costs for monitoring water use and collecting water charges

Source: Modified from (Shah et al. 2004) and http://www.iwmi.cgiar.org/home/integrated_river_basin.htm, accessed November 2004; as reproduced in (Hooper 2005).

emphasis on context and scale, including the role of organizational coordination across scales. One way to enhance understanding of scale is to use a framework as provided in Figure 1. This clarifies jurisdictions but requires mechanisms to be identified to enhance cross-jurisdiction and inter- and intraregional coordination. Integrated river basin management (IRBM) was flagged in these papers as a key organization for IWRM action. IRBM is a subset of IWRM and can be seen as the implementation arm of IWRM in a national water planning context. Much has been learned over the last forty years regarding the importance of river basin approaches (White 1963, 1997) with recent calls in this journal to accelerate the use of current basin management technologies and institutions (Howe 2005). Much work has been done to identify "best practice" IRBM. For example, over twenty studies were reviewed by the author in 2006 and the results are summarized in twenty benchmarks (Table 2).

Critical IWRM Research Questions

UCOWR is a unique organization on the international and U.S. political and water sector landscape. It is ideally placed, with its multiple university teaching and research connections to advance IWRM nationally and provide a wealth



	MACRO LEVEL	MESO LEVEL	MICRO LEVEL
Natural System and Resources	Part of a geographical zone such such as a river basin or different ecological zones	Regional or local ecological resource system	Areas with relatively uniform ecological conditions
Mapping scale	>1:1,000,000	1:100,000 – 1:500,000	1:10,000 1:1,000
Mapping unit	Provinces	Land systems	Land units, land facets
	NATIONAL LEVEL	**REGIONAL LEVEL**	**LOCAL LEVEL AND INDIVIDUAL**
Level of decision-making	Highest political decision-making, international agreements	Province, State, District, Territory	Village cooperative, farm, factory, forest, individual
IRBM organization example	International commision	Inter state basin commission/authority/association	Local land and water management group
IRBM	International agreement	River basin management plan	Land and water management plan, storm water management plan

Figure 1. Scales, mapping, decision making, organizations and documents in integrated river basin management. Adapted from (Newson 1992). Source: (Hooper 2005) p. 120.

Table 2. Twenty benchmarks of mature, auto-adaptive river basin organizations implementing effective integrated river basin management.

Decision-making	
1.	Decision-making by the river basin organization occurs within a national framework of natural resources management objectives and investments
2.	Decision-making is consensual and coordinates across sectors in the basin
3.	Decision-making is reflected in the river basin organization's business plan, is prioritized, focuses on ef ficiency, links vertically to governments and provides stakeholder access to government
Goals, Goal Shift, and Goal Completion	
4.	An IWRM approach is agreed to and practiced by the river basin organization
5.	Objectives are specified in and articulated through feasible options in a river basin management plan
Financing	
6.	River basin management is financed through cost-sharing
7.	Financing is on-going, guaranteed, adequate, linked to national and state priorities
8.	Ex-ante and ex-post economic assessments of management options are practiced
9.	Water pricing and alternative demand management are practiced
River Basin Commission Functions	
10.	Stable democratic conventions exist to provide stability to the institutional setting
11.	The river basin organization's functions are co-ordination driven and realistic
Law	
12.	Ongoing laws exist to enact natural resources management relevant to basin management
13.	The roles and responsibilities of the river basin organization are clearly specified in both national water policy and law
Staff Training	
14.	The river basin organization has a program in place to improve staff quality for management skills, leadership and communication
Information and Monitoring	
15.	The river basin organization has its own, or joint access to, a well developed, accurate, up-to-date, information and monitoring system
16.	Science informs the river basin organization through modelling and spatial representation of options, which are costed and linked to the river basin organization's decision system: options which are delivered through strategic planning and decision-making processes
17.	The information management system reports on how the basin is being managed and resources are consumed and protected
Coordinated Management With Stakeholders	
18.	Public involvement processes are effective, providing for joint decision-making and conflict resolution
19.	The roles and responsibilities of stakeholders are specified and understood
20.	The river basin organization uses joint ventures and coordinates strategic decisions between partners

Source: (Hooper 2006).

of U.S. and international experience to the global water sector. This is the purpose of this issue. A further option is to advance a research agenda which addresses critical dimensions of IWRM and IRBM. Through international collaborative symposia and programs, aid programs, and research projects, a number of critical research questions can be addressed. The following are provided to stimulate discussion about the future of IWRM both in the U.S. and internationally:

1. Which implementation factors of IWRM make the difference? How can the implementation

of these factors be accelerated?

2. There is a fundamental difference between developed versus developing countries' experiences in IWRM. Should there be a generic template of "best practice" IWRM?
3. To what scale is IWRM best devolved? Is the New Zealand regional council or the Canadian conservation authority model the best?
4. Are evidence-based solutions rather than experts' opinions of what is good IWRM the best? How can we tell what works best? What indicators should we use?
5. Foundational water institutions (formal water governance structures in a nation) appear to drive good governance from the top down. What are the basic organizational and functional requirements of water policy, water law, water pricing, and funding national water initiatives?
6. Do we have enough knowledge to already adaptively manage? How much further governance research is required?
7. How can we separate IWRM practice in a river basin from overall change in environmental conditions from that caused by regional economic development? Knowing the forces that affect landscape change, how we can tell that IWRM has made a difference?
8. Who pays for IWRM? Should there always be a private sector partner when the common resource (water) is publicly owned in most countries?
9. Knowing toolboxes for IWRM (such as those prepared by the Global Water Partnership), how is IWRM best taught for a coming generation of water resources managers? Workshops, masters-level programs, in-service training, or combinations of these?
10. What is the appropriate time frame for integrated adaptive management? Can we see results in generational time frames?
11. How do the contextual dynamics of integrated watershed management and the broader approach, IWRM, influence outcomes?
12. How does the need for national water security (including terrorist risk and risks imposed by extreme events such as droughts and floods) interact with national water plans that use an integrated adaptive approach?

In conclusion, this issue has provided new insights into the widespread experience of IWRM. I hope that readers' involvement in IWRM research and program implementation can progress by reading it.

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Australia's water aid program. He provided policies to improve the adoption of salinity management and catchment management information exchange in the Murray-Darling Basin, also in the 1990's. He has developed the core dimensions of integrated water resources management and integrated river basin management through his career, now published in Integrated River Basin Governance. Learning from International Experiences (IWA Publishing, London, 2005). Contact: bph@dhigroup.com

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