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Integrated Water Resources Management and River Basin Governance

Bruce P. Hooper

Southern Illinois University Carbondale

This paper briefly discusses early geographical perspectives on water resources management and notes that the current focus on integration was initially identified decades ago. Several dimensions of integrated water resources management are discussed, including a recent statement on the need for improved governance. Finally, various fundamentals are provided for river basin organizations charged with implementing IWRM, and suggestions are made for future geographical research on river basin governance.

Natural Resources Management and Geography

Natural resources management is the manipulation of resource-producing natural systems to optimize their long-term productivity for both human use and biological production. It is most effective in the context of sustainable land use, and it must be undertaken within an ecosystem framework if it is to achieve ecologically sustainable development (Burton, J., 1984). "Wise" land use means the use of natural resources to avoid degradation (i.e. using land within the constraints imposed by the inherent biophysical characteristics of the land itself). Resource management is also a decision-making process. It involves allocating resources according to the needs, aspirations, and desires of people within the framework of society's technological inventiveness; political and social institutions; and legal and administrative arrangements (O'Riordan, 1971). This process is a conscious procedure, involving judgment, preference, and commitment, whereby desired outputs are sought from a limited set of perceived resource combinations through various managerial, technical, and administrative alternatives.

Water resource management is best conceptualized as a "land-resource-environment" interaction system (Burton, J., 1984). The nature of resource management is determined by how people use land and water resources to gain utility. The management of this interactive phenomenon is the concern of natural resources management and geography. Because geographers focus on people-environment relationships as well as natural hazards (floods, droughts, weather extremes), they have provided new approaches to the practice of water resources management. Since the middle of the 20th century, the scholarly leadership in geography has come from scholars who have focused on natural resources management and natural hazards. Led by Gilbert White, Robert Kates, and Ian Burton, geographers have identified natural resources management as a method both for assessing resource potential and planning resource use (Burton, 1961; Burton and Kates, 1964; Burton, Kates and White, 1968, 1978, 1993; Kates, 1962, 1971; White, 1961, 1963, 1964, 1970, 1974, 1997). Because natural resources management also focuses on people-environment interactions, it shares a concern with this geographical tradition. However, it does not necessarily focus on the spatial dimensions which geographers pursue.

Much work in resource management by geographers emerged with the behavioral revolution in that discipline in the 1960s. For example, White (1963) maintained that the study of resources was

fundamental to the geographic tradition. In the context of resource use, he stated that:

> . . . what does seem important is to recognize the intellectual problems which call for solution and which because of their relation to spatial distributions and human adjustment to differences in the physical environment are of interest to geographers. (426)

White (1961) probed the meaning of choice of use in resource management. He developed a framework for describing resource decisions from research in floodplain occupance, water use, and recreational land use. He also suggested that resource managers evaluate some or all of the quantity and quality of the resource; the present values of the gains and losses accruing from future use of the resource; the technological change which might affect future demand, production and compatible uses; and the relation of the resource to other resource uses in contiguous or functionally linked areas before making a choice about a specified resource. White (1961) emphasized that:

> . . . perception of environments is a basic feature of resource management and may drastically limit the practical range of choice. From this starting point through appraisal of possible uses, income streams, technological trends, and regional impacts, the comparison of the manager's appraisal with that of others helps to identify distinctive and crucial aspects of decision making. (29)

He showed how decisions are made from within the practical range of choices set by culture and institutions and not from a theoretical range of choice such as is set by the physical environment. Other geographers, for example Golledge et al. (1972), noted that the behavioral approach developed two significant streams of thought in the 1960s. The first emphasised "man-land" environment relations expressed through human perceptions of environment. The second was more targeted, focusing on the goals, aspirations, and motivations of decision-makers. Wolpert (1964) examined the decision process in a spatial context. He suggested that decisions were made under suboptimal conditions of imperfect knowledge and not by simply following an optimizing procedure. This approach was stimulated by the concept of satisfying rather than optimizing decision-making behavior (Simon, 1957). Wolpert and Simon's work marks a watershed in decision-making research. Their questioning of the accepted dominant view of the time (i.e. that decision-making was concerned with "Economic Man" making "rational" decisions based on perfect knowledge) led to a significant reformation of conceptual frameworks for decision-making in resources management. The emphasis was now placed on a broader range of variables.

While natural resources management may be an ally of geography, it has evolved as a divergent field of enquiry, drawing techniques from many fields. Johnston (1983) explored the links between natural resources management, resource analysis, as well as human and physical geography, but he commented that these links were yet to be proven. Geography has drawn from other fields of enquiry (e.g. hydrology, water resources engineering, and economics) and has provided a spatial perspective on the management of natural resources. Initially, much of the collaborative effort was focused on the assessment of water resources potential for river basin development. These efforts included the estimation of physical potential, determination of technical and economic feasibility, and evaluation of social desirability (Chorley and Kates, 1969).

Changing Approaches to Water Management

In recent years, there have been substantial changes in water management approaches as a result of the emergence of new paradigms. Traditional approaches were essentially hydro-centric or single-sector (water) oriented. Consequently, the river basin or groundwater province was viewed as a complex physical system based on complex interrelationships between the hydrological and geomorphologic characteristics of the basin and its rivers and streams. Common in the 1930s to 1960s and favoured by water engineers and water economists, this approach viewed the basin as a resource system whose waters were to be exploited for economic development. This approach emphasised the determination of maximum possible yield and the development of mechanisms for the most effective water allocation between users. It also served as the impetus for significant water resources development projects, such as the Hoover Dam—an icon of an era dedicated to dam building and irrigation expansion. Highly scientific

methods and technological innovation were the driving forces behind this single-sector approach, which sought to maximize available yield from river basins and watersheds. As evidenced in the work of the Tennessee Valley Authority and the U.S. Army Corps of Engineers in the US, the Nagarjuna Sagar Dam project in India, and the Snowy Mountains Scheme in Australia, more complex approaches promoted multi-objective development of water resources systems, including recreation, hydropower, navigation, and irrigation development.

The ecological and ecosystems approaches to water resources management, which were a product of the environmental movement of the 1970s, questioned the single (and multi-) objective approach and its strong development emphasis. The reality was that the traditional paradigm ignored the more diverse range of resource use features of river basins that interact to create the so-called "wicked" problems of environmental management and sustainable water resources management. The new paradigm recognized river basins as large, complex, integrated ecological systems.

The term "ecosystem approach" served as a corollary for the integrated approach. Using this critical lens, the watershed was seen as an integrated ecological system in which human impacts were but one component of the functioning of ecosystems. The geographer, Mitchell (1991), recognised that the challenge of this integrated approach was its interpretation. He maintained that its advocates had for too long interpreted the ecosystem approach as synonymous with a *comprehensive approach*, in which attention is given to all components and linkages in a system. When a comprehensive approach is taken, there is a high probability that the period of time required to complete an analysis will be very long, thus resulting in a final plan that is no more than an obsolete historical document.

Mitchell's interpretation of an *integrated approach* involves a more selective or focused perspective. Rather than focusing on all the components and connections in a system, it considers only those components that—on the basis of knowledge from all stakeholders (acquired through focus groups or other forums involving people, ranging from technical analysts to long-term residents)—are judged to be the key drivers of variability in the system (Hooper et al., 1999). Both a comprehensive and an integrated interpretation are consistent with an ecosystem approach, but the latter is more likely to produce a practical output.

Integrated water resources management (IWRM) has been proposed and is now practiced as the new method of water management. It is an approach to land and water resources planning and management that encourages participants to consider a wide array of social and environmental interconnections. It extends beyond traditional, multi-purpose natural resources management to address societal goals and ecosystem functioning. The term IWRM implies the inclusion of a full array of physical, biological, and socioeconomic variables involved in managing a region for environmental values and human use. Many agency natural resource managers and academics have supported planning and managing water and related land resources on a watershed (catchment, river basin) basis and the approach is now being widely adopted (Anonymous, 1997; Ballweber, undated; Batchelor, 1999; Bellamy et al., 1999; Born and Margerum, 1993; Born and Sonzogni, 1995; Burton, J, 1986, 1988; CGIAR Challenge Program on Water and Food, 2003; Downs et al., 1991; Environmental Protection Agency, 1993; Gonzales and Arias, 2001; Heathcote, 1998; Hooper and Margerum, 2000; Jonch-Clausen and Fugl, 2001; Margerum and Born, 2000; Mitchell and Hollick, 1993; OECD, 1989; Rogers; 1993; White, 1997).

IWRM extols the use of integrated, cross-sectoral, and coordinated approaches to water resources management across time and space as well as the river basin scale. IWRM uses co-management but is fraught with the classic problems of commonly managed resources: differing interpretations of property rights, conflicts over use, spatial and temporal variations in access to water, susceptibility to hazards of water surpluses or deficits, lack of ongoing financing when other spending (military, health, education) consumes public service delivery budgets, and others. Despite these problems, IWRM provides mechanisms for meeting top-down with bottom-up management. In any geographical setting, "entry points" for success in IWRM need to be crafted, primarily through either improved human and organizational capacity; dedicated and sustained funding that employs cost-sharing; water visioning, not just ownership of the "commons" problem but also covenants of mutual responsibility and self responsibility; or building

leadership skills. What works in one location may not work elsewhere.

In practice, IWRM must bring together a diverse array of people who have a "stake" in a system if it is to collaboratively manage the activities and impacts. These stakeholders include government entities, community groups, business and industry organizations, and others with a particular concern or interest in water resources management. IWRM must also involve "the public" who also have an interest, albeit less well defined. This participatory approach produces strategies that are more coordinated, more cognisant of interconnections, and more inclusive of the diversity of goals. Furthermore, it increases support and commitment as well as the likelihood of implementation.

The conceptual development of IWRM was extended recently by the Global Water Partnership (Global Water Partnership, 2000; Jonch-Clausen and Fugl, 2001). Moreover, international endorsement of the concept has now been seen at the highest levels, including the 2003 Summit on Sustainable Development in Johannesburg, South Africa as well as the Second (2000) and Third (2003) World Water Forums in Kyoto, Japan. At the latter, "IWRM and the Basin Management Theme" was issued. This statement recognized, *inter alia*, that:

> . . . the key issue confronting most countries today is that of effective *governance*, improved *capacity,* and adequate *financing* to address the increasing challenge of satisfying human and environmental requirements for water. We face a *governance crisis*, rather than a water crisis. Water governance is about putting IWRM with river and lake basin management and public participation as critically important elements, into practice [their italics].

This statement also calls for action, in "new policies, strategies and laws for water resources development and management . . . in a large number of countries, using the principles of IWRM. Such plans have often led to restructuring of the institutional framework as a result, including river and lake basin organizations as the basic institutional entities for implementing IWRM" (World Water Council, 2003. p.2).

IWRM and River Basin Management

The nature of hydrological linkages suggests that a river basin forms a natural unit of management for river conservation or other purposes, especially in sub-humid, temperate, tropical, and equatorial hydrological regimes. Rivers are significant areas within watersheds. They are intimately linked to the land systems that surround them. They act as hydrological conduits, receiving excess water from precipitation, infiltration, and groundwater movement and transfering water across the landscape to watershed outlets, such as rivers, lakes, estuaries, and oceans. Thus, the ecological health of a river system reflects the ecological health of the land systems in the river basin and indicates the impact of upstream land management practices on ecological processes.

A recent statement on river basin governance captures the importance of rivers and river basin management. The expert group statement on Integrated River Basin Management for the Second World Water Forum and Ministerial Conference in the Hague, 2000, maintained that sustainable river basin management required proper study, understanding, and effective management within the context of social, economic and environmental resources. This study should recognise that water management at the basin scale must be understood systemically—recognising conjunctive uses, aquatic ecosystem needs and upstream-downstream relationships (RBA Centre, 1999). In view of regional differences, a blueprint for river basin management was not given in this report, but they provided recommendations and guidelines for sustainable river basin management, focusing on:

1. *Basin-wide planning*: Basin-wide planning should balance all user needs for water resources, in the present and the long-term, and it should incorporate spatial developments. Vital human and ecosystem needs have to be given special attention.
2. *Participation in decision-making*: Local empowerment as well as public and stakeholder participation in decision-making will strengthen river basin management.
3. *Demand management*: Demand management has to be part of sustainable water management. Managing the demand for water is more likely to achieve sustainable use than is continual expansion of water supplies .
4. *Compliance*: Compliance monitoring and assessment of commitments under river basin

agreements and arrangements need to be developed.
5. *Human and financial capacities*: Long-term development of sufficient human and financial capacity is a necessity.

The Issue of Distributive Governance in IWRM Basin-Level Implementation

At the basin level, there are concerns that IWRM is fraught with difficulties and implementation is difficult. Many significant implementation difficulties have been observed, primarily relating to political will, the lack of workable methods of distributive governance, the role of law, and stakeholder participation. For example, in an Australian setting, studies by AACM and Centre for Water Policy Research (1995) and Bellamy et al. (1999) of the evaluation of integrated resources management/ catchment management have shown that implementation difficulties focus on institutional and process issues, including (in no rank order):

- Problems related to the lack of co-ordination;
- The need to help community river basin management organizations mature;
- Confusion between bottom-up consultation and community participation, and top-down policy and government investment;
- The lack of integration of economic development with ecological management;
- Institutional barriers to effective integration;
- The effectiveness of local institutions;
- Lack of environmental and natural resources management policy and planning at the regional scale;
- The need for a river basin advocate who can transcend local interests and overcome government inertia and champion the need for a regional approach to integrated resource and environmental management;
- Ignorance of the range of institutional arrangements that facilitate integrated management techniques;
- The lack of knowledge of the decision systems in the river basin;
- The need to refine methods to incorporate differing values and expectations about resource use in a river basin management;
- Failure to use economic analysis to assess the benefits and costs of river basin management actions;
- Ignorance about what drives regional economies;
- The lack of use of social impact assessment to determine net social gains from implementing river basin management plans;
- The lack of ongoing financial and infrastructure support by government to community-based river basin management committees; and
- Increasing evidence of burnout by volunteer river basin management participants.

Clearly, a new method of distributive governance is required for river basin management. Hall (2003) suggests more effective water governance involves changing institutions and redefining roles of different players in society. In the recent dialogue process prior to the Third World Water Forum, he pointed out that many participants emphasised the large differences between countries and that the debate on water governance should avoid promoting generic solutions.

It is, therefore, difficult to advocate unequivocally that river basin organizations will provide effective management of natural resources and implementation of IWRM. This fact is due, in part, to the current complex, dynamic institutional environment of the water sector. However, consultants at the "coal face" of water management such as Millington (who advised the World Commission on Dams) and Radosevich and Olson, in presentations to the World Bank's 1999 Third Workshop on River Basin Institution Development, suggested that basin organizations provide useful opportunities for improved water management (Millington, 1999). To do this, they state that "good" basin organizations are those which:

1. operate in a *stable institutional framework* that overcomes fragmentation and overlap of responsibilities, and are supported by strong and comprehensive, but flexible legislation, regulations, decrees etc. This requirement ensures "fairness" in basin-wide decisions and a process of accountability;
2. use a *strong knowledge base* that derives from a good, uniform, and comprehensive data network, systems and models for analysis, and that allows "knowledgeable" natural resources/water management policies and strategies to be developed and implemented;

3. *integrate action* across all natural resource issues, which means agencies do not find singular solutions but look at impacts and improvements across the spectrum of natural resources as well as the development of regional (basin scale) natural resources management policies.
4. use *strong community awareness and participation processes*—to enhance greater farmer involvement in basin scale plans of action;
5. have a *strong foundation and mandate in legislation* that clearly identifies its function, structure, financial base and whose administration and operation is based upon a decision-making process of authority, responsibility and accountability; and
6. *are conceived in the reality of existing conditions*, where there are vested interests, attitudes and economic bases. Where reforms of the magnitude of river basin management are introduced or expanded, there is resistance to change and concern over infringement on administrative level and agency "turf," so a strategic planning and implementation process based on communications, coordination, and cooperation within a river basin organisation is developed.

Fundamentals for Improved Distributive Governance in River Basins

At the international and sub-national scales, river basin organizations have been promoted as organizations to implement IWRM (GWP, 2000). As noted above, far greater effort is required to strengthen the capacity of these organizations. The approach used will vary from place to place according to the context. There is no one set method, but several fundamentals are suggested for improved river basin governance:

1. *Water resources management design*—use accurate scientific data to assess resource condition and trend; use economic analysis and social impact assessment of river basin management plans; and apply accurate modelling of options to guide management.
2. *Stakeholder engagement processes*—use contractual arrangements for participation of decision-makers, rather than ad-hoc, voluntary arrangements; use powerful information exchange mechanisms to link multiple, distant players; invest in face-to-face contacts and community advisory processes.
3. *Institutional arrangements*—use a range of methods including cost-sharing programs, tradable discharge permits, local government planning powers, voluntary actions, regulatory practices (pollution laws, zoning laws, best practice standards) and more. The Global Water Partnership's IWRM Toolbox provides water professionals with a useful range of available instruments (www.gwpforum.org).
4. *Organizational structures*—should have a skills-based membership, be democratic (i.e. elected by the regional community); be accountable (e.g. a separate CEO reports to an independent Board of Directors); be linked to high levels of government.
5. *Basin advocacy*—should characterize the river basin organization (who else represents the basin?) coupled with a strong advocacy leadership style of the CEO.
6. *Accountability*—is required to monitor the implementation of actions, including compliance with current environmental guidelines and legislation. This could be reported through State of the Environment (Basin) type audits.

The application of IWRM by river basin organisations will vary according to the hydrological, socio-political, and economic conditions affecting each application. What works in one place may not work elsewhere. The key to success is learning by doing, and an adaptive management approach (as recommended for large rivers by Prato, 2003) provides the necessary institutional and organisational opportunities for learning. River basin scale approaches continue to provide the "big picture" of natural resources management, a practical perspective on land and water management in an age of local initiatives, funded frequently by national programs. The challenge remains for entities to evolve in the early twenty-first century to capture this big picture approach and develop comprehensive integrated approaches at the strategic, regional level, using effective public involvement techniques and designing and implementing workable cost-sharing mechanisms. Many countries lack the legal and water policy infrastructure to do this and much work

remains to be done in establishing water governance structures and mechanisms appropriate to their own regional settings.

Future Research

In many respects, this paper raises more questions than it answers. Perhaps the most important of these, at least in this author's mind, are the following yet unanswered research questions:

- What are the performance indicators that can be used to measure distributive governance at the regional, river basin scale? Can they be used by past, current and emerging river basin organisations, with different agendas (economic development, conservation)?
- How can state of the environment reporting be used more effectively by river basin organisations? Can it be used as a tool to demonstrate improved social and natural environmental conditions that result from both new landscapes created by a changing world economy and the specific programs of river basin organisations? Can we really see cause and effect relationships when it comes to river basin programs?
- The mantra of local governance, espoused at the Rio sustainability summit and thereafter, has been used to accelerate local governments' role in resource and environmental management. The question remains, though, as to what are the most effective mechanisms to coordinate local government action at the river basin scale? This is an important question when regional governance and government is frowned upon by Western democracies, as they endorse state/provincial rights and administrative jurisdictions. Unfortunately, river basins do not coincide with state boundaries!

The answers to these questions will rely on reorienting research priorities in natural resources management to address this regional approach. If this occurs, and is driven simultaneously by stronger river basin advocacy, there will be opportunities to address these fundamental questions. One way in which this research could yield useful results is to use an action-oriented approach – engaging river basin organisations to help frame research questions and drive research programs. There is the opportunity for geographers to provide significant input into this process, utilizing the rich traditions of resource management geography outlined earlier in this paper. This will not only provide utilitarian outcomes but will inform public policy and create new paradigms of distributive governance in water.

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Author Information

Bruce Hooper is a water resources geographer based at Southern Illinois University Carbondale, where he researches and teaches integrated water resources management and river basin governance. In 2001-03, he led a team of Indian water professionals who developed a Water Vision for the State of Andhra Pradesh. In the 1990s, he developed policy approaches for improved adoption of salinity management and integrated floodplain management in Australia. He recently assisted the Global Water Partnership to build and disseminate a Toolbox for Integrated Water Resources Management. Hooper's work focuses on improving integrated catchment management and analyzing methods for effective river basin scale governance.Contact:Email: bhooper@siu.edu;Telephone: 1 618 453 6024 ; Mail address: Department of Geography. 4533 Faner Hall, Mailcode 4514. Carbondale IL 62901-4514. USA

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