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Integrated Water-Resources Governance in a River-Basin Context: A Synthesis Paper

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Introduction

As water use expands within river basins, the need for coordination among different uses and users grows. Effective institutions for water governance can help prevent and resolve conflicts, while promoting more efficient, equitable and sustainable use of water resources. The studies in this volume report on seven river basins in Asia, pointing out problems and opportunities for improving water governance in the face of current and future demands.

In order to better understand some of the problems and opportunities affecting management of river basins in Asia, the International Water Management Institute (IWMI) conducted research on "Developing Effective Water Management Institutions," supported by the Asian Development Bank through Regional Technical Assistance Grant 5812. The studies examined patterns of water use in selected river basins in six Asian countries. Findings by IWMI researchers and their colleagues highlighted the extent to which management is not yet well integrated, with information scarce and users often unaware of how others are using the same shared water resource. Study activities have helped bring together representatives of various users to begin discussing and formulating ways to address the challenges of integrated water resources management (IWRM) in specific river basins.

The International Food Policy Research Institute (IFPRI) has worked with colleagues in Vietnam and Indonesia to study economic, hydrological and institutional aspects of two basin water-resources systems, also supported by a Regional Technical Assistance grant from the Asian Development Bank (RETA 5866). Based on collection and analysis of information at several levels, simulation models integrated key relationships of water stocks and flows; institutional rules; and economic benefits and costs. The papers in this volume report on the preliminary use of these models to understand current conditions and to assess alternative scenarios concerning future water demand and supply, including the possible consequences of institutional changes in how water is allocated.

These two studies have carried out a series of joint workshops, to share questions, frameworks and findings (for the proceedings of the 2001 workshop, see Bruns et al. 2002). The papers in this volume come from the third workshop, held in Bangkok, Thailand in May 2002. This final paper provides an overview and synthesis of some key ideas concerning the papers and presentations in this volume.

The first section of this paper puts the country cases in the context of basins moving from open conditions of water abundance to closed conditions of limited and scarce supplies. Governance issues were the topic of this workshop, and the second section reviews institutional frameworks for basin governance, mostly in incipient stages in the basins covered in the two studies. As discussed in the third section, understanding the problems and potential for

integrated water management benefits from basic accounting information to depict quantities of water available and how they are being used. Changing water demands, policies and institutions have impacts on agriculture and other sectors, and as discussed in the fifth section, integrated hydro-economic modeling provides one way of assessing current conditions and exploring scenarios for changes that might occur in the future. Most basins in Asia are in relatively early stages of developing specialized institutions for basin management, making it useful to consider the challenges, limitations and opportunities involved in developing better institutions for governance of water resources in suitably integrated ways, as outlined in the sixth section. The final section of this paper summarizes some of the key challenges for integrated water resources governance in various basin contexts, findings from the various studies, and agendas for action.

From Open to Closed Basins

Changes in river-basin governance can be seen as a response to development, in a process shifting from open basins with abundant water resources to closed basins with scarce, fully utilized supplies. River-basin development can be broadly categorized into three phases, which have different conditions and needs in terms of IWRM, as shown in figure 1, p.225. During the *development phase*, construction to utilize water is the primary concern. During the *transitional phase*, development continues but better utilization of existing resources, for example, through improving irrigation schedules and reservoir operation rules, becomes a concern and there is a need to consider the interaction between uses in different sectors. During the *allocation phase*, utilization nears or exceeds available supplies, so there are increasing pressures to clarify how water is allocated, adjust for how usage affects water quality for other users and to transfer water among uses.

As seen in earlier chapters in this volume, the cases in IWMI's study on "Developing Effective Water Management Institutions" cover all three phases, from the East Rapti basin in Nepal where relatively little of the available water is used to the Fuyang basin in China where surface sources are heavily exploited and drawdown of groundwater poses a major challenge for management. The Pampanga basin in the Philippines is in the early stages of shifting from a focus on irrigation to greater consideration of how to integrate competing demands from various sectors. While water is still relatively abundant in the Ombilin subbasin in Indonesia, management issues have begun to appear. Construction of a hydropower installation that transfers water into another basin affected downstream farmers who had relied on waterwheels for irrigation. In Sri Lanka's Deduru Oya basin, seasonal scarcity is most pronounced in the middle areas of the basin but water usage is still predominantly agricultural. In the Dong Nai basin in Vietnam, although much water is still available and groundwater is not yet heavily used, there is a need to prevent saline intrusion during low flow periods and to coordinate planned growth in demand and supply. The Brantas basin in Indonesia faces greater demand, and there is a need to integrate power production and agricultural demands with industrial and urban use, particularly during the dry season.

Monsoonal climates create major seasonal differences in water abundance and scarcity, so that most of the basins discussed here shift back and forth from being open in the wet season to a closed condition in the dry season. Water accounting on an annual basis presents a summary picture of how available supplies are used, but seasonal conditions have an

important influence on institutional development. The need for management is often driven by seasonal scarcity, lasting for weeks or months during the dry season. Even water-abundant basins, such as East Rapti and Pampanga, face challenges to provide more effective institutional arrangements for coping with competition during periods of low flow, such as protecting supplies for the national park in East Rapti and ensuring urban water supplies from the Pampanga basin. Institutions developed to provide integrated management in early phases of basin development might play a major role in reducing problems and facilitating improved management during subsequent phases of basin development.

Governance Institutions for IWRM

Institutional analysis of basin management should help identify existing and future ways to respond to the challenges of IWRM, which is based on a number of key principles, representing a shift to a more holistic way of thinking about and managing water (GWP-TAC 2000; Calder 2000). Water management should look at all uses, not just those within a single sector, such as irrigation or urban water supply. Attention should be paid not just to water quantity but also to water quality. Environmental impacts and water needs for preserving in-stream flows, wetlands and other aquatic habitats should be taken into consideration. IWRM should deal with the entire basin, not just with a small locality considered in isolation. Management should deal not with surface water alone, but groundwater aquifers and the entire hydrological cycle, including how land use upstream influences runoff, evaporation and infiltration, with subsequent impacts on the timing and amount of water available further downstream.

The implication is that governance arrangements will need to appropriately involve the institutions and organizations that are concerned with all the relevant aspects of water management in a basin. An important conclusion and principle is that every basin is different, there is no single model for basin management that can be applied universally. While it is possible and worthwhile to learn from experience elsewhere, institutional arrangements need to be customized to the conditions of a particular basin.

The conceptual framework for the IWMI studies emphasized three institutional "pillars" of policies, laws and administration (Bandaragoda 2002). Formal and informal institutions constitute "rules of the game," including laws, regulations, organizations, procedures, accountability and incentive mechanisms as well as other norms, traditions, practices and customs. Water-management organizations are nested within a larger institutional environment that encompasses many water-using organizations within and beyond their particular basin.

Institutional analysis in the studies was built on information about socioeconomic, physical and performance indicators in each basin. For the studies, given current trends and likely future conditions, the adequacy and appropriateness of existing institutions were assessed and possible institutional changes identified. The IFPRI studies covered similar information, but emphasized the formulation of quantitative simulation models that could represent key linkages and examine possible changes in infrastructure, operation and institutions. Using the integrated economic-hydrological models, alternative scenarios could be used to explore the implications of changing water allocation in basins, for example increasing costs to users of obtaining water and facilitating transferability of water between uses.

The papers presented in this volume show how governance institutions for IWRM are weak or absent in most of the basins. Sectoral agencies have responsibilities for irrigation, water supply and other matters, but often have little idea of what other users are doing. Coordination among different users may not happen at all, or be done on an ad hoc basis in response to drought or other specific problems.

Rights to use water, and obligations concerning water quality, return flows and other impacts are not well defined. National laws and policies may provide some framework regarding authority and rights in water allocation, but often even those rules are often not worked out in much detail. Fora or platforms to bring together users within and between sectors are not well developed, and those that exist usually lack the capacity to move from discussion to establishment of binding commitments. Institutions to monitor and enforce rules about water use are generally not present, and those that are present often have little or no ability to actually implement whatever legal authority they may hold. As emphasized by the title of the workshop, the need in most basins is not just one of minor technical changes in operational rules, or strengthening implementation and enforcement, but of constituting new institutions through which water can be effectively governed.

This does not necessarily mean that a single, monolithic river-basin organization is the only or best way to manage the basin. As stated in the summary of the five-country studies:

The lessons from the case study of advanced river-basin management (Japan and Australia) suggests that formal "river-basin organizations" are not an essential feature of successfully managed water-scarce river basins. Other arrangements, including various kinds of committees and networks, can often work just as effectively. But there needs to be a clear legal framework, including clarity on water rights, and a regulatory framework to make such arrangements work (Samad 2003, this volume).

Water Accounting

Water accounting (Molden et al. 2001) provides an important tool to obtain an overview and summary of how much water is available and how it is being used. In the context of phases of basin development, it provides a quantitative picture of how available supplies are currently being used in different sectors. Water accounting results help decision makers involved in water governance to better understand the situations they face.

The IWMI studies show how water accounting can provide a useful framework for integrating information about usage in different sectors. It helps identify the extent of use by different stakeholders, who should be involved in efforts to improve the governance of water within a basin. Trying to systematically account for water helps ensure that issues such as return flows, environmental water allocations, interbasin transfers and groundwater withdrawals are brought into the picture, rather than starting from a narrow sectoral perspective on a single type of water use.

The studies also identified data gaps and needs. Information on water usage is often incomplete, and better data are an important priority for strengthening future management

efforts. Socioeconomic data are usually available in the context of administrative units, such as provinces and districts, making it a challenge to provide a good picture of conditions in a river basin. Water accounting on an annual basis provides a useful overview, but many of the challenges for management stem from shortages that are season- and location-specific.

Modeling

Changes in basin governance are intended to result in changes in how water is used. Integrated economic-hydrological models can provide a useful tool for assessing what might be the impact of such changes, comparing alternatives without requiring years of experimentation (Rosegrant et al. 2000; Rodgers 2002). Sets of equations provide a way to simulate the systematic relationships that structure the impact of changes in basin institutions. Chapters 9 and 10 in this volume report on efforts that integrate hydrological modeling of stocks and flows of water within basins with economic modeling of the benefits and costs of farming, hydropower, domestic water supply and other water uses.

Integrated models can help identify the likely impacts of changes, including trends in water use, storage construction, expansion in water services and changes in the costs paid by users to obtain water. In addition to examining the possible impacts of new construction and reallocation of water through administrative or market processes, such models can also look at how users might respond to increased charges for water, changes in the prices of food and agricultural inputs, and other policy changes that may affect water-resources management. As basins close, and developing new supplies becomes more and more expensive, institutional changes need to play an increasingly important role in IWRM. Integrated modeling provides a useful tool for understanding what might be accomplished through institutional changes intended to increase the benefits of water use.

As in most other basins discussed in the workshop, the Dong Nai and Brantas basins still have an overall surplus of water, but are increasingly affected by seasonal shortages. In the short term the Dong Nai faces few constraints beyond continuing to prevent saline intrusion during the periods of lowest flow. However, the models offer a way to project the basin-level impact of planned and proposed projects to increase storage and expand water supply for irrigation, industry and other uses. They can thus integrate the impact of multiple changes in different parts of the basin, together with possible changes in food policies, water charges and other factors. Integrated hydro-economic models can be further developed, for example to examine in more detail the interactions between surface water and groundwater.

IWRM in Basin Contexts

Integrated governance of water resources requires institutions that link users in different sectors, such as farming, industry and urban water supply, who have often known little about who else was sharing the use of the same water resource. Problems of water shortage, flooding and pollution often cannot be solved within a small locality, but require institutions that cover

an entire basin or subbasin, from upstream catchments to the downstream delta. Fisheries and aquatic habitats cannot be sustained unless adequate flows and water quality can be assured.

Existing organizations and institutional arrangements often lack the scope, authority, legitimacy and other characteristics needed to be effective in governing how water will be used. Finding solutions is often not just a matter of adjusting specific operational rules or strengthening their implementation and enforcement, but requires changes in governance. There is a need to convene stakeholders and constitute new institutional arrangements, whether by modifying existing institutions or establishing new ones. This makes it important to look broadly and in an integrated way at the governance of water in river basins, at the set of institutions that determine who obtains water, how disputes are resolved and otherwise assist diverse and dispersed water users to coordinate their actions.

IWRM embodies current thinking about the importance of understanding the interaction between water use in different sectors, including the environment. Basins are seen as the natural and relevant units for management efforts. The principle of having better institutions to manage basin water resources is generally accepted. However, ideas are often less clear and more diverse about how to put such principles into practice. River-basin organizations are discussed, but pose questions, including implications for those organizations already involved in activities related to basin water-resources management, the division of responsibilities for policy guidance, planning, regulation and more routine operational tasks, and the roles of stakeholders in decision making (see for example Hofwegen 2001 and other papers in Abernethy 2001). Since groundwater is less visible, and harder to monitor and understand, management of groundwater basins poses even greater challenges.

The studies included in this volume show the feasibility of convening stakeholders to identify and discuss problems in basin management. Consensus was formed about the need, in principle, for IWRM. Immediate agendas usually concerned the need for better information, for education to improve awareness and understanding of basin-management conditions and opportunities, and for further discussion. However, major challenges appear to exist in terms of getting powerful players to "buy in" to a process of joint decisions and compliance with basin and national policies. Resources are limited and changes that seem advisable and necessary may lack political support and funding, unless or until reforms are precipitated by a crisis.

Nevertheless, the agendas formulated during the studies include not just improving information and institutions but also more specific topics, particularly concerning the planning of future construction, and clarifying the allocation of water to different users. The studies have helped analyze and highlight specific management problems that institutions for basin governance will need to be able to manage. Thus future institutional development can be customized to the particular context of the individual basin.

Adapting changes in governance and management to the conditions in each basin could help avoid some of the pitfalls facing attempts to import basin-management concepts in an oversimplified manner (Shah et al. 2001). Rather than replicating models evolved for very different conditions, development can be made more appropriate through better prioritization of what kind of institutional changes are needed, focusing institutional strengthening on specific capacities that will yield useful benefits, and respect for the linkages between land and water use in rain-fed areas upstream with irrigators and others taking water from rivers downstream.

There is also the danger that IWRM might repeat the fate of earlier integrated rural development projects, where good intentions and potential synergies were overwhelmed by the complexities of coordinating diverse activities and agencies dealing with multiple problems requiring very different sorts of capabilities. IWRM may risk similar disappointments, unless institutional development is efficient, well sequenced, and yields some clear benefits quickly. By focusing on priority problems and involving key stakeholders there could be a better opportunity to develop basin-governance institutions that are effectively adapted to local conditions and priorities.

Developing Effective Institutions for Integrated River-Basin Governance

The papers presented at the workshop depict current conditions and management challenges in a range of basins, from water abundance in Nepal to severe shortages in China. In the basins studied, institutions for basin governance are at best in the incipient stages of development. However, the potential has been demonstrated to convene stakeholders, discuss problems and formulate agendas for improving basin governance and IWRM.

An interdisciplinary range of information is needed to illuminate hydrological, socio-economic and other factors influencing management. Water accounting provides an overview of how much water is available and how it is being used. Integrated hydro-economic optimization models provide a tool for depicting relationships and assessing possible scenarios for future development, including alternative policy options for improving the integration and effectiveness of basin water-resources management.

The studies have helped clarify priorities for further study and action to provide IWRM adapted to the contexts of specific basins. Many water users and water-management organizations lack awareness and understanding of who else is using water and how they are affected by other water use, so education is an early priority. Much additional discussion may be needed to generate consensus on how best to improve basin governance, and on the urgency and potential benefits of institutional changes. In developing institutions for basin governance it will be important to ensure that they have adequate scope, for example to deal with such problems as ensuring water for environmental needs, protecting water quality, and controlling sand mining in rivers. Mechanisms are needed to create commitments that will be enforceable, including support from local governments, industrial users, hydropower operators, and other stakeholders beyond irrigation agencies and water utilities. While various types of river-basin organizations may have important roles, there is no uniform answer, no generic remedy for the management challenges facing most basins. Developing institutions that will be effective needs to draw on processes that focus not just on ad hoc solutions to specific problems but to look more broadly and creatively at how to achieve better basin governance.

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