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The Challenges of Integrated River Basin Management in India

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The idea of transferring 'ready-made' Integrated River Basin Management (IRBM) solutions from Australia, North America and Europe to India and other developing countries holds great appeal for policy makers, donors and social researchers. But a review of actual experience suggests that effective solutions need to be tailored to fit the realities of Indian basins.

The Challenges of Integrated River Basin Management in India

Issues in transferring successful river basin management models to the developing world

The problems that river basin institutions in the developed world successfully address—such as pollution, sediment buildup in rivers and the degradation of wetlands—are not the top priorities for Indian policy makers and people. The items that do top Indian agendas—providing access to water for drinking and growing food, eradicating poverty, and stopping groundwater overexploitation—are either unresolved in the developed world or have become irrelevant due to economic development.

This does not mean that India and other developing countries cannot learn valuable lessons from models for Integrated River Basin Management. Loosely structured River Basin Organizations, such as Southeast Asia's Mekong Commission, can contribute to basin welfare by serving as a coordinating mechanism. They can facilitate dialogue and negotiation on resource allocation among organized stakeholders and representative bodies (such as national or state governments sharing a river basin). But River Basin Organizations by themselves cannot be expected to address the more fundamental issues that water sectors in India must contend with.

Integrated River Basin Management (IRBM) is a powerful concept, and will increasingly dominate natural resources management discussions in both the North and the South. Many developed countries have created highly effective and resilient institutions for IRBM. These institutional models, which have evolved over centuries in Europe and decades in the USA and Australia, are increasingly being imposed on developing country river basins by well-intentioned donors and governments. In many cases, this reform has focused entirely on the creation of basin-level organizations. The implicit assumption often is that the mere formation of such organizations will result in IRBM. Actual experiences show otherwise.

For example, the Damodar Valley Authority, India's attempt to adopt the USA's Tennessee Valley Authority model, proved to be a failure at IRBM. Four decades after it was established, the only thing the Authority is managing is a thermal power plant. In China, Basin Management Committees were established as early as the 1950s in some of the major river basins, such as

the Yangtze and the Yellow, to plan and exploit water resources, generate electricity, mitigate flood damage and provide facilities for navigation. But the Committees quickly abandoned their broad agenda, and in the end focused narrowly on irrigation. In Sri Lanka, the experience was much the same: a Water Resources Board was established in 1964 to promote integrated water resources planning. The Board never worked on its broad mandate, but instead concentrated on hydrological investigations and drilling tube wells. Despite a wealth of such examples, basin-level institutions are still held up as the best, even the only model, for water management—regardless of context.

A look at the realities of developing country river



This issue of *Water Policy Briefing* is based on research presented in the paper *Limits to Leapfrogging: Issues in Transposing Successful River Basin Management Institutions in the Developing World* by Tushaar Shah, leader of the IWMI-Tata Water Policy Program, and Ian Makin and R. Sakthivadivel of IWMI. Readers interested in the details of this research are invited to read the full text of the paper at www.iwmi.org/iwmi-tata or request a copy at the address given below. Questions and comments on this issue may be directed to Dr. Tushaar Shah c/o IWMI, Elecon, Anand-Sojitra Road, Vallabh Vidyanagar 388 001, Gujarat, India or iwmi-tata@cgiar.org.

COVER PHOTO: J.FROEN ENSINK, IWMI

basins shows why IRBM models break down when transferred to developing country contexts. In most cases, these institutional models are not designed to handle the hydrogeology, demography, socioeconomics and the organization of the water sector found in the developing world.

Hydrology, climate & demographics: A case for decentralized institutions

Climatic and hydrological conditions, combined with demographics, explain why decentralized institutions for water management have evolved in India and many other parts of the developing world. Monsoon climates (most rainfall concentrated in a short period of time), higher mean temperatures and evaporation rates, and lower stream densities typical of arid and semiarid regions, focus the primary river basin activities in these countries around capturing and storing rainfall locally—before it is lost through evaporation or runoff to the sea.

Historically, communities in peninsular India and Sri Lanka have met this challenge by digging small local reservoirs, or tanks, to collect monsoon rain for use throughout the year. Even today, one collective maintenance task carried out by many South Indian tank communities before the start of the monsoon is cleaning and deepening the channels that feed rainwater runoff to their tanks. People here recognize that if they do not capture runoff in artificial streams, most of it will evaporate before it reaches their tanks.

In India, as well as in China and other densely populated countries, population is high both upstream and downstream of dams. It can be argued that the a primary driver of intensive groundwater development in these countries is that most people do not live downstream of large dams. By sinking tube wells, people upstream are challenging the basic inequity inherent in the pattern of large irrigation projects that usurp the lion's share of the water for the benefit of a small number of canal irrigators.

The picture is markedly different in the river basins of the developed world. In most cases, reservoirs have large catchments free of competition; evaporation rates are generally not as high, and human settlements are concentrated near coasts and along rivers, where they can be easily supplied through large-scale water diversion structures. Here the water management challenge is to make the best use of 'managed' water.

The advantages of community rainwater harvesting

In defence of the popular rainwater harvesting movement, the Delhi-based Centre for Science and Environment (CSE) has asked: What does India need more: irrigation or drought-proofing? In reply it has suggested that by

totally rethinking river basin management, India can trade irrigation of relatively small areas for drought-proofing over vast areas. It has offered evidence that diverting rainwater to a large number of small water-harvesting structures in a catchment captures and stores more rainfall closer to communities than having a large reservoir downstream. The larger the area the water has to flow over before being collected for use, the more the water lost to evaporation.

Rural communities in semiarid India are certainly more concerned with ensuring their supply of drinking water for the nine months of the year with no rainfall than having water to irrigate crops. Many Indian observers think that the answer to this challenge lies not in piped water supply schemes but in decentralized rainwater harvesting. CSE has estimated the average area needed per village to capture sufficient water to meet every household's drinking and cooking water requirement in the various regions. The average for India as a whole is 1.14 ha/village in a normal year and double that in a drought year.

For more information, see: Agarwal, Anil. 2000. *Drought? Try capturing the rain*. Delhi: Centre for Science and Environment.



PHOTO: ICRISAT

Community-based approaches to water management

In developing country river basin communities, water management centers on rainfall, not 'managed' water. Here people depend on local water-harvesting and storage structures, and consequently their understanding of ownership and rights over water relates more easily to rainfall than to diverted water. The approaches to water rights found in the USA and Australia are only applicable when the majority of irrigators and water users are concentrated along rivers and streams. But such institutional systems make no sense for the some 20 million people pumping groundwater in South Asia, or the communities that depend on South India's 300,000 tanks or China's seven million ponds.

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While government investment programs concentrate on building large reservoirs downstream to support irrigation and municipal water supplies to towns, the problems of people living in the catchment area remain unaddressed. Disenchanted with government and public systems in India, NGOs and communities are finding their own solutions. The past decade has witnessed a massive popular awakening as the result of the efforts of NGOs such as Tarun Bharat Sangh, PRADAN and of religious organizations such as the Swadhyaya Pariwar. This has taken the form of rainwater conservation and groundwater recharge work on a scale that governments and public agencies would not be able to manage. These movements are driven by the need to ensure availability of domestic water supply for the two months before the monsoon and for one or two crop-saving waterings from the wells. This local approach provides these communities with enough water at the right time to protect their health and their crops.

Government agencies and scientists (hydrologists in particular) have been sceptical of these 'home-grown' solutions. They argue that rainwater-harvesting structures upstream reduce the input into the reservoirs downstream and reduce their productivity. But this argument does not resonate with the communities, especially in the upstream areas. They fail to see why they cannot meet their basic water needs instead of feeding reservoirs to irrigate relatively small areas of paddy or cotton.

Challenges for enhancing basin welfare in developing countries

Successful institutional reforms in the water sector worldwide have a similar pattern. They have focused largely on management of surface water bodies and on



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improving the productivity of large, publicly managed water bodies. These reforms have not dealt with groundwater nor have they had to contend with informal water sectors. Basically, they have ignored the challenges central to sustainable and productive use of water in developing countries.

Challenge 1: Addressing the 'informal' water sector

In low-income countries, most water users—the poorest ones—get their water directly from rain and from local private or community storage without any significant mediation from public agencies or organized service providers.

In developed countries, most users receive their water from organized public or private service providers licensed by the government. This makes resource governance feasible, even simple. If a basin management regime wants to increase the water price to domestic users by 5 percent, or make a law intended to change the way business is done, it can easily do so. But this is not true when the bulk of the water users and uses are served by an informal sector where 'service providers' are not even registered.

One standard refrain of institutional discussions in the water sector is to "get the water law right." But the problem is not passing a law but enforcing it in a society with a vast number of stakeholders operating in the informal sector with little or no link to resource governance structures. This is why many governments readily pass acts but spend years before converting them into laws.

Sri Lanka has been debating a water law since the early 1980s, but it has yet to enact it. This is presumably because it is difficult to figure out how to implement water permit

systems, full-cost pricing and water courts in a country where 50 to 70 percent of the rural people acquire their water not through water supply service utilities or companies but straight from nature or from local storage in small community tanks.

There are also cases where countries have passed laws that have had little or no impact. In the case of South Africa's progressive new water policy, the government is struggling to extend reforms to the communities in the former homelands, which operate in the informal water sector. And hard as the government is trying, this is not proving to be easy. In evaluating the process of Catchment Management Agency (CMA) formation in the Olifants river basin, IWMI research has found that rural communities were unaware of the provisions of the new water law and the CMA process—despite the efforts to inform people and offer them opportunities to express their views. Small-scale farmers had not heard about the CMA, but the Irrigation Boards providing water to large commercial farmers were participating actively in the process.

A small number of large stakeholders is easy to work with. The game changes fundamentally once you have to deal with a vast number of small-scale water users. Developed-country institutions have not solved the problem of serving or regulating large numbers of small users particularly well; indeed they have not yet found satisfactory ways of dealing with moderate numbers of large users. For example, in the Australian provinces of New South Wales, Queensland and Victoria, the existing law confers on every occupier of land the right to take and use water for domestic consumption, watering stock, irrigating home gardens and noncommercial crops on a maximum of 2 hectares. If this exemption were applied in India, it would cover over 80 percent of all land and over 90 percent of all water users.

"Get the price right" is another old prescription to make water an economic good. Now that water scarcity in many parts of the world is a reality, it would be naive to question the value of pricing, not so much for revenue collection but to signal the value of scarce water to users. The real issue is devising a mechanism

A comparison of 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

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to impose and collect charges in a situation where most users are in the informal sector and have their water delivered by the rain gods. The high transaction cost of monitoring water use and collecting water charges from vast numbers of small-scale users is the central issue in water pricing in India.

One way the informal sector can be 'formalized' is through grassroots user organizations. Irrigation Management Transfer (IMT) initiatives to organize irrigators into water user associations are partly

motivated by the need to bring users into the formal sector. But in this too, small numbers of large users in the developed world have an advantage over large numbers of small users in the developing countries. All manner of user associations form spontaneously in countries like the USA and Australia. These institutional models are constantly being tried in developing countries. But they generally prove ineffective in the case of large numbers of small stakeholders.

Challenge 2: Improving the productivity of 'green water'

IRBM discussions have tended to focus on 'blue water'—the water resources tapped from rivers, lakes, or aquifers—and to ignore 'green water'—rain and soil-moisture. But harvesting rainwater and making the most of soil moisture are critical issues in India.

In water-scarce tropical countries that have uniformly high population densities, such as in India and China, increasing the productivity of diverted water is certainly important. But equally vital is the need to maximize the proportion of water flowing into a basin that is productively used. Here irrigation is used to supplement rainfall, not to meet the full water requirements of plants as it is in developed countries. This 'informal' irrigation increases the productivity of rain and water stored in the soil.

Challenge 3: Managing groundwater

In South Asia, Southeast Asia and northern China, groundwater is the most valuable and threatened water resource. Protecting groundwater from over-development is among the top environmental and development priorities. Yet delivering on this imperative is proving to be a challenge because groundwater is in the informal sector. Even in highly evolved river basins, sustainable management of groundwater is highly problematic. Even the best examples of IRBM, such as Australia's Murray-Darling Basin, have not been unequivocally successful in regulating groundwater use.

In low-income Asia, communities reliant on intensive use of groundwater struggle with the difficult task of choosing between surviving today and preserving the resource for tomorrow. They are choosing to survive today. Only the innovative mechanisms for groundwater recharge springing up in many of these communities offer hope for sustainably

Australia's Murray-Darling model

Exploring whether developed-country basin institutions—particularly the Murray-Darling experience—can be replicated in a developing-country context has fascinated many researchers in recent years. The results of these investigations have not been very encouraging. For example, Hu explored the applicability of Murray-Darling experience in the Chinese context and concluded negatively because of:

1. Difficulty of coordinating authorities at different levels;
2. Unclear ownership of resources;
3. Small farming scales; and
4. Poor education of resource users.

In a similar vein, Malano, Bryant and Turrall examined whether the Australian IRBM model can be successfully transferred to Vietnam. Their investigation suggests that Vietnam has a long way to go before it is ready for the Murray-Darling prescription. However, the new water law of Vietnam already contains provisions to adopt an integrated river basin approach. And the World Bank and the Asian Development Bank have apparently held up funding to Vietnam until it forms the National Water Council to implement it. But the Ministry of Agriculture and Rural Development, which is at present in charge of water, does not relish the responsibility of IRBM. The progress in stakeholder participation, another Murray-Darling prescription, has been slow. Farmers view irrigation provision as a government responsibility; even so, irrigation charges in Vietnam are high by Asian standards. Yet, presumably under donor pressure, the government tried to eliminate irrigation subsidies. This was followed by massive popular unrest in 1998, whereupon, the government had to restore the subsidies.

Can the Australian success in enforcing the 'user pays' principle be transferred to the Solomon Islands? Hunt explored this issue in a recent study and has concluded that such transfer "is not sustainably viable" on account of huge differences in political structures, national priorities, living standards, cultural traits, technological development, literacy levels, financial and infrastructural growth, and change-management competency. All these differences result in the absence of what Hunt calls a "contextual fit" between the policy development and the respective policy application environment.

For more information, see:

- Hu, Xiandeng. 1999. Integrated catchment management in China: Application of the Australian experience. *Water International*, vol. 24, no 4, pp 323–328.
- Hunt, Chris. 1999. Transposing of water policies from developed to developing countries: The case of user pays. *Water International*, vol. 24, no 4, pp 293–306.
- Malano, Hector; Michael Bryant; and H. Turrall. 1999. Management of water resources: Can Australian experiences be transferred to Vietnam? *Water International*, vol. 24, no 4, pp 307–315.

The answers to water challenges of developing countries may, to a large extent, fall outside of what are traditionally defined as 'institutions'

managing the resource. In Rajasthan and Gujarat, two states with serious groundwater-depletion problems, large-scale, community-based water harvesting and recharge may not be a perfect and complete answer but do contain elements of a potential solution.

Small-scale irrigation technologies are also having an impact. In Maikaal region of Madhya Pradesh and Vidarbha region of Maharashtra, the several million smallholders irrigating cotton from open, shallow wells found they often could pump for only 15 to 20 minutes before running out of water. A few years ago, local NGOs began promoting low-cost drip irrigation among these cotton growers. Farmers saw that by using pipes and micro-tubes, they can water an acre or more of cotton even with this restricted pumping time. Recent times have seen a veritable revolution in farmers adapting drip irrigation as a survival mechanism. Most striking is a drip-irrigation system designed using low-grade, light-weight pipes used for making ice candy locally called 'Pepsi.' Now adoption of these disposable 'Pepsi' kits is spreading like wildfire simply because it costs less than Rs 1,000/acre to build compared to micro-irrigation kits that cost Rs 12,000/acre and branded drip irrigation systems that cost Rs 60,000/acre.

The need to take a broader view of institutional change

An extraordinary aspect of the institutional discussion in the global water sector is how very narrowly it has focused on things that governments can do: make laws, set up regulatory organizations, turn over irrigation systems, and specify property rights. If institutional change is about how societies adapt to new demands, its study must deal with more than what just the governments do. People, businesses,

exchange institutions, civil society institutions, religions and popular movements—all these must be covered in the ambit of institutional analysis.

To uncritically adopt 'Western' models in developing country basins results in managing water only on paper. Finding ways of affecting users' behavior is more important than creating laws or institutions with 'the right ingredients' for integrated basin management.

The answers to water challenges of developing countries may, to a large extent, fall outside of what are traditionally defined as 'institutions.' Which elements of the Murray-Darling experience can be sensibly applied in which developing country context is certainly an important analytical enterprise, but equally or even more important is the need to listen to voices from the grass roots. Communities tend to find their own solutions and will have to play a large role in any successful strategy.

River Basin Organizations that are being created—as under the new World-Bank-funded 'Water Sector Restructuring Project' in Uttar Pradesh—to achieve "sustainable water resources planning, management and operation in a river basin framework" are unlikely to succeed in their mission. To achieve integrated water management in the Indian context, it is critical to meet an array of preconditions at the user end before a river basin entity can be effective.

For example, a system of licensing and registering groundwater structures needs to be established. The principle of 'user pays, polluter pays' needs to be developed at the operational level. Electricity pricing and supply policies for agriculture need to be rationalized. Legal frameworks need to be created to facilitate institutional reform in irrigation systems and urban and rural water supply and sanitation systems. Pollution control institutions and regulatory frameworks need to be modernized. Agencies dealing with water at the local and meso levels need to be developed into a unified structure, shifting the focus from just resources management to resources and service management. Once we have done some painstaking work on these hard items on the agenda, we might begin thinking about integrated water resources management in a river basin context.



Water Policy Briefing Series

The Water Policy Briefing Series translates the findings of research in water resources management into useful information for Indian policy makers. The Series is put out by the International Water Management Institute (IWMI) in collaboration with national and State research organizations. It is made possible by a grant from the Sir Ratan Tata Trust.

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IWMI-Tata Water Policy Program

The IWMI-Tata Water Policy Program was launched in 2000. This is a new initiative supported by the Sir Ratan Tata Trust. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resources management. Its objective is to help policy makers at the central, State and local levels address their water challenges—in areas such as sustainable groundwater management, water scarcity, and rural poverty—by translating research findings into practical policy recommendations.

Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water-management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the *Water Policy Briefing Series*.

The Policy Program's website (www.iwmi.org/iwmi-tata) promotes the exchange of knowledge on water-resources management, within the research community and between researchers and policy makers in India.

IWMI in India

Over the past decade, researchers from IWMI have been collaborating with Indian scientists and development organizations in the areas of irrigation performance; satellite remote sensing; irrigation management transfer; analysis of gender, water and poverty; and malaria control.

In January 2001, a field office was established in Anand, Gujarat to work with Indian partners on groundwater management and governance. In October 2001, IWMI established its India Regional Office in Patancheru, Hyderabad, Andhra Pradesh. IWMI's research and cooperation in India focus on three key areas: river basin water productivity, water and land management in watersheds, and groundwater management.

IWMI's principal partners and collaborators for its work in India are the Indian Council of Agricultural Research (ICAR), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and a host of state irrigation departments, agricultural universities and nongovernmental organizations.

For further information, see www.iwmi.org/india or write to iwmi-india@cgiar.org

About IWMI

IWMI is one of the 16 Future Harvest Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

The research program of IWMI centers around five core themes:

- Integrated Water Resources Management for Agriculture
- Sustainable Smallholder Water & Land Management Systems
- Sustainable Groundwater Management
- Water, Health and Environment
- Water Resources Institutions and Policy

The Institute fields a team of some 50 senior researchers with significant international experience, supported by national research staff and a corps of some 20 postdoctoral scientists, mostly from developing countries. IWMI is headquartered in Sri Lanka with regional offices in India, South Africa and Thailand.

All IWMI research is done with local partners (universities, government agencies, NGOs, research centers, etc.). The Institute's outputs are public goods that are freely available for use by all actors in water management and development. The IWMI Research Reports, data and other publications can be downloaded from the IWMI website or received free of charge from the IWMI publications office. A series of tools for improved water management is also available.

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