Integrated river basin Management

From Concepts to Good Practice

Briefing Note 1

An Introduction to Integrated River Basin Management

What is integrated river basin management (IRBM) and which institutional options suit IRBM?

This note is the first in a series explaining the attributes and practical application of integrated river basin management (IRBM). The purpose of the Briefing Note series and the issues and aspects that are covered are outlined in the mini-guide.

This note discusses:

- The concept of integration in the river basin setting
- The institutional options available
- The typical functions of a river basin organization and other related agencies.

Contents

Acknowledgments

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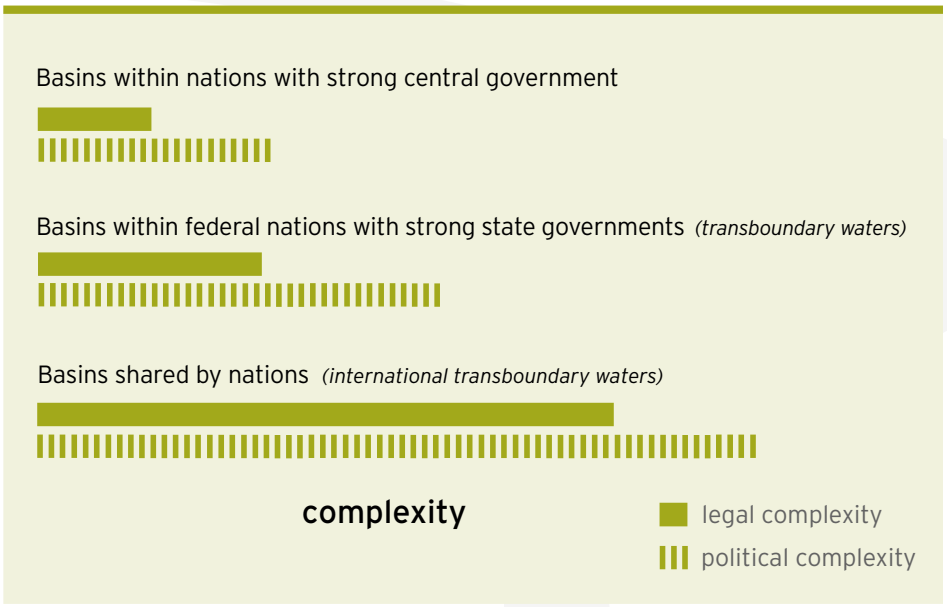
figure 1.1

POLITICAL AND LEGAL COMPLEXITIES IN VARIOUS BASIN SCENARIOS



Introduction

Over the last 100 years, some form of river basin management has been in practice in many countries. In earlier days, single-purpose water resource planning was the norm, and surface water quantity was the prime concern. Gradually, planning became more multi-purpose, but water quantity has remained a core dimension.

Over time it became clear that issues pertaining to both water quality and quantity, and to groundwater and surface water, should be treated together. This more comprehensive approach to planning and management became known as *integrated water resources management*.

Perhaps the most notable success story of an early form of integrated water resources management has been the Tennessee Valley Authority in the United States. Among developing countries, the Mahaweli Authority in Sri Lanka has also been successful in this regard.

Today, it is considered best practice in water resources planning to integrate water quantity and quality management for both groundwater and surface water, while incorporating a full understanding of how the natural resources and the people of a basin are impacted by various levels of development or by adopting new resource use policies. Land use as well as land and vegetation management are thus issues that need to be considered in water resources planning and management. This is best done in a highly participative way, involving all the major stakeholder groups, and in a way that achieves a balance between the level of economic development and the consequent impact on the natural resource base of a river basin as agreed by the stakeholders. This participatory and comprehensive approach is what is generally referred to as good **integrated river basin management** (IRBM).

When rivers cross international, interstate, or administrative boundaries, water resources issues become increasingly more complex. The political dimension usually then dominates the legal and technical aspects, as shown in figure 1.1. Across borders, there are usually different institutional, regulatory, policy, and planning procedures and processes in place, and no coordinating mechanisms to bring these together.

> Integrated river basin management aims to establish a framework for coordination whereby all administrations and stakeholders involved in river basin planning and management can come together to develop an agreed set of policies and strategies such that a balanced and acceptable approach to land, water, and natural resource management can be achieved.

Infrastructure projects, including World Bank projects, can gain in effectiveness and sustainability from having a sound, overarching framework in place for IRBM. But it must also be understood that working within a river basin management framework usually adds to the preparation time of a project. Institution building, integration of concerns from the broadest range of stakeholders, community involvement, and optimization of efficiencies at the river basin level all take time and can alter (or even physically move) the initial project design. So while the outcomes are rewarding and lead to better projects, the inherent delays, longer timelines, and probable changes that will occur from this approach must be recognized at the outset.

What Does Integration Mean?

Integration in IRBM means much more than just considering water resources as part of the overall natural resource base of a river basin. Almost without exception, the old administrative boundaries established by governments to manage their affairs and their communities have little or no relationship to the hydrologic boundaries of a basin. Often there are five to ten administrative units (states, provinces, prefectures) within a single river basin. Each unit has its own specific responsibilities and accountabilities – which immediately results in conflict and/or inconsistent collective natural resource management across the entire basin. Hence the implementation of what might be called ***participative transboundary planning and management*** goes against the traditional approach to management, which seeks to solve a particular problem within a single state or province, using only the state's resources and procedures without the involvement of outsiders.

Integration extends to ***economic, social, and environmental issues***. This means taking into account not only the financial and economic costs and benefits of natural resource management decisions, but also the social and environmental costs and benefits to reach an acceptable balance among all these. Historically, water resource managers have not been good at this balancing act.

The integration of stakeholder and community views is now seen as another critical factor in good IRBM. Each country will develop participative processes differently. Nevertheless, gender, minority community issues, and the like should be considered. Last but not least, there is the ***sectoral (and sub-sectoral) integration***, which must take account of the competition and conflicts for water among irrigation, hydropower, domestic supply, public health and sanitation, industry, and so on. This is important in the planning phase and also in the implementation and operational phase. For example, a dam operation biased toward one use can seriously impact the needs and rights of other uses.

In addition to the challenges of integrating all these aspects, the varying and at times opposing views of the natural resource management professionals need to be reconciled and balanced as well. The ecologist, water resources engineer, lawyer, economist, sociologist, national planner, and the rural development planner all have different aims, objectives and biases. Through IRBM, these various views are brought to the debating table.

How Can an Integrated Approach be Achieved?

There is no magic solution or single correct way to go about achieving the right degree or level of integration, nor is there one specific institutional model that is applicable to all cases. What is required is a change in how individuals and agencies think about their water-related activities. Often, strong political will and leadership are needed to get all players on board and move the process forward.

Notwithstanding these difficulties, an analysis of a wide cross-section of countries and basin organizations that are undertaking IRBM suggests that there are five common features or attributes that constitute best practice in IRBM. Those basin organizations or countries that are addressing or managing these five features seem to be achieving the best results. These are as follows:

1. The establishment of a basin-wide institutional framework that allows all the main government administrations operating within the basin to participate. This framework needs to be strong, clear, and flexible. It should allow for an equal partnership among all member administrations and be supported by some form of legislation, regulation, or decree. There should also be an integrated natural resource policy agenda and clear financing and budgeting systems for the range of basin-wide activities.

2. Good knowledge of the condition and behavior of the natural resources of the basin. This refers to the strategic assessment of water and related resources to include all aspects of catchment data, not just water quantity. This should not stop at data collection, but convert the data to information and provide some trend analysis and other useful knowledge.

3. The development of all policies, strategies, decisions, and projects in an integrated manner in recognition of the holistic and interactive way that natural resources behave. This integration needs to be built into how institutions interact, and how policy is developed and resource management undertaken.

4. Incorporation of community and stakeholder participation into the planning and management processes. The views of the basin community can no longer be ignored or taken for granted; they must be systematically incorporated.

5. Establishment of a system to assess whether or not the river basin is being managed sustainably. This may include the introduction of a detailed, ongoing monitoring and auditing process to openly assess if the basin-wide institutional arrangements are achieving the goals and objectives set by governments; whether the principal officers charged with the work are indeed achieving what is intended; and that the health or condition of the river basin is being maintained at the agreed level, consistent with the level of development that is proposed and under implementation. A good monitoring and auditing program tends to create or reinforce accountability among the key organizations and their staff.

There are other important features that could be considered best practice in IRBM, such as the importance of a clear communication strategy, political leadership, and a willingness to compromise and change. These (and other issues) will be largely addressed within the discussion of the five main attributes.

What Institutional Options are Available to Implement IRBM?

An overriding principle in selecting a suitable basin coordinating arrangement is to adopt the simplest model or framework that will deliver the improvements sought in terms of sustainable basin management, with the least possible disruption to any existing agencies or processes that are operating reasonably effectively.

Therefore a model in successful operation in one scenario should not be automatically carbon-copied and adopted elsewhere – as the social, cultural, and political conditions will most probably be significantly different.

Many of the early attempts to create basin organizations resulted in the establishment of very powerful and wide-ranging organizations that tended to absorb the roles of many of the operating/managing water-related agencies that existed in the basin, because those agencies were not carrying out their roles and functions effectively. Hence the basin organization became manager and operator, as well as planner, coordinator, and monitor of performance. Today, many of the specific agencies operating within a basin perform adequately. Thus the basin organization's primary functions are not so much to take over the management and operations but to coordinate basin-wide planning and policy setting, and to monitor the performance and output of the existing agencies.

Therefore, in assessing the need for a river basin organization, a situational analysis should first be undertaken of the strengths and weaknesses of the current arrangements for water resources management. Any gaps can be identified. Then the various options for introducing a basin-wide management should be analyzed, compared with existing arrangements and circumstances. The appropriate model or mix of models can then be selected that would result in the desired level of improvements with as little disruption as possible to those already performing effectively. The result is likely to be a mix, including the creation of a new basin organization or some other form of basin coordination, and the strengthening of existing implementing and operational agencies. This situational analysis can take quite different forms, depending on what is the malaise of the basin. In the Niger River Basin, for example, after the development of a *Shared Vision*, the World Bank funded an institutional audit to assess institutional effectiveness of the Niger Basin Authority. This is being followed up by a functional review of all staff, departments, and other units to establish how the institution can be made more relevant and efficient.

Generally speaking, river basin organizations can be grouped into three categories. Other models can be developed to include features of all three categories, but this is uncommon. The three main models are as follows:

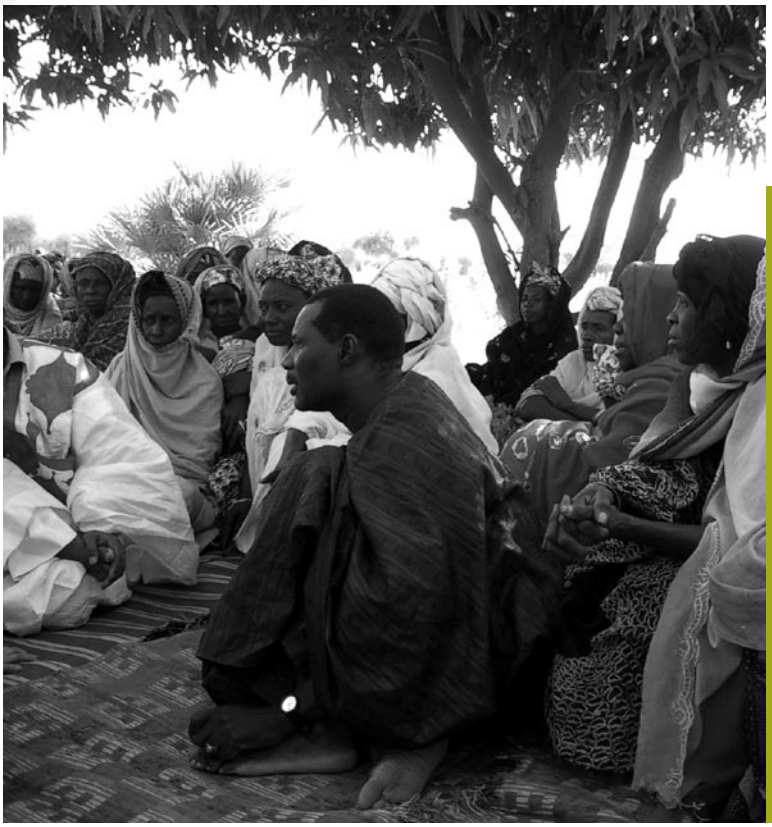
- River basin coordinating committee/council
- River basin commission
- River basin authority

The names or titles for these organizations will likely differ from country to country. Normally the softest, or perhaps least threatening, river basin organization to existing institutional arrangements is the basin coordinating committee. The basin authority is the strongest and most powerful model, and it tends to absorb the roles of existing agencies.

River Basin Coordinating Committee or Council

This model is based on the following assumptions:

- The existing agencies within the river basin are operating effectively.
- Most of the important data networks are in place and good quality data and information is being generated.
- Most of the high priority water projects have been constructed.
- Competition for resource use between the states or provinces in the basin and the major uses within each of these has been resolved.



Therefore the water resources environment can be described as stable and mature, where population, irrigation, and industrial expansions are likely to be relatively small and any additional water requirements will likely be met by transfers from existing development rather than by significant new infrastructure development.

The coordinating committee would comprise ministers or senior representatives of the main water-related agencies from each of the states, provinces, prefectures, or other entities operating within the basin. They would meet, for example, every six months, to debate policies, strategies, data-sharing protocols, basin-wide modeling, and other systems issues and operating procedures that have impacts across administrative boundaries, as well as any existing or potential areas of conflict. The committee would normally monitor the overall management of the basin through the assessment of sustainable resource use and allocation. In some circumstances, the committee would also monitor the performance of operating agencies to ensure compliance with basin policies and strategies, but would not intervene in any day-to-day operational and management matters.

In short, to be effective, this model requires the goodwill of all the participating administrations, as the committee has no real power to direct the activities and actions of members. Letters of agreement are normally established between all participating administrations and as such can be dissolved or rendered less effective, simply through the withdrawal of one member. As the committee does not have any executive powers, it cannot override the roles and activities of the member organizations. Its strength (and its weakness) lies in its reliance on the full and fair cooperation and participation of its members, as well as the strength and ability of the chairperson to manage the affairs and to achieve the trust and confidence of all members.

The head of a coordination committee or council could be selected by rotation of the existing members, or by specific appointment based on experience and reputation.

A small technical team is needed to support the committee. This could be staffed specifically for that purpose or on a rotational basis from the agency of the chairperson.

This type of model can also be used as the first stage in the development of an ongoing form of basin coordination. For example, a coordinating committee may be established for a short fixed period – say, two years – with the exclusive task of comprehensively reviewing current and emerging needs and proposing options and recommendations for longer-term coordination of the basin, such as the establishment of a basin commission. The coordination committee would cease to function when the new organization comes into being.

River Basin Commission

This arrangement is usually followed:

- When significant development options are still to be considered in the river basin
- Where conflicting uses are significant
- Where information and policies still need further development to ensure equitable sharing of resources and to limit the harmful impacts of resource use

- When water resource planning and management practices are not well detailed – either to facilitate further development or to limit development to restore desired environmental values in the basin, and
- Where simulation models, systems and the underlying data and information are not readily available, or need further development.

Usually, the existing water-related organizations in the basin are operating reasonably well and there is no need to take over their operations and management roles and functions directly. However, there is a need for better coordination and planning across the whole basin and to further develop the tools, systems, and models to synchronize the systems in use across all the organizations.

A basin commission would normally be a much more formally constituted body than the committee/council model. It would be comprised of a board of management or group of commissioners who set objectives, goals, policy, and strategic direction. The commission would be supported by a technical office of water, natural resources, and socioeconomic planning and management experts, often drawn from existing agencies operating in the basin. In some cases, there may be a Ministerial Council that presides over the commission to provide ultimate authority. This Ministerial Council would normally meet once a year to endorse major policy directions and planning outcomes, and decide on the overall budget and longer-term financing issues. Each minister would then be responsible for ensuring effective implementation in his/her respective state/province/administration.

The board of management or commissioners, would meet more regularly – perhaps four times a year – and would have a much more hands-on role. In addition to directing the affairs of the technical office, the board would develop strategic plans and short-term action or business plans, oversee the development of new data networks, systems, and models, and interact closely with the technical agencies operating within each state or province in the basin. The commissioners would normally be the senior water resources and environmental officials (that is, departmental or agency heads or CEOs) from each top-level government office or administration located within the basin.

The commission would not usually interfere in river, irrigation, or hydropower operations. These normally would be left to the existing operating agencies, unless these tasks are not being done effectively; the operations are in conflict with the overall objectives set out for the basin, there is a project that will significantly affect all member governments, or such a role was specifically included in the commission's charter.

The commission usually would not interfere in general water management functions, such as water extraction licensing or issuance of wastewater permits. These are normally handled by the operating agencies in each member-state or province in the basin. However, the commission would set the bulk water shares that each state/province is entitled to divert and would monitor water use at the higher state/provincial level.

In those cases where, by agreement, operational functions are part of the charter, it is likely that once management of the basin has matured or stabilized, such responsibilities would be returned to the provincial agencies, or in some countries, be corporatized (designated to parastatal organizations) or privatized. The basin commission would then concentrate on the strategic natural resource management of the rivers and catchments.

A strong feature of the commission model is the equal partnership among the member- governments operating in the basin – usually several states or provinces and the national government. There is a high level of consultation and participation among all stakeholders, and member administrations have equal rights. The commission is usually legally sanctioned and has well-defined and limited executive and administrative power, such that it cannot intervene in the day-to-day management activities undertaken by the various member agencies, unless otherwise stipulated in the charter.

Frequently, one of the commission's duties is to arbitrate transjurisdictional or transboundary disputes. Decisions could be binding, depending on the legal authority of the commission and the legal system of the particular country.

The strengths of the river basin commission model are equal partnership among all stakeholders, good knowledge of the basin's resources (data/information, systems and models), and involvement of the basin community as and when relevant in planning and decision making.

River Basin Authority

This model usually takes one of two forms. It may be a large, multi-disciplinary organization with specific development tasks to undertake, such as hydropower development or navigation. These tasks tend to be large and complex and are likely to continue over many years. Examples are the Tennessee Valley Authority in the United States, the Snowy Mountains Authority in Australia, and the Mahaweli Basin Authority in Sri Lanka.

Alternatively, the authority may be an organization that absorbs virtually all the water resources functions of other agencies in the basin, rendering it very large and powerful. Regulation, operations, and resource management functions (though kept disparate) usually all fall within its purview.

The river basin authority model was more common about 50 years ago, when there was more large-scale development of water resources systems for urban, industrial, or agricultural expansion. The authorities resembled large private companies. They were usually constituted by a specific national law or regulation, which gave the authority significant power and the right to takeover all or part of the functions of existing agencies operating in the basin. The Snowy Mountains Authority has been disbanded and replaced by a coordinating committee/council. The Tennessee Valley and Mahaweli River Basin Authorities are transitioning toward the basin commission model.

While similar circumstances still exist in some developing countries, such as in Africa, where less than 10 percent of the water resources potential has been developed, the river basin authority model remains relevant and the river basin commission model may not be the optimum choice. This has been the experience in the Niger and Senegal River Basins. In the Nile Basin, however, which is historically, geographically, and politically very complex, having such an authority would not be the best arrangement.

In addition, today, river basin authorities can be constituted in a far more participatory way than in the past and include stakeholder consultation and participation, community involvement, and environmental stewardship, among other matters. The Water Charter for the Senegal River Basin Authority, endorsed in 2001, is one of the most advanced international pieces of legislation, incorporating users' rights, protecting traditional water uses, and facilitating community participation in decision making.

What Functions Should a New or Restructured Basin Organization Have?

As mentioned, in selecting the model that is best suited for a particular circumstance, the initial evaluation should be on the basis of what is the simplest form that will address the job at hand. An honest assessment of the current problems and the possible solutions, including future trends and issues, is required. This must be agreed to by all parties involved. In undertaking this assessment, parochial or biased interests must be put aside, as one administration gaining an advantage over another will simply result in failure of the new organization – or at least diminished effectiveness.

The political realities must also be considered. The reforms to be achieved and the corresponding timeframes will vary from country to country. There will also likely be a key driver promoting change, such as a natural disaster, conflict in water sharing, severely poor regulation and management, or severe resource degradation. These drivers are opportunities for the promotion of river basin management and should be used to maximum effect.

The roles and functions of the basin organization are usually indicative of the way the organization was formed: that is, whether the basin organization is new entity or has existed for some years and has been remodeled and evolved over time. Table 1.1 illustrates how the roles of a RBO may evolve from inception to maturation. This table is only suggestive. Prevailing circumstances in a river basin, such as pressing political issues or severe water shortages, may alter or accelerate the process.

table 1.1

EVOLUTION OF A RBO

Functions	new RBO	adult RBO	mature RBO
GROUP 1: Water (and natural resource) data collection & processing, systems modeling, water & natural resource planning	■	■	■
GROUP 2: Project feasibility, design, implementation, operation & maintenance, raising funds	■	■	
GROUP 3: Allocating & monitoring water shares (quality and quantity and possibly natural resource sharing), cost sharing principles		■	■
GROUP 4: Policy & strategy development for economic, social & environmental issues, community awareness & participation			■
GROUP 5: Monitoring water use & shares, monitoring pollution & environmental conditions, oversight & review role for projects promoted by RBO partners, monitoring and assessing the health of the basin's natural resources, monitoring the sustainability of resource management			■

Functions of River Basins Organizations

Each RBO will evolve as the circumstances dictate. Many will follow a different evolutionary path to that described above. For example, the Rhine Commission in Europe commenced with group 1 functions and then included group 5 functions, followed by group 3 functions. At maturation, the commission included the functions of groups 1, 5, 3, and 4 (never incorporating group 2).

The functions in group 1 are critical to any RBO. The organization cannot effectively manage water allocations and usage, and resource protection with inadequate data, systems and models. Normally, the extent and complexity of data networks and the nature of the planning become more sophisticated as the RBO matures.

Group 2 activities are perhaps the more traditional responsibilities of RBOs in developing countries. These reflect the direct connection between regional planning and new water infrastructure. These roles in the mature river basin scenarios are now usually undertaken by corporatized (parastatal) or privatized bodies, under licensed agreements.

Thus the sequence shown in table 1.1 is not the only one. Where water scarcity is the major driver promoting IRBM, such as in the Senegal and Niger River Basins, policy development and strategy for environmental management were of paramount importance much earlier in the RBO evolution process. In cases such as these, it is likely that the group 4 functions will be the first to be developed; the others will follow. Other international experiences include the following:

- In Australia, the Ministerial Council coordinates water and natural resource policy issues between eight states/territories and the national government. This arrangement has been very effective in driving a uniform national water resources policy and planning agenda. Each state in Australia has retained a constitutional right to develop its own natural resources so some form of national coordination and consultation was essential for overall effective resource usage.
- Australia's Murray-Darling Basin Commission (MDBC) deals with a river basin that covers five of these states/territories. It has been in existence for some 80 years. It has evolved as described in table 1.1 into a successful mature basin organization.
- The basin agencies in France and the basin organizations in Spain are combinations of the commission and the coordinating committee arrangements. They also undertake a few functions that usual fall under the purview of the authority model. Both countries have adopted a highly participative and consultative approach, so their operations and performance resemble those of the MDBC in Australia.
- The river basin councils being established in Mexico carry out the functions of groups 1 and 4, as well as some of the functions of groups 3 and 5.

> River basin organizations need to evolve with, and respond to, emerging issues within the particular basin. Otherwise they cease to be relevant and attempts will be made to reinstate the more traditional form of management using separate agencies and stakeholders.

Separating the Roles/Functions to Achieve Clarity of Responsibilities

Analyses of international water resources management practices over the last decade indicate that much of the inefficiency is a result of overlapping or conflicting roles and functions among the various water agencies. For example, the agency or bureau that issues a water license to a hydropower, irrigation, or an industrial company should not also be on the board or be part of the management team of that hydropower, irrigation, or industrial company, as this will lead to conflicts of interest. In this instance, it is difficult to manage the riverine resources impartially and at the same time maximize company profits.

Clarity of roles can be achieved in various ways, but common international practice now seeks to divide – preferably into separate organizations – the roles as follows:

- *An environmental/pollution overseeing agency* to be the standard-setter/primary regulator/auditor. The agency will set standards for water quality and for the water-related environment through a community participation process, and report or audit how well the standards are being achieved by the agency responsible for resource management.

- *A water resources management agency* to be responsible for water planning, allocation, and management. The agency will determine water shares and issue licenses among the various uses and users; manage or police how these shares are extracted and used; and manage the resource so as to achieve water quality standards and objectives set by the standard setter.

- *Water services operators, provides and developers*, such as town water supply authorities or bureaus, hydropower companies, industrial complexes, water supply corporations, and water user associations controlling irrigation areas, use water as per licenses or agreements issued by the water resources management agency.

It is important and useful to have clear demarcation between the roles as described above.

Undertaking a situational analysis of current arrangements for water resources management, and then determining what might be the broader needs for some form of basin-wide coordinating mechanism or improved agency coordination and management processes, should not be seen as a process that slows down or hinders a project. This work needs to be structured into the project plan from the start. The institutional and regulatory issues can proceed in tandem with the project development. With this approach, there is a much greater chance that the project will be more successful and achieve long-term sustainability.

How to Move River Basin Management Forward: A Few Key Questions

- Is any form of river basin coordination occurring in relation to natural resource management? How does it rate against the five features or attributes of good IRBM?
- Does an analysis of existing and future issues and problems suggest that a river basin organization is needed? What type best suits the basin circumstances: a coordinating committee, a basin commission, or a basin authority? Are all the key organizations and stakeholders in agreement? Should a short-term coordinating committee first be established to evaluate options in a more participative and detailed way?

- What roles and functions are being undertaken by existing agencies operating in the river basin? Are there any obvious gaps or weaknesses in these arrangements?
- Is there clarity of roles and functions for all agencies working in natural resource management in the basin? Do any of these roles need to change to complement the establishment of the basin organization?
- Is there a willingness to compromise on existing priority projects or on expected timeframes, or both? If not, how can agreement be achieved among the basin partners?
- Is the existing capacity at the national and basin levels adequate to support a basin-wide approach or should the basin organization take on a stronger role?
- What are the development needs in the basin regarding the natural resource base?
- Who is responsible for the environmental stewardship of the basin? Should the basin organization take over this role? If so, how will this be linked to the work of the other environmental agencies?

Abbreviations and Acronyms

BDP	Basin Development Plan
BET	Beneficial Evapo-transpiration (ET)
CU	Consumptive Use
DSF	Decision Support Framework
ERS	Environmental Resources Study
ET	Evapo-transpiration
GW	Groundwater
IRBM	Integrated river basin management
KRA	Key Result Areas
LWMP	Land and Water Management Plans
MDBC	Murray-Darling Basin Commission
MRC	Mekong River Commission
NBET	Non-beneficial Evapo-transpiration (ET)
O&M	Operation and maintenance
OMVS	Organisation pour la Mise en Valeur du Fleuve Senegal
RBO	River basin organization
SMART goals	Goal that are S (Specific), M (Measurable), A (Achievable), R (Realistic), and T (Time-based)
SW	Surface water
SWOT analysis	Analysis of Strengths, Weaknesses, Opportunities, and Threats
TBWRC	Tarim Basin Water Resources Commission
TQM	Total Quality Management
WSC	Water supply corporation
WUA	Water user association
WUP	Water Utilization Program

References

WEB SITES

Water Resources Management
Sectors and themes including:
- Coastal and marine management
- Dams and reservoirs
- Groundwater
- Irrigation and drainage
- River basin management
- Transboundary water management
- Water and environment
- Water economics
- Water supply and sanitation
- Watershed management

Information and access to the respective Web sites can be found at:
http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocName/SectorsandThemes

Dams
Benefit Sharing from Dam Projects, November 2002
http://www-esd.worldbank.org/documents/bnwpp/2/FinalReportBenefitSharing.pdf

Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydroelectric Projects
http://essd.worldbank.org/essdint.nsf/90ByDocName/

Groundwater
GW-MATE: Groundwater Management Advisory Team Briefing Note Series.
The overall structure of the series is as follows:
Notes 1 and 2 – Broad introduction to the scope of groundwater management and groundwater system characterization
Notes 3, 4, 5, 6, and 7 – Essential components of management practice for major aquifers with large groundwater storage under stress from intensive water-supply development for irrigated agriculture and/or urban water-supply
Note 8 – The protection of potable groundwater supplies
Notes 9, 10, and 15 – Planning national and regional action for groundwater resource management
Notes 13 and 14 – Management of smaller-scale water supply development in the rural environment
The remainder of the series (Notes 11,12,16, and 17) deals with a number of specific topics that pose a special challenge.
http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocName/SectorsandThemesGroundwaterBriefingNotesSeries

The Murray-Darling Basin
Murray-Darling Basin Initiative
http://www.mdbc.gov.au/

The Living Murray Initiative
http:/www.thelivingmurray.mdbc.gov.au/

Heartlands Initiative
http://www.ciw.csiro.au/heartlands/partners/index.html

Toolkits
Benchmarking, Rural Water Supply and Sanitation for Multi-Sector Projects, Gender, Hygiene and Sanitation, Private Sector Participation, Small Towns
http://www.worldbank.org/html/fpd/water/toolkits.html

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Building Awareness and Overcoming Obstacles to Water Demand Management, Guideline for River Basin and Catchment Management Organizations, IUCN
http://www.gwpforum.org/gwp/library/River_basin_management_guideline_26Oct2004.pdf

Water Resources and Environment Technical Notes
The overall structure of the series is as follows:
A. Environmental Issues and Lessons
B. Institutional and Regulatory Issues
C. Environmental Flow Assessment
D. Water Quality Management
E. Irrigation and Drainage
F. Water Conservation and Demand Management
G. Waterbody Management
H. Selected Topics

http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocName/SectorsandThemesWaterandEnvironmentWaterResourcesandEnvironmentTechnicalNotes

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