



# International Dimensions of Integrated Water Resource Management

Volkmar Hartje

003/2002

---

This article will be published in:

I. Al Baz, V. Hartje, W. Scheumann (eds.)  
Co-operation on transboundary rivers  
Nomos Verlagsgesellschaft Baden-Baden

Contact: Prof. Dr. Volkmar Hartje  
hartje@imup.tu-berlin.de  
Institute for Landscape and Environmental Planning  
Technical University of Berlin  
Franklinstraße 28/29  
D- 10587 Berlin

---

## **Abstract**

Integrated Water Resource Management (IWRM) has become one of the key concepts of the renewed international interest in water policy issues. Beginning with the 1992 Dublin International Water Conference, IWRM emerged as an international policy consensus, beginning with the 1992 UN Conference on Environment and Development on the level of the United Nations, expanding to the multilateral and bilateral development agencies and embracing the international community of water professionals. In contrast to the wide normative use of the concept as quasi-self-implementing, this article surveys the institutional development of the water sector in the industrialised and developing countries in comparison to the standards of IWRM. It finds changes towards the integration in a number of countries, but to a limited extent as result of the new policy consensus. These changes on the national level have international implications beyond their demonstration value, as they form the institutional basis for the management of transboundary water resources. Here, a change can be identified, as the regimes of transboundary rivers have changed to a considerable extent to broaden towards a more integrated manner.

## **Zusammenfassung**

Integrierte Wasserressourcen Bewirtschaftung (IWB) ist zu einem Schlüsselkonzept des erneuten internationalen Interesses an Themen der Wasserwirtschaft geworden. Mit der Dubliner Wasserkonferenz von 1992 wurde IWB zum international akzeptierten Leitbild auf der UN-Ebene, beginnend mit der 1992 UN Konferenz über Umwelt und Entwicklung, bis hin zu den internationalen Entwicklungsbanken und den internationalen Vereinigungen der Wasserexperten. Im Gegensatz zur verbreiteten normativen Präsentation des Konzeptes wird in diesem Artikel eine Bestandsaufnahme der institutionellen Veränderungen der Wasserwirtschaft in Industrie- und Entwicklungsländern vorgenommen, die diese Veränderungen am Konzept der IWB misst. Dabei stehen das Mass der Veränderungen im Verhältnis zu den Anforderungen des Konzeptes, die Rolle des Konzeptes als Erklärungsfaktor für diese Veränderungen und die Auswirkungen auf das Management grenzüberschreitender Flüsse im Vordergrund.

---

**Contents**

- 1 Integrated Water Resource Management – A New Concept..... 1
  - 1.1 The Limits of Traditional Water Management..... 1
  - 1.2 The Economic Rationale for Reform ..... 3
  - 1.3 Integrated Water Resource Management as an International Policy Consensus and its Diffusion ..... 6
- 2 Implementing the Policy Consensus on a National Level ..... 9
  - 2.1 Institutional Structure in Industrialized Countries..... 9
    - 2.1.1 Organizational Set-up for Basic Functions ..... 10
    - 2.1.2 Recent Policy and Organizational Changes ..... 11
    - 2.1.3 The Role of River Basin Organizations ..... 16
  - 2.2 Water Policy Reform in Transformation and Developing Countries ..... 20
- 3 Integrated Water Resource Management in Transboundary Waters..... 23
- 4 Trends and Perspectives ..... 26
- References ..... 28



**Figures**

Tab. 1: Organizational responsibilities of water management  
functions in six OECD countries ..... 13

## **International Dimensions of Integrated Water Resource Management**

### **1 Integrated Water Resource Management – A New Concept**

Integrated Water Resource Management (IWRM) has become a concept and a strategy for policy change in the water sector, taking over from the traditional understanding and practice of water resources development mainly directed at policy and institutional changes on a national and sub-national level. The concept has two international dimensions: one results from the pervasiveness of transboundary freshwater resources (Beach et al. 2000) which is the very theme of this book, but it has a second international dimension in the sense that Integrated Water Resource Management has become an international policy consensus, a guiding principle of UN agencies, international development agencies, a topic of professional networks and a theme in a sequence of international conferences. It is international in the sense that national experience in applying the concept is of international interest for the above epistemic community and for policy makers in other nations as well. When Integrated Water Resource Management becomes a widely accepted national practice, this will have implications for the management of transboundary waters, arguably in fostering co-operation.

This paper is organized as follows: beginning with a sketch of traditional water management and its limits, the criticism directed to it are summarized. Then the emergence and the establishment of the concept of Integrated Water Resource Management as an international policy consensus based on the Dublin Principles and Agenda 21 is traced. In a second chapter, the institutional structures of water management in industrialized countries and their changes in the nineties are compared to the standards required by IWRM, with a special emphasis given to river basin organizations. To illustrate the different starting point for developing countries, a number of examples are presented. In the third chapter, the implications of IWRM for transboundary watercourses are discussed.

#### **1.1 The Limits of Traditional Water Management**

The current international consensus on Integrated Water Resource Management is the result of a reorientation after a century of development in which the water sector was faced with a number of serious problems. The water sector expanded during the last century in the industrialized countries and from the sixties onward in the developing

---

countries by augmenting the supply of water for the various increasing uses. The population grew faster during the 20th century, from 1.65 to 6.1 billion, and it is expected to continue to grow to 8 billion by the year 2025. This population became more urbanized over the 20th century and its share is expected to reach 60 percent in the year 2025. This increasing population required more water, from 1,400 cubic kilometers in 1950 to 5,200 cubic kilometers in 2000 (Clarke 1993) and the expected growth will add to existing water consumption.

This expansion of the water sector was organized by central governments by establishing state or state-owned water organizations and water development organizations on the user side in irrigated agriculture, electricity production and for flood protection, financed primarily through taxes. Water resources development was seen as a means for improving the situation in poor regions, the Tennessee valley being the prime example, or for starting and supporting the development process in developing countries. The main problem was to raise the front-financing as the indivisibility of the necessary infrastructure caused problems for private market financing. The resulting infrastructure tended to be capital-intensive and was driven by the technical expertise of water specialists. Up to the sixties in the industrialized countries and the eighties in the developing countries, the water resource itself was not considered to be a major problem: water resources planning consisted of forecasts of expected increases of use, the estimate of the required capacity to meet these increases and the identification and selection of projects to meet the capacity.

In the seventies, with the beginning of the environmental movement in the OECD countries, this type of expansion came under severe criticism. The environmental movement focused initially on problems in the industrialized countries and changed the political system to a large extent. Very soon, however, conditions and problems in the developing countries became part of the agenda, merging with an emerging environmental movement in the developing world. With respect to the water sector, the following points of criticism were put forward:

- The pollution of the rivers and lakes and later the oceans;
- The neglect of environmental impact of individual water projects;
- The destruction of rivers and lakes as natural ecosystems.

A second round of criticism was directed towards the effectiveness of the solution offered and the economic waste of resources, not only in terms of water, in the sector. It came from economists with a focus on the efficiency of governmental services and

---

the donor agencies, who were disappointed about the efforts to improve drinking water and sanitation:

- The limited success of the international efforts in water supply and sanitation in the developing countries;
- Lack of accountability of water institutions including a low degree of cost recovery of their services;
- The high degree of subsidizing and rent seeking within the sector.

A third wave was directed towards the neglect of social dimensions of the water sector. Parallel to, and interwoven with, the environmental aspects, the opposition to water-related investment projects developed for social reasons: the expected economic benefits were considered to be restricted to a small group and attained at the expense of larger groups negatively affected by inundation and other losses of livelihood.

A fourth catalyst of change was the increasing awareness of the limits of the resource itself, which was the result of research and new understanding from within the sector. For irrigation and hydropower, the favorable sites were becoming scarce, resulting in an exhausted potential in industrialized countries and increasing costs in developing countries. For water supply, access to additional water resources usable for drinking water required more capital and led to an increase of the cost of service (World Bank 1993). As this became clear, water specialists developed the notion of a coming water crisis (Falkenmark 1989; Postel 1989) and started looking at the water balance in the future. The expected increase of the world population and its increasing demand on water compared to a relatively fixed resource led to the prognosis of a coming water crisis.

## **1.2 The Economic Rationale for Reform**

Water as a resource has a number of characteristics making it a special resource which can result in market failures, forcing governmental actions beyond its role of providing the framework for markets to operate (Winpenny 1994; World Bank 1993). The economic rationale is based on the following principles:

- The use of water is often interdependent over the water (river) basin. The withdrawal of water at one point influences the use at other points: as a quantitative restriction if it is consumed, i.e. not returned and as an externality due to pollution.
-

- Certain water uses have public good characteristics, i.e. individuals cannot be excluded from the benefit of once the services are provided. They include flood protection, drainage and protection of aquatic ecosystems (wetlands).
- A number of investments necessary to use water are rather large and exhibit economies of scale, creating the potential for natural monopolies (bulk water supply, sewage collection, treatment facilities).
- Many investments are multipurpose, e.g. flood protection, hydropower generation, recreation and water supply, leading to problems in pricing and allocations.
- The large size of these investments often implies a long time-horizon for the return of the capital. In small economies with underdeveloped capital markets, these qualities have created problems for private investments.

In the past, the previous point was decisive for a large governmental role in the water sector even if the economy as a whole was organized as a market economy. Governmental agencies and government-owned enterprises were, as described above, central in the provision of most water-related services: irrigation, hydropower, drinking water supply, sewage collection and treatment, and flood protection. The economic analysis of the water sector in the eighties and nineties – the freshwater resource and the related infrastructure investments – led to the proposition of a different and to some extent smaller role of the government: a smaller role in the field of service provision and a more coherent role in the setting up of objectives, instruments and institutions.

The smaller role of the government has two aspects: decentralization and privatization of water services. *Decentralization* implies that the service provision is divided up on a regional or local level and, if possible, on a functional level, e.g. the responsibility for dams and bulk water supply are separated from local or regional water supply. This gives local decision-making a larger role in services provision and makes it more accountable. These local units could be municipalities or user-organizations. The objective of *privatization* is to make the service more efficient and more user-oriented and to gain access to international capital markets. This implies more than cost recovery and the absence of the misuse of the private monopoly position (overpricing, low quality service): the government must create the competition for the concession or competitive bidding for projects and a regulatory framework against monopoly misuse.

The change of the governmental role towards more coherence amounts to a national and sub-national water policy reform and an adjustment of the organizational

---

set-up. This economic reform program implies:

- Making water rights consistent with the limits of the resource

Usually rights to the water resource are defined as public property and use rights are granted to users by governmental agencies on a first come first serve basis. Private water rights are the exception, with the USA as the best known example. The total amount of user rights and private rights as well is often not defined in relation to the available resources, particularly for groundwater or with respect to instream flows other than barging. Whatever legal quality the water rights have, avoiding overuse requires that they should be allocated within the limit of the resource, including an agreed amount of instream use.

- Creating an efficient and fair mechanism for reallocation of water rights

As established uses are often based on past subsidies, and as alternative uses have different growth rates, it makes sense to provide mechanisms for reallocating water rights between users of one sector or among sectors when the water resource is fully used. The economists' proposal as a solution to this problem is to create water markets as they provide the seller with a incentive to save water. The role of the government here remains that of a regulator with respect to return flows and that of a facilitator.

- Regulating the externalities

The policy for pollution control remains a governmental responsibility, particularly with respect to setting the desired ambient quality of the water. These standards have to be set in relation to the main purpose of the water concerned, e.g. irrigation water, drinking water or a wetland with habitat functions for fisheries. Then, the questions about the relevant instruments arise and what emission sources have to contribute towards reduction.

- Making information available to all decision-makers and the public

The specific interdependencies among the various uses and their plans about future increases with water quantity and quality can be best assessed if all the information is available, particularly with current uses. With respect to surface water, this tends to be the river basin, in terms of groundwater the aquifer.

- Regulating service provision

The responsibilities for service provision and the role of private companies must be defined and the conditions for contracting have to be set to benefit from the potential

---

advantages of private sector participation: this includes transparent procedures for granting concessions and bidding for contracts as well as price regulation and quality control.

These principles were first summarized on a policy level by the OECD for its member states in the late eighties, when it defined water resources management explicitly including water demand management and groundwater protection (OECD 1989).

### **1.3 Integrated Water Resource Management as an International Policy Consensus and its Diffusion**

The 1992 Dublin International Conference on Water and the Environment and the freshwater chapter of Agenda 21 of the 1992 UN Conference on Environment and Development (UNCED) are considered to be the turning points for the newly defined policy consensus of an integrated water resource management in an international context. These two conferences filled a niche left by the Brundlandt-Report, published in 1987 and developed as a North-South policy consensus in 1985/86, as the report is rather negligent on water issues (Hartje 1998). The conferences were a reaction to the New Delhi Conference in 1990 which evaluated the rather disappointing achievement of the International Drinking Water and Sanitation Decade. The 1992 consensus evolved after considerable debate, particularly on transboundary issues, environmental impacts and water pricing (cp. Scheumann and Klaphake 2001) during the 2 years of PrepCom sessions, but the discussions later tapered off as there was no substantial opposition in sight.

The basis of the definition of integration can be derived from the Dublin Principles developed by water professionals at an UN-supported conference in 1992:

- No 1: Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
  - No 2: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
  - No 3: Women play a central part in the provision, management and safeguarding of water.
  - No 4: Water has an economic value in all its competing uses and should be recognized as an economic good (UNCED 1992).
-

The freshwater chapter of Agenda 21 of UNCED 1992 is built upon these Dublin Principles, but it was written in a different framework. It consists of seven program areas, each with a set of objectives, activities and means of implementation, consisting of financing, scientific and technological means, human resource development and capacity building (UN 1992).

The first of the seven program areas *Integrated Water Resources Development and Management* consists of the following core elements:

- Water as a part of the ecosystem, a natural resource and a social and economic good,
- Catchment basin of surface and groundwater as a basis,
- Integration of land- and water-related aspects,
- Identification and protection of potential sources of freshwater supply,
- Sustainable and rational utilization,
- Design and evaluation of projects and programs that are efficient and socially appropriate,
- Participatory policy-making and decision-making process,
- Emphasis on institutional, legal and financial instruments for its implementation.

These recommendations are mainly directed at national governments. In the case of transboundary water resources, the harmonization of strategies and action programs are called for. All these objectives have two deadlines: (a) the year 2000 for designed national programs, appropriate institutional structures and legal instruments in place; in the developing countries only if the new and additional financial resources are made available; and (b) the year 2025 to achieve the sub-sectional targets for water resource protection and water quality, drinking water supply and sanitation, water for sustainable urban development and water for sustainable food production.

Since there is no convention that commits states to an agreed set of elements for integrated water resources management, there is a process of continued redefinition and expansion. It is not restricted to the UN-agencies which achieved the consensus, although the Commission on Sustainable Development (CSD) and the Rio+10 process provide continuity on this level. The specialized UN agencies with water functions (e.g. FAO, WHO, UNESCO, UNDP, UNEP) have adopted the consensus and tried to integrate it within their responsibilities. Traditional professional global actors (ICID,

---

IWRA) in the water sector adopted the principles and new actors were established with the explicit purpose of disseminating them. The World Water Council was established in 1996 in Marseilles and the Global Water Partnership in the same year in Stockholm. Both of them, organized as networks with multi-sectoral and multi-institutional membership, are active in producing reports and organizing the World Water Fora. Subscribing to the policy consensus is a quasi-requirement for membership: the water experts of the World Water Commission of the World Water Council wrote a report on water security which contains a section strongly supporting IWRM, including a strong commitment to river basin management (WWC 1998). The commitment to IWRM, however, formulated in the ministerial declaration of the second World Water Forum in the Hague, co-organized by these two organizations, remains rather vague.

Such a vague commitment is not surprising as some of the principles remain subject to continued debate in the UN context, particularly along the North-South line, while others receive redefinition and different emphasis by individual states or other actors. The debating points are:

- The new additional financial resources which the G-77 countries called for and the Northern countries were less and less willing to provide: Official development assistance (ODA) declined by US\$ 20 billion between 1992 and 1998 (OECD/DAC 2000) if the historical share of 0.33 percent of gross national product had been maintained. Water continued to be an important sector of ODA, with water supply and sanitation experiencing absolute and relative increases (WHO/UNICEF 2000), but irrigation and hydropower becoming less attractive to private sector financing. A smaller share of ODA goes to projects with capacity-building objectives.
  - The next point of contention is the assessment of water as an economic good and the impact of this perception on poverty and income distribution. Economists and increasingly environmental and ODA agencies in OECD countries see the positive effects of full cost water pricing with a number of developing countries opposing cost recovery for social reasons. The proposed solution to target subsidies directly and transparently to low income groups has not convinced a number of governments, policy-makers and water professionals in the developing countries.
  - A related topic is the degree of private sector participation in funding and managing water resource projects. A shortage of public funds and experience with public sector or private water companies influence to a large extent the debate on a national level and then the international policy consensus. The North-South dichotomy along the two poles of the role assigned to the private sector is no longer valid.
-

- The reference to transboundary co-operation was vague in the language of Agenda 21, but it was still a point of debate even during the discussion of the CSD freshwater session in 1998 along the positions taken during the negotiations of the Convention on the Law of the Non-navigational Uses of International Watercourses, signed in 1997.

## **2 Implementing the Policy Consensus on a National Level**

The commitment of governments to Integrated Water Resource Management must be translated to considerable policy and institutional changes if the initial policy conditions are still supply dominated and the institutional structure is very fragmented. A number of countries changed their water policies and their institutional structure in the nineties, but not all changes measure up to the standards of the IWRM that the World Water Commission formulated. The institutional structure of the water sector is influenced by historical development, the general administrative structure (federal, unitary), the problems and priorities in water management and the constellation of organizational interests when changes are about to be decided.

The industrialized countries usually have water laws and institutions for integration in place, have the capacity established and have built most of the infrastructure for water services. They started to integrate water quantity and water quality and reduced the large point sources, moving towards cost-oriented water pricing even though the standard of the World Water Commission has been reached in only a few countries (OECD 1998a). The developing countries have a longer way to go as water laws must still be made coherent in a number of countries and the organizational capacity for monitoring, data management and policy advice needs to be developed. A coherent water quantity management often still needs to be established, particularly with respect to groundwater. Water quality regulations have been introduced, but the success of clean-up efforts are still lacking. Infrastructure investment needs are huge and pressing, but the changes in water pricing are slow.

### **2.1 Institutional Structure in Industrialized Countries**

On paper, the integration of water resource management is the accepted political objective among the OECD countries, but this consensus about the ideal water management has not been put into practice as a blueprint. Most industrialized

---

countries have a specific institutional structure in water management but there seems to be a strong influence of its general structure (federal, unitary character).

### 2.1.1 Organizational Set-up for Basic Functions

If one compares individual countries with respect to their ability to integrate water resources management one must distinguish the various functions that water resource management has to perform and how these functions are organized. The first function is the general *policy function*, i.e. the decision-making for general water laws, on functional responsibilities, policy objective and the financing system. The second function is *planning on a river basin level*. The third function covers the *allocation of water use rights among sectors and users*, particularly for abstraction and related to the fourth function which is the *control of discharges and discharge requirements*. As a fifth function, one should mention *service provision*, i.e. the planning, construction and operation of the infrastructure for water supply, drainage, sewage treatment, flood protection.

Considering France, England, Spain, the Netherlands, Germany and the USA as examples, the general institutional structure and the division of responsibilities according to function can be seen in the following table (Table 1). The three central states have relatively strong river basin organizations while the activities on a river basin level in the federal states rely more on co-operation among states. In the USA, there are additionally strong federal agencies for irrigation, flood protection and pollution control. The Dutch system relies to a limited extent on river basin units as the well-known waterboards are organized on a sub-basin level, or on a group of polders. Central policy functions are mostly within one major (environmental) ministry, the exceptions being the Netherlands with a dual system and the USA with an impressive fragmentation.

This picture would become more complicated if the responsibilities for water transportation and the control of agricultural non-point sources were to be included. The regulatory functions are assigned to the river basin authorities in England and Spain, however, not in France where an interagency structure is active. In Germany, the state water agencies have been integrated to regulate abstraction and discharges. In the Netherlands, the regulation is dispersed over different organizations as they are in the USA where the situations differ according to the state. Service provision has traditionally been decentralized (Germany, USA, Netherlands) or privatized (France, USA), with the privatization of water supply and sewage services in England and Wales as a new development. Large infrastructure services, bulk water supply and flood

---

protection often remained on a national level with specialized governmental agencies as the providers. With the privatization in England, the degree of user-oriented financing increased considerably, with the exception of tax financing for flood protection and river restoration. Subsidies are still quite common and vary across the countries, but irrigation and sewage tend to receive the highest share (OECD 1999a).

### **2.1.2 Recent Policy and Organizational Changes**

There have been a number of recent *policy changes* in the OECD countries, but they were more problem-driven and less determined by a political will to implement the international IWRM policy consensus. Here it makes sense to distinguish between temperate countries with industrial and urban uses dominating, and arid and semi-arid countries with irrigation uses competing to a substantial degree (Turrall 1998).

In the majority, the OECD countries belong to *the group of temperate countries* which is dominated by *water quality concerns* with respect to the safety of drinking water and its sources, and because of the strength of the environmental movement with ecosystem aspects as well. Here, the regulation of industrial pollution sources, but of urban sewage as well, improved the quality of surface waters to a considerable extent, but required considerable investment into the water infrastructure (OECD 1999a).

The concern with ecosystem health and the limits of traditional structural flood protection, as proven by a number of floods in the nineties, effectively limits the use of structural approaches and opened the use to non-structural approaches, i.e. to river restoration and to land-use planning solutions. But these changes have not been uniformly adopted among OECD countries; they tend to be expensive for public sources and individual sites receive priority: the Sacramento River, the Everglades in Florida, the lower Rhine for flood protection.

One of the major reasons for a lack of integration is that the fragmented organizational structure has not been fundamentally changed. Instead, in the nineties there were organizational and policy changes as a result of national problems and priorities. If the prominent examples of industrialized countries in water management are taken into consideration, only France, England and Wales had major changes, while the Netherlands, Germany, Spain and the USA only had fine-tuning changes.

France, the model country of the river basin-approach, established its Agences de l'Eau in the sixties and passed a new water law in 1992. This law introduced large, top-down basin-wide river management plans combined with bottom-up, local plans on a

---

sub-basin level, developed by a local commission defining the general objectives for use, development and protection of the water resources, ecosystems and wetlands (Barraqué et al. 1997). Since 1997 only a few of these sub-basin plans have been developed or are in preparation (Mostert 2000b). A second planned innovation by the Environment Ministry to introduce an integrated regulatory body for licensing and enforcement on a regional level did not materialize; but the existing agencies will develop a co-ordinated interagency regulatory procedure.

In England and Wales, the law concerning the privatization of water supply and sewerage services was passed already in 1989, but in 1990 a system of integrated pollution control was introduced, streamlining the licensing and enforcement process for large point sources. In 1996, the Environment Agency was established as a merger of the National River Authority and the Pollution Inspectorate as a unified licensing body, but remained organized on a regional level along river basins (Zabel and Rees 1997). However, it kept the public works dimension for flood protection. This agency was active in issuing Catchment Management Plans for consultation in the nineties. This did not seem satisfactory as the Agency was in the process of developing Catchment Abstraction Management Strategies in closer co-operation with users and with an explicit consideration of minimum instream flows.

In the Netherlands, the institutional structure of water management remained unchanged, with the exception of the concentration process of the water boards. Important changes on the policy level have been initiated in the area of flood protection along the Rhine and Meuse where non-structural solutions are receiving higher attention after major floods in 1993 and 1995. Changes towards privatization and a reform of the financing system are still being discussed (Mostert 2000b).

In the western part of Germany, the basic institutional set-up and the division of responsibilities remained with some changes on the Laender level, where the state environment ministries often merged with the agricultural ministries and where, in a number of cases, the sub-state licensing and enforcement agencies were reorganized. However, because of unification, the institutional structure in Eastern Germany was completely remodeled according to the structure of the western states. The federal water law was amended in 1995 with tightened emission standards and elements in the licensing procedure were changed. Privatization of water services was much debated, but the changes of the organizational structure in Eastern Germany resulted in a decentralization towards the municipal level and privatization as an exception.

---

Table 1: Organizational responsibilities of water management functions in six OECD countries

Function	England / Wales	France	Spain	Netherlands	Germany	USA
<b>Basic structure of management on a river basin level</b>	Environment Agency, regional offices	Agence de l'Eau (RBO)	Confederaciones Hidrográficas (RBO) (interregional rivers)	Rijkswaterstaat; Waterboards (differ by water body); Provinces (groundwater)	Laender water agencies; ARGE - Working Group (interstate rivers)	State water and environment agencies; Functionally specialized federal agencies
<b>General policy functions</b>	Environmental and Planning Ministry; Ministry for Agriculture, Fisheries and Food (flood protection)	Environmental Ministry, Water Directorate	Environmental Ministry, Water Secretary; Autonomous communities	Central Public Works and Water Ministry; Planning and Environment Ministry; Provinces	Federal Environment Ministry; Laender ministries; Federal-Laender interagency body (LAWA)	Specialized federal agencies; Interagency Task Forces
<b>Planning on river basin level</b>	Environment Agency (catchment management plans)	Agence de l'Eau; Large river basin plan (SDAGE); Local sub-basin plan (SAGE)	Confederaciones Hidrográficas (river basin plan)	Separate water management plans on national, provincial and municipal level	Laender plans on sub-basin level; ARGE interstate rivers	Exception, traditionally problem-specific, limited to a few basins; Interagency agreements
<b>Water allocation</b>	Environment Agency, regional offices	RBO (intersectoral allocation); Municipalities and irrigation organizations (local distribution)	RBO large scale; irrigation organizations	Water boards (surface water); Provinces (groundwater)	Federal water law, implementation by Laender agencies	State water rights; River compacts (surface water); States (groundwater)

Table 1 continued

Regulation of discharges	Environment Agency, regional offices	Environment Ministry, 22 regional directorates	RBO for discharge permits	Rijkswaterstaat / Provinces	Laender agencies	EPA /state agencies for pollution; FERC for hydro-power; ACE for wetlands
<b>Service provision</b>	Private water companies on river basin (water supply, sewage treatment); Drainage Boards (drainage); Environment Agency (flood protection)	Municipalities, private companies on a concession basis (water supply, sewerage, sewage treatment); sectoral ministries (flood protection)	RBO for resource development; bulk water supply; Irrigation association for local supply; Municipalities and private companies for water supply, sewerage and sewage treatment	Rijkswaterstaat; Water boards (flood protection, drainage, sewage treatment); Municipalities (water supply, sewerage); Private / public companies	Laender agencies (flood protection, bulk water); Municipalities; Private companies (water supply, sewerage, sewage treatment)	Municipal, private organizations (water supply, sewerage, sewage treatment); BoR, water districts (irrigation water); ACE (flood protection)
<b>Financing</b>	User prices for water, sewage collection and treatment (water companies); Community charges and general taxes for flood protection	Mostly user; Assessment, collection and distribution by RBO and local authorities; Subsidies for rural water supply, sewerage and sewage treatment (Paris region)	Mostly user; Low cost recovery for irrigation and water supply; Subsidies for RBO; National tax revenues and EU subsidies for sewerage and sewage treatment	Mostly user; General taxes for flood protection; Subsidies for sewerage	Mostly user; Independent of river basin, reflect cost of infrastructure; Federal subsidies for water supply and sewerage; Flood protection tax-financed (federal / state)	Mostly user; Federal subsidies for irrigation and bulk water in western states; Federal subsidies for sewerage treatment

Barraqué et al. 2000; Fredericks 1991; Kraemer and Jäger 1997; Mostert 1998; Mostert 2000a; OECD 1998a; Turral 1998; Zabel and Rees 1997. RBO=River Basin Organisation; ACE=Army Corps of Engineers; BoR=Bureau of Reclamation; EPA=Environmental Protection Agency; FERC=Federal Energy Regulatory Commission

In the United States, the fragmented organizational structure of water management evolved over the last century with the Environmental Protection Agency as the last addition in the seventies. The nineties did not see a major reorganization, nor were there major policy changes. The economics of water development projects and a Congress critical of the traditional development agencies limited federal funding for new traditional projects; increasing the financing of the existing infrastructure and changing cost sharing between the states and the federal government. But still, subsidies for water users in the USA are widespread (OECD 1999a). One could consider the introduction of the *no net loss* policy for wetlands announced in 1990 and reconfirmed in 1993 as an innovation, but here the relevant laws were passed and the responsible organizations were established in the seventies (Crosson and Frederick 1999). Part of this redirection are individual, location specific programs, ordered by congressional mandate in response to court actions aimed at mitigating environmental degradation, such as the restoration efforts of the Everglades, of the Sacramento River Delta and in the Columbia and Snake River Basin.

In the drier countries and regions in Southern Europe, western USA, and Australia, irrigated agriculture must be added as another important user. This has led to a consumption level exceeding the available supply, a situation similar to many dry developing countries, and creating enormous quality problems: the reduced role of the federal government in funding new projects in the American West at a highly subsidized rate can be considered a change as a result of rising cost, the obvious limits of the resource and environmental pressure. The upper Colorado states, however, consider themselves to be entitled to their share of projects which have not materialized yet (MacDonald 1997). The alternative for water reuse and reallocation via market-oriented transfers are now being tried, but they are considered to be of limited scale (Turrall 1998).

Water resource management in Spain can be characterized as moving out of the water development phase (Turrall 1998). The water law was amended already in 1985 to improve the existing set-of river basin organizations (Confederaciones Hidrograficas) and to improve the co-ordination on the national level. The National Hydrologic Plan (NHP) has the objective of balancing water supply and needs on a national scale. Because of a severe drought between 1991 and 1995, its first draft centered, in a classical supply orientation, on the provision of the necessary infrastructure (storage facilities and inter-basin aqueducts) for additional irrigated agricultural production in the southern regions. As a ministerial plan it was rejected by Parliament in 1994 (Garrido 1998). The NHP underwent considerable changes from its first draft in the nineties. As the economics of the augmented supply depended on the Common Agricultural Policy and the financial support of the EU, the alternative of reducing losses and modernizing the existing infrastructure was included to a larger extent in the second version. Parallel to the drought, the Spanish municipalities established savings programs on their own. The current plan, approved by the cabinet in 2001, still includes inter-

---

basin transfer and the necessary infrastructure. However, the modernization of the existing irrigation infrastructure will receive a higher share of the total investment than the inter-basin transfer, and the protection of instream flows and of wetlands is likely going to be the area for the political opposition.

The institutional development in Australia is considered best practice so far under dry agricultural conditions (Saleth and Dinar 1999). In 1994, the Council of Australian Governments signed a Water Policy Agreement which moved the water sector in the direction of Integrated Water Resource Management. As a reaction towards a number of problems in the water sector (localized overuse, increasing salinisation, loss of wetlands) the Agreement contains institutional and policy changes. They include the management of water abstraction with the goal of balancing consumptive uses and instream flows, separation of water resource management from standard setting, regulation and service provision, the introduction of full cost recovery for water services and the trading of water rights. The abstractions are based on water rights, which were separated from land rights in the 1980s, and which create the basis for the quantitative entitlements and metering. This Agreement is now implemented with deadlines for certain measures (e.g. full cost recovery for rural water supply by 2001) by the states, supported by federal grants (HLSG 1999). Unresolved are groundwater management, the question of water reuse and stormwater runoff, and the national water quality strategy. This policy change took place with intensive stakeholder involvement.

### **2.1.3 The Role of River Basin Organizations**

River basin organizations play a central role in the concept of Integrated Water Resource Management. Beginning with the Dublin Principles, the actors of international policy consensus emphasize the importance of planning and decision-making on a river basin scale, but not all propose river basin organizations specifically. The World Water Commission formulates the set-up of river basin agencies explicitly as an implementing mechanism (WWC 1998). The attractiveness of river basin organizations as an organizational solution to the integration problem probably lies in the fact that it creates the image of integration by itself. But the river basin organizations have to be co-ordinated with existing administrative units based on historical or administrative, planning, and economic boundaries, which are only in exceptional cases congruent with river basin boundaries. The structure and the severity of the co-ordination problem is influenced by a number of factors. Here the most important is discussed: the different functions involved in water management. The functional dimension dominates the discussion in the literature as functions are used to define the ideal river basin organization and to describe the various types used as empirical models (Mostert 1998; Briscoe 1994).

First, these functions (cp. Table 1) are used to develop a *normative set of guidelines for 'good' institutional structure of river basin management* (IHP 2000). There seems to be a

---

consensus on a set of minimum requirement of functions to be delegated to river basin organizations: planning, data gathering, modeling and water resource allocation. In combination with the participatory approach this set-up is expected to ensure that the available water and the various demands are balanced and the rules concerning allocation and reallocation, including those water markets, are politically accepted. An open question, usually to be answered from a central level, is the definition of the uses or users, particularly with respect to instream water uses and delta flows. A second level is the delegation of goal-setting competence to the river basin level with respect to water quality, either by explicitly allowing variation in terms of water quality or in terms of financing charges for pollution control (Holm 1988).

A consensus seems to be developing that the provision of water services beyond the delivery of bulk services, power generation and distribution, water supply, sewerage and irrigation supply should be separated from a river basin authority. Here, the literature points to the options of organizing utilities, e.g. investor-owned companies, local government-owned and beneficiary-owned service corporations as they provide measurable services and provide mechanisms for accountability (Frederiksen 1997). The picture seems less clear with respect to the infrastructure for drainage, flood protection and navigation. For drainage and flood protection, a nested approach along the spatial of basin and sub-basin is developing, with the navigation infrastructure maintained and operated separately. For the actors of the international policy consensus, this question seems to be of lesser importance.

The model of using river basin organizations as a tool for regional economic development seems to have lost its appeal (Barrow 1998); the integration of water resource management and land use, presented as an expanded objective, has a more environmental dimension to maintain water quality and the water retention capacity of soils.

The second purpose of *separating functions* in water management is to *analyse the empirical situation* as there are a number of types of river basin organizations observable in water management practice which differ according to the range of functions which they are assigned. The range varies from river basin authorities encompassing nearly the whole range of functions to a data collection co-ordinating committee. If one lists the various functions of water resource management and tries to classify the typical structure, it becomes clear that the set-up in each country is very specific and the typology can only provide a very rough picture. According to Teclaff (1996), it is useful to distinguish between river basin authorities, commissions and committees.

*River basin authorities* are the most comprehensive as they assume functions in water services and manage the river infrastructure, and they have the highest degree of autonomy. The Tennessee Valley Authority (TVA), the most cited example, owns and operates the dams, their hydroelectric facilities and the infrastructure on the Tennessee necessary for barging. It was involved in other services as the production of fertilizer, in soil protection and

---

forestry because the Authority was conceived as an economic development agency. In this sub-basin, the TVA displaced the Army Corps of Engineers as the federal functional agency for water development, but never managed a similar inter-organizational change with functional agencies in agriculture (Berthick 1974). It is, however, not involved in water supply and sewage services and in the regulation of water quality. With the large role in service provision, the TVA is rather unique among the industrialized countries. Similar models have been established on a broader scale in developing countries. The involvement of TVA in other services has been reduced and it has been changed to a government owned, bulk supplier of electricity.

The *river basin commission* is an organizational model which encompasses only water related responsibilities and includes only limited executive autonomy. It is more common among the OECD countries:

The Spanish River Organizations (Confederaciones Hidrograficas) are the most comprehensive as they cover all services from planning, data collection, water allocation, regulation, operation of river infrastructure to the supply of bulk water for agricultural user associations and for the municipalities.

The English Environment Agency with its river basin-based divisions covers the broadest range of functions from catchment planning, water allocation, regulation, data gathering and the building and operation of river infrastructure with respect to flood protection. It has lost its involvement in water services (urban water supply and sewage) due to privatization in 1989 which had been organized on a river basin scale in 1973 as a tribute to integrated water resource management. The Environment Agency now regulates the private water companies as a watchdog of the river quality while the functions of being the watchdog for the delivered piped water quality and pricing practices are performed by two other governmental agencies.

The French Agences de l'Eau have a strong role in planning on the river scale, data gathering and water allocation, but not directly by granting water rights or issuing discharge permits, but rather by raising use-related revenues redistributed to finance water and wastewater treatment facilities. These Agencies do not build, own and operate water services facilities or river-based infrastructure as their counterparts in England and Wales do. The water services are either privatized or decentralized on a municipal level. The infrastructure along the river are built and operated by separate functional governmental agencies. The regulation and enforcement of pollution control remains the responsibility of national functional agencies.

The fourth example comes from Germany with the Ruhrverband and its sister organizations of the Emscher, Wupper and the Lippe. These river basin organizations were established to build and operate dams, water supply and sewage treatment facilities on behalf of their members, the municipal and industrial water users. In addition, they plan water use on their respective sub-basin level and gather data, but they are subject to the control

---

and enforcement of state pollution control agencies. The focus on water supply and sewage treatment led to a considerable neglect of ecosystem aspects in the Emscher basin which was changed due to a major state restoration effort.

*Committees* have a more consultative and co-ordinating role and they are quite common, especially in federal states. Well known examples for the co-ordinating committees come from the USA and Germany. In the USA, seven federal-state river basin organizations were established in the sixties, based on the Water Resources Planning Act of 1965, which came close to the above co-ordinating committee type, but were effectively abolished in 1981 (Teclaff 1996). Rather selectively, a number of river basin organizations survived with several of them established prior to the 1965 Act. They tend to be interstate or federal-state compacts, concerned with water allocation, policy analysis and data gathering in the western states and pollution control compacts with varying coverage of functions. Multipurpose regulatory compacts are the exception, except for two basins, the Delaware and Susquehanna, which give broad powers to commissions similar to the English model, including the authority to build river infrastructure.

The German examples for the committee type are the co-ordinating bodies for river basins, covering more than one state which were all transboundary rivers: Rhine, Weser, Elbe. After unification, the Weser basin lies within the Federal Republic of Germany. These committees are called working co-operatives (Arbeitsgemeinschaften, ARGE) and were set up for data gathering, monitoring and policy analysis purposes. In the case of the ARGE Weser, a problem specific federal interstate compact was signed to reduce the Weser salt-load mainly dealing with the financing of the mitigation measures.

The concept of integrated river basin management is being revived in the industrialized countries, partially as result of the Dublin-Rio consensus, but also because of specific circumstances in a number of countries. The signing and revision of the Murray Darling Agreement in 1987/1992 constitute a major change in the management of this river basin, with considerably broadened functions of the Ministerial Council and the Commission, leading towards a cap on further abstraction in 1997. It was motivated by a number of environmental problems (salinisation, algal blooms) in the basin and the perception of the limits of the water resource (Pigram 1999).

A second sign is the passing of the Water Framework Directive of the European Union in late 2000 which will require its member states to establish water resources planning on a river basin level with a common timeframe for the next ten years. It is oriented mainly towards pollution control, but the necessary definition of river quality to be attained includes a number of ecosystem aspects and gives a major push towards cost recovery in the provision of water services. The organizational set-up to implement these requirements are to be decided by the member states, which are likely to continue along their traditional paths, but the requirement of integrated plans for transboundary rivers will increase the pressure

---

towards cooperation. The political basis for this directive were serious doubts about the process of water policy in the European Union, the existing range of directives and the cost implication of these directives for a number of member states (Kallis and Nijkamp 2000).

The weakest sign comes from the USA, where water policy came under review as well, as Congress mandated the US President in 1995 to establish a Western Water Policy Review Advisory Commission which was to recommend policy changes for the federal water policy. This commission came out strongly in favor of river basin management; its organizational recommendations centered on an internal reorganization of federal agencies on a water basin level to improve the co-ordination potential among these federal agencies and to pool their financial resources in a river basin trust fund, similar to the restoration efforts in the Everglades, the Sacramento Delta and Chesapeake Bay (WWPRAC 1998). As it focused on federal agencies, it attracted a negative response from the western states that felt inadequately dealt with.

## **2.2 Water Policy Reform in Transformation and Developing Countries**

Although the degree of water stress, the experience of the personnel and the economic situation varies considerably between the industrialized countries and the transformation and developing countries, one can discern in the second country group a trend towards a modernization of the water sector on a national level in the nineties. Here, the commitment towards integrated water resource management and an increasing role of river basin planning and organizations is increasing. As this change must be conceptualized as long and arduous, the various countries are at different points of this journey as the following examples show.

In the *transformation countries*, the legislation and institutional structure is being reorganized to a considerable extent. Here, plans for using river basin organizations are common (Bulgaria, Estonia, Poland, Romania), although their overall role remains to be determined (Kindler and Somlyódy 2000). For both groups of countries, the passed Water Framework Directive of the EU will influence the further institutional structure of integrated water resource management considerably as it requires river basin management plans by the year 2009.

In *Latin America*, reviews of water policies have taken place, water laws have been changed and river basin organizations introduced on a pilot level in Brazil and Mexico. The change of the Chilean water code in 1981 and 1988 attracted considerable attention as it introduced water use rights as private property and set up water markets with a national authority to register the water rights and not a river basin organization. The prominent role of water users organizations in financing investment projects provides the system with strong

---

integration elements on the quantity side, but the lacking use requirements of the water rights led to an unresolved conflict between agricultural and hydropower use due to speculation.

Mexico and Brazil are two countries experimenting with river basin organizations. Mexico started in 1989 with the Lerma Basin Council which was considered to be a success in resolving interstate conflicts and which was then extended to the valley of Mexico (Saleth and Dinar 2000). In 1992, the Law on National Waters was passed to regulate water uses and the National Water Commission charged with implementing it. Concurrently, the country is establishing 13 basin councils which will together with the states assume a larger role in water management. The provision of water services has been decentralized to user organizations for irrigation, and the municipalities and independent water utilities for urban water supply and sanitation (OECD 1998b).

In Brazil, the water sector changed considerably in the nineties as well, as the water policy competence was removed from the federal Ministry of Mining and Energy in 1995 and moved to a Ministry of the Environment, Water Resources and Legal Amazon. In 1997, the National Water Resource Policy Law passed which articulates a number of approaches along the international Dublin-Rio policy consensus. Part of this reorganization is the set up of a basin management system which takes the distinction between federal and state waters into account. They will issue water rights and charge for water use. The Brazilian states have to adjust their respective water legislation, and accordingly the planning and development role of the special federal agencies will diminish (Vadas 2000).

The conditions in *Sub-Saharan Africa* were characterized by a highly centralized public sector-dominated water sector. The institutional and professional capacities are weak and limited. The status of the water resources in terms of quantity and quality and ecological values is quite often unknown and the degree of awareness about the finiteness of the resource is rather limited (Sharma et al. 1996). Only a few countries have water policies and legislation addressing the issues of integrated water management. River basin organizations exist, but need reform as they were developed as investment agencies. The existing investments have deteriorated and the water resources have been degraded.

Nigeria has had a history of River Basin Authorities with a broad development mandate which they were not able to deliver (Orji 2000). They lost their agricultural functions in 1987 and a major reorganization effort started with a Resources Master Plan in 1995 and a Management Strategy in 1999. In South Africa, the water sector has been completely reorganized as part of the post-apartheid restructuring with the creation of a national Department of Water Affairs and Forestry, a White Paper on Water Policy and the creation of Catchment Management Agencies. These catchment agencies have a strong stakeholder approach with farmers, water distribution agencies and participating municipalities (Saleth and Dinar 2000).

---

The institutional situation in the Turkish water sector has not changed much. The Ministry of Environment has a co-ordinating role due to its functions in the Environmental Impact Assessment system established in 1993; but the State Planning Organization and the General Directorate of State Hydraulic Works dominate and maintain their resource development perspective. An exception in the stability of the institutional set-up is the transfer of irrigation networks to farmers, which is mostly the result of the continuing expansion of the irrigation infrastructure on the national budget (Scheumann 1997). The seventh Five Year Development Plan states as its objectives with respect to the water sector: besides a further expansion of irrigated area and the management transfer to users organisations, the increase of cost recovery and the introduction of river basin management (OECD 1999b).

*India*, a federal state with a strong central government, has not accomplished a comprehensive intersectoral water policy as its states have considerable authority in the water sector, but they differ in terms of technical capabilities, planning skills and financial resources which the federal government has not been able to overcome in a co-ordinated manner. A drought in 1987 led to the definition of a National Water Policy in the same year with the introduction of demand-side perspectives. The reduced financial governmental resources available to the water sector in the early nineties led to an increase of cost recovery and the establishment of basin-based semi-autonomous agencies (Narmada and Krishna valley) to attract external resources. The turnover of irrigation systems to users organisations has begun, but progress has been slow. In a few states the water administration has been reorganized along the river basin boundaries, but a major review of the water sector is underway in a joint effort between the Indian government and the World Bank (Saleth and Dinar 1999).

*Sri Lanka* has had a long experience with river basin organisations and development, e.g. the Mahaweli and Gal Oya schemes, but these were parallel to a number of sectoral responsibilities on the union and provincial government level. There is currently no legal or policy basis in place to direct the water sector towards integrated management. There are, however, two initiatives moving the country in this direction. One consists of the process of developing a water vision with broad participation, based on the input of the Global Water Partnership and the other, an Action Plan for Comprehensive Water Management plans a transition of the water sector with the national Water Resources Council and external donors and advisors (Saleth and Dinar 1999).

*Thailand* faced a severe drought in 1993/94 whose repercussions made the weaknesses of the Thai water sector in terms of fragmentation visible to the public. In 1996, a National Water Resources Committee was instituted to co-ordinate water management. It proposed a new basic water law, defining water rights and establishing river basin organisations. However, the proposed law must be submitted to the Cabinet for approval. For the mayor

---

river, the Chao Phraya, a comprehensive management strategy has been completed by the government, but the basic responsibilities of the various agencies and ministries involved still overlap and cause inconsistencies (ADB 2000).

*Vietnam* reorganized its water sector as part of the transition process, but the importance of the sectoral users and their ministries is still high. In 1998, the government enacted a Water Resources Law which established a system of water allocation through licenses, river basin organisations as the basis for water resources planning and a national water resources council as an advisory body (ADB 2000). The implementation of these provisions started with the Red river, the Se San and the Mekong river as examples. These activities are necessary for the management of the Mekong as a transboundary water as the Mekong River Commission found the data to support its planning and management activities *on the whole inadequate, fragmented and outdated* (ADB 2000).

### **3 Integrated Water Resource Management in Transboundary Waters**

The extension of the concept of Integrated Water Resource Management and particularly the concept of river basin management to the international arena by applying it to transboundary waters has already been explicitly formulated as an objective in the water chapter of Agenda 21. It was reiterated in the following UN documents and within the context of the global water networks, but usually formulated as an appeal for co-operation, reflecting the lack of consensus on concrete principles for the allocation of water rights as the negotiation process of the UN Convention on the Law of the Non-navigational Uses of International Watercourses 1997 reveals.

Although the lack of co-operation on international waters continues to dominate the public perception of international waters, the pervasiveness of international agreements and institutions fostering co-operation has been documented thoroughly by now (Beach et al. 2000). The high degree of co-operation is usually measured in terms of agreements concluded and violent conflicts avoided. If one looks at the degree of integrated management of transboundary waters then the picture is less impressive. A number of agreements deal with one purpose only, or combine two or three aspects, but the treaty or transboundary regime that manages its water in an integrated manner still is the exception: only concerning the Rhine and the Great Lakes have corresponding claims been made (Wieriks and Schulte-Wülwer-Leidig 1997; Donahue 1988), but a closer examination reveals the degree of integration which seems to be spreading on a bilateral or even regional basis.

To assess the degree of this change, it makes sense to *classify the existing agreements* on transboundary waters for which three groups are proposed here according to their prime purpose:

---

- Agreements allocating water

The primary purpose is to allocate the water quantity, mainly for domestic agriculture, usually in semi-arid, monsoon regions with favorable circumstances for intensive use: In two areas, an allocation formula has not been reached by the riparians (Jordan, Euphrates), in one transboundary water it has been developed by only two out of nine riparians with some of the remainders protesting (Nile). In some transboundary waters with an allocation consensus, the agreed claims are higher than the average flow (Colorado, Aral Sea basin rivers). They have been enlarged to include all water sources in the area, but the focus was mainly on securing additional supplies and monitoring the agreed allocation formula. Demand management and flexible allocation mechanisms are usually not part of the treaty, but they were issues on a national level (USA in the case of the Colorado as an exception).

- Agreements to develop joint projects and to provide a minimum flow for shipping

These developmental agreements are quite numerous as they correspond to the traditional water development paradigm when concluded in the sixties and seventies. Not all were successful in implementing their projects when they depended on external financing. When successful, an integration of the management of the resource took place, as in the case of the Columbia River; it was and is restricted to the agreed goals, here power supply, flood protection, navigation and recreation. In most of the cases, the link to river quality and other downstream externalities, e.g. the lack of floods for floodplain irrigation in the lower Senegal river, was not established (cp. WCD 2000).

- Agreements controlling pollution

These agreements started in the sixties and they were successful in reducing pollution parallel to the development of effective national water pollution control policies vis-à-vis large point sources. When agricultural non-point sources had to be included, it became obvious that technical solutions as add-ons were exhausted. The goals were broadened and the objective of water quality expanded to river quality. The Rhine commission and the Water Quality Commission of the Great Lakes started with ecosystem approaches.

There are newer developments in the nineties than can be considered supportive to the concept of IWRM within transboundary water agreements (Hartje 2001):

For the water allocation treaties, the distributive goals still dominate the debate, particularly in those cases where no permanent solution has been reached (Euphrates-Tigris, Jordan, Nile). But in those cases where an allocation has been agreed upon, at the time of the agreement, the allocation formula was not based on the principles of Integrated Water Resource Management. For the Colorado and for the tributaries of the Aral Sea the agreed allocated water is larger than the average river flow. An integrated perspective would have

---

included the share of instream uses, or the size of the residual claim of the river delta. In the extreme case of the Aral Sea, the decision-makers are well aware of this discrepancy, but the transformation phase of the former Soviet Union made the traditional over-allocation the only political acceptable solution before any downward adjustment in terms of reducing consumption could be agreed upon. In the case of the Colorado, it seems plausible that stream flows were overestimated, but the lack of concern over the water use of the river delta ecosystem can be used as an indicator of the lack of integration. Only recently, demand of the river for water to be restored and on the size of (technical) savings and potential reallocation providing the river ecosystem with sufficient water: for the Aral Sea, optimists and pessimists are arguing whether the region can sustain the economic impact of the necessary adjustment. For the lower Colorado and the Tijuana river, national interest groups on both sides are pushing for a broadening of water allocation for the delta ecosystem (Pitt et al. 2000). For the Nile, the ongoing negotiations can be seen as a broadening of the agenda from pure water allocation towards an integration with joint development goals (Peichert 2001).

Among the developmental transboundary water agreements, changes point towards a broader orientation beyond the planning and construction of individual projects. While there are still older agreements in Africa only with projects on the drawing board, agreements with single-purpose projects implemented broadened their objectives (Senegal operation of Manantali). The major change in the nineties was the SADC Protocol on Shared Watercourses which provides the framework for fifteen south African watercourses, the renewed agreement on the Mekong River Commission and the negotiating process on the Nile. A similar change took place with the 1998 Convention on Co-operation between Spain and Portugal on their transboundary rivers broadening the concern to sustainable water use from previous conventions focussing on hydropower utilization.

Among the agreements with water quality objectives dominating, a number of new agreements were concluded in Europe (Meuse, Schelde, Elbe, Odra, Danube; Bug, Narva), with a broad mandate including ecosystem health and in some cases (Elbe, Odra) flood protection. Among the previously established agreements, the coverage was expanded from water quality to flood protection. On the other continents, the agreements established in the 1970s and 1980s continue to operate and to implement specific programs to achieve water quality goals, particularly on the North American continent, but some of the bilateral agreements in Northern and Southern Europe as well. Because of the Water Framework Directive of the European Union and the enlargement process of the Union, the integrative perspective will have a broad coverage in terms of water quality and quantity, and a standardized format of setting river specific objectives and action programs.

---

#### 4 Trends and Perspectives

The Dublin-Rio consensus has achieved a considerable impact on water resources management on a global scale. The debate progressed from discussion of the advantages of integrated water resource management to the action agenda. A number of international development banks have revised their sector policy papers and adjusted their lending criteria accordingly (e.g. World Bank 1993; FAO 1995; BMZ 1995; IDB 1998).

Water policy changed in the direction of integration in the industrialized countries, based on an established institutional structure which is to a large extent able to provide the necessary information for decision-making. In most countries a major effort in water pollution control was successful with point sources. This effort changed the institutional landscape in the water sector already in the seventies and eighties. Changes towards a wider adoption of stronger river basin organisations might come from the implementation of the EU Water Framework Directive, but to a larger extent in the accession countries than in the old member states. The unitary states seem to be in a better situation to reorganize in a radical manner. The adjustment in the USA via special purpose agreement between established agencies might be another model to be followed by other federal states with a complex institutional structure.

Currently there is progress towards the integration of water quantity and quality issues, but the perspective of ecosystem integrity has recently been included in a number of new and revised agreements although its implementation proceeds only on a case by case basis. But here the pressure towards integration is mounting as *non-structural solutions in flood protection* are becoming debatable options and the *control of non-point (agricultural) pollution sources* remains unresolved. These two topics may lead to an effective integration of water management with land use policies.

*Decentralization and privatization* of water services climbed on the political agenda after the changes in England and Wales, including the reform in the water pricing systems. But the vague formulation of the EU Water Framework Directive with respect to *water pricing* shows that the Dublin-Rio consensus is difficult to implement even within a relatively homogenous group of countries as those in the European Union. Further progress might be difficult as the additional demands with respect to environmental quality and the replacement needs of the aging water infrastructure will lead to cost increases, while the political feasibility of passing them on to the water users is not ensured.

In the developing countries, the institutional structure was dominated by sector-specific user-oriented institutions with a development outlook and the capacity for policy analysis for an integrated perspective has often yet to be developed. Within the group of countries, there is a wide variety of institutional development, from the need to start nearly from scratch after civil war up to global scale analytical capabilities.

---

The national organizational structure of the water sector has been changed in a number of countries; but there countries where a review of the water sector has only led to limited changes: the speed towards integration varies as well. For those countries with major changes, the resulting degree of integration can only be assessed after the changes have been implemented. The national changes often involve the creation of policy analysis and advice institutions with an integrated perspective which are likely to keep the momentum. A parallel innovation is the introduction of river basin organisations as an option countrywide and the implementation with lead basins scale as learning steps which can be valuable in countries without prior experience in river basin management.

There are trends towards the separation of water services from overall water management, most visibly the turnover to user organisations in irrigation and decentralization and to some extent the privatization of urban water services. But these changes are at the beginning of the diffusion curve. The highly debated topic of water pricing has made considerable headway as the principle of water being an economic good faces less general opposition. But actually implementing price reform faces the opposition of the specific interests of users with resources and other arguments at their disposal. The investment needs and the budgetary situation, however, are economic forces which will continue to push for higher cost recovery.

This survey of recent changes in water sector management hopefully revealed for both country groups that the circumstances of policy and institutional change will determine the actual changes to be decided and implemented. There are a variety of factors influencing this decision-making-process, from the definition of a problem during a national political water crisis up to relative political strength of different water users and the restrictions of public funds. The term *political feasibility of the options*, however, introduced by Allan et al. (2000) to assess the chances of implementing the concept of integrated water resource management, should be a core concept for the future.

---

## References

- ADB, Asian Development Bank 2000: *Environments in transition: Cambodia, Lao PDR, Thailand, Vietnam*, Manila.
- Allan, T., K. Motadullah, A. Hall 2000: The role of river basin management in the vision process and framework for action up to now, in: *International Hydrological Programme, River Basin Management. Proceedings of the International Workshop, The Hague, Oct 1999, IHP-V Technical Documents in Hydrology, No. 31, Paris*, pp. 127-139.
- Barraqué, B., J.M. Berland, S. Cambon 1997: Frankreich. In: Correira et al. (Eds.): *Institutionen der Wasserwirtschaft in Europa. Band 1 Laenderberichte*, Berlin-Heidelberg, pp. 193-325.
- Barrow, C.J. 1998: River basin development planning and management: A critical review, in: *World Development, Vol. 26 (1)*, pp. 171-186.
- Beach, H.L., J. Hamner, J.J. Hewitt, E. Kaufman, A. Kurki, J.A. Oppenheimer, A.T. Wolf 2000: *Transboundary freshwater dispute resolution. Theory, practice and annotated references*. Tokyo, New York, N.Y.
- Berthick, M. 1974: *Between state and nation, regional organisations of the United States*. Brookings Institution, Washington, D.C.
- Briscoe, J. 1994: Implementing the new water resources policy consensus: Lessons from good and bad practices. Paper for VIIIth World Congress of the International Water Resources Association, Cairo.
- BMZ, Bundesministerium fuer wirtschaftliche Zusammenarbeit und Entwicklung 1995: *Überlebensfrage Wasser – eine Ressource wird knapp*, Bonn.
- Clarke, R. 1993: *Water: The international crisis*, Cambridge, Mass.
- Crosson, P., K.D. Frederick 1999: Impact of federal policies and programs on wetlands. Resources for the future, Discussion Paper 99-26, Washington, D.C.
- Dinar, A., A. Subramanian 1997: *Water pricing experiences: An international perspective*, World Bank Technical Paper No. 386, Washington, D.C.
- Donahue, M. 1988: Institutional arrangements for Great Lakes management, in: Caldwell, L.K. (Ed.): *Perspectives on ecosystem management for the Great Lakes*, pp. 115-139.
- Falkenmark, M. 1989: The massive water scarcity now threatening Africa – why isn't it being addressed?, in: *Ambio, 18(2)*, pp. 112-118.
- FAO, Food and Agriculture Organisation 1995: *Water sector policy review and strategy formulation: A general framework*. FAO Land and Water Bulletin, No. 3, Rome.
- Frederick, K.D. 1991: Water resources: Increasing demand and scarce supplies. In: Frederick, K.D., R.A. Sedjo (Eds.): *America's renewable resources. Historical trends and current challenges, Resources for the future*. Washington, D.C., pp. 23-78.
- Frederiksen, H.D. 1997: Institutional principles for sound management of water and related environmental resources, in: Biswas, A.K. (Ed.): *Water resources, environmental planning, management, and development*, New York, San Francisco, pp. 527-577.
- Garrido, A. 1998: Economic analysis of water markets in the Spanish agricultural sector: Can they provide substantial benefits?, in: Easter, K.W., M.W. Rosegrant, A. Dinar (Eds.): *Markets for water: Potential and performance*. Boston, Dordrecht, London, pp. 223-239.
-

- Hartje, V. 1998: Die Thematisierung der Wasserknappheit und ihre Wirkungen auf die Wasserpolitik, in: Hartje, V., H. Ermel (Eds.): Wasser - Kultur- Politik, Wechselwirkungen und Optionen, Berlin, pp. 1-28.
- Hartje, V. 2001: Integrated water resource management in transboundary watercourses, e-discussion paper, Institute of Environmental and Landscape Planning, Technical University, Berlin.
- HLSG, High Level Steering Group on Water 1999: Progress in implementation of the COAG water reform framework. Report to COAG, Occasional Paper No. 1.
- Holm, K. 1988: Wasserverbände im internationalen Vergleich, ifo Studien zur Umweltökonomie, No. 3, Munich.
- IDB, Inter-American Development Bank 1998: Integrated water resources management in Latin America and the Caribbean. ENV-123, 12, Washington, D.C.
- IHP, International Hydrological Programme 2000: River basin management. Proceedings of the International Workshop, The Hague, Oct 1999, IHP-V Technical Documents in Hydrology, No. 31, Paris.
- Kallis, G., P. Nijkamp 2000: Evolution of EU water policy: A critical assessment and a hopeful perspective, in: Zeitschrift für Umweltpolitik und Umweltrecht, Vol. 23(3), pp. 301-335.
- Kindler, J., J. Somlyódy 2000: Water for the 21st century: Vision to action: Central and Eastern Europe. Edited by Central and Eastern Europe Regional Technical Advisory Committee of Global Water Partnership, Paper for the second World Water Forum, The Hague.
- Kraemer, R.A., F. Jäger 1997: Deutschland. In: Correia et al. (Eds.): Institutionen der Wasserwirtschaft in Europa. Band 1 Länderberichte, Berlin-Heidelberg, pp. 13-188.
- MacDonald, J.W. 1997: The upper basins' political conundrum: A deal is not a deal. Report to the Western Water Policy Review Advisory Commission, Washington, D.C.
- Mostert, E. 1998: River basin management in the European Union, in: European water management, Vol. 1 (3), pp. 26-35.
- Mostert, E. 2000a: Water resources management in the Netherlands. In: Canali, G.V. et al. (Eds.): Water resources management. Brazilian and European trends and approaches, Porto Alegre, pp. 103-119.
- Mostert, E. 2000b: Models for river basin management in the Eurowater countries. In: Canali et al. (Eds.), pp. 193-207.
- OECD 1989: Water resource management: Integrated policies. Paris.
- OECD 1998a: Water management: Performance and challenges in OECD countries. Paris.
- OECD 1998b: Environmental performance review: Mexico. Paris.
- OECD 1999a: The price of water: trends in OECD countries. Paris.
- OECD 1999b: Environmental performance review: Turkey. Paris.
- OECD/DAC 2000: 1999 Development cooperation report, Paris.
- Orji, O.A.C. 2000: An overview of river basin management in Nigeria, in: International Hydrological Programme, Oct 1999, pp. 219-222.
- Peichert, H. 2001: The Nile Basin Initiative: A promising hydrological peace process, this volume.
- Pigram, J.J. 1999: Towards upstream-downstream hydrosolidarity: Australia's Murray-Darling River Basin. Paper presented at the Stockholm Water Symposium, Stockholm.
-

- Pitt, J., D.F. Luecke, M.J. Cohen, E.P. Glenn, C. Valdés-Casillas 2000: Two nations, one river: Managing ecosystem conservation in the Colorado River Delta, in: *Natural Resources Journal*, Vol. 40(3), pp. 819-864.
- Postel, S. 1989: *Water for agriculture: Facing the limits*. Worldwatch Paper, No. 93, Washington, D.C.
- Saleth, R.M.; A. Dinar 1999: *Water challenge and institutional response: A cross-country perspective*. World Bank Policy Research Working Paper No. 2045, Washington, D.C.
- Saleth, R.M.; A. Dinar 2000: *Institutional changes in global water sector: Trends, patterns and implications*. In: *Water Policy*, Vol. 1(2), pp. 175-199.
- Scheumann, W. 1997: *Managing salinization: Institutional analysis of public irrigation systems*, Berlin.
- Scheumann, W., Klaphake, A. 2001: *Freshwater resources and transboundary rivers on the international agenda: From UNCED to Rio+10*, Bonn, Paper of the German Development Institute. Bonn.
- Sharma, N.P. et al. 1996: *African water resources: Challenges and opportunities for sustainable development*. World Bank Technical Paper No. 331, Washington, D.C.
- Teclaff, L.A. 1996: *Evolution of the river basin concept in national and international water law*. In: *Natural Resources Journal*, Vol. 36 (2), pp. 359-391.
- Turrall, H. 1998: *Hydro logic? Reform in water resources management in developed countries with major agricultural water use*. Overseas Development Institute, London.
- UN, United Nations 1992: *Report of the United Nations Conference on Environment and Development, Chapter 18, Protection of the quality and supply of freshwater resources*, A/CONF.151/26 Vol II, New York.
- Vadas, R.G. 2000: *The São Francisco River Basin*, in: *International Hydrological Programme River Basin Management*, Oct 1999, pp. 97-114.
- WHO/UNICEF 2000: *Global water supply and sanitation assessment 2000 report*, Geneva.
- Winpenny, J. 1994: *Managing water as an economic resource*, London, New York.
- World Bank 1993: *Water resources management, A World Bank policy paper*, Washington, D.C.
- WCD, World Commission on Dams 2000: *Dams and development: A framework for decision-making*, London-Sterling Va.
- Wieriks, K., A. Schulte-Wülwer-Leidig 1997: *Integrated water management for the Rhine river basin, from pollution prevention to ecosystem improvement*, in: *Natural Resources Forum*, Vol. 21(2), pp. 147-156.
- WWC, World Water Vision Commission Report 1998: *A water secure world. Vision for water, life, and the environment*, URL: <http://www.worldwatercouncil.org/reports.htm>
- WWRPAC, Western Water Policy Review Advisory Commission 1998: *Water in the West: Challenge for the next century*, Washington, D.C.
- Zabel, T.F., Y.J. Rees 1997: *Vereinigtes Koenigreich*. In: Correira et al. (Eds.): *Institutionen der Wasserwirtschaft in Europa*, Band 1, Berlin, pp. 583-759.
-