



# **Institutions for Integrated River Basin Management in Latin America**

**Cecilia Tortajada**

**2002**

## RESEARCH REPORTS

The **Third World Centre for Water Management** was established in Mexico in 1999. The Centre is a unique institution in the water sector, in terms of its philosophy, its inter-sectoral and multidisciplinary approach to problems solving and its modus operandi. These are based on the following assumptions:

- The water management processes will become increasingly more and more complex in the coming years.
- Tomorrow's water problems cannot be solved on the basis of analyses of yesterday's problems and using day before yesterday's solutions.
- Increasingly many of the emerging water problems and their solutions will come from outside the water sector and the water profession.
- Implementable solutions have to be case specific. For example, solutions that are feasible in France, Germany, UK or USA may not be applicable in China, India, Egypt or Mexico, because of differing climatic, physical, economic, social, environmental, legal and/or institutional conditions.
- A single paradigm may not be equally valid, or operationally applicable, for all countries of a non-homogenous world, which are at different stages of socio-economic development, irrespective of its conceptual attractiveness.

One of the main objectives of the Centre is to disseminate water-related information covering all aspects of water development and management, in both industrialized and developing countries. Towards this end, the Centre has published many books by major international publishers, some of which have been translated into several languages. The **Research Reports** and the **International Journal of Water Resources Development**, which is one of the leading journals on water-related issues in the world, help to achieve this objective. It is hoped that these information would be useful to decision-makers, scientists, government, research institutions, non-government organizations, media, and other people interested in water resources management anywhere in the world

The Centre welcomes comments on its activities, outputs and publications.

Sincerely,

**Asit K. Biswas**  
**President**

## **ABOUT THE AUTHOR**

### **Dr. Cecilia Tortajada**

is the Vice-President, Third World Centre for Water Management in Mexico. She has been an advisor to major international institutions like FAO, UNDP and CDG, and the Governments of Cameroon, India, Turkey, and Republic of Congo. She is currently working on sustainability of water resources development in developing countries; management and planning strategies for the water sector; development of environmental and social strategies for water projects; and review of environmental policies. She is the Editor of the International Journal of Water Resources Development, and member of the Editorial Board of Water International. She currently chairs the Mexican National Committee in International Water Resources Association (IWRA). She is the former Vice-Chairman in the Committee on International Cooperation of International Impact Assessments (IAIA).

© 2002

Copyright. Third World Centre for Water Management

Permission of the Centre is necessary if sentences or paragraphs from this report is to be quoted.

# Contents

ABSTRACT	1
INTRODUCTION	1
LATIN AMERICAN EXPERIENCES: Brazilian Experiences Mexican Experiences	2
CONCLUDING REMARKS	9
Acknowledgements	10
References	11

# INSTITUTIONS FOR INTEGRATED RIVER BASIN MANAGEMENT IN LATIN AMERICA\*

---

*Cecilia Tortajada*

## ABSTRACT

Latin America is moving towards the concept of river basin management. However, one cannot prejudge the results of this shift, since integrated river basin management is a very complex subject, as are its institutional arrangements. On the basis of the present analysis, it can be said that nearly all of the river basin organizations in Latin America need significant evolution before they can become effective units for management and planning. Further decentralization in terms of authority, decision-making and financial and human resources and the enhancement of institutional capacities are prerequisites if these institutions are to become viable units for efficient water resources management in the future.

## INTRODUCTION

Many Latin American countries became interested in river basin organizations in the late 1960s and the early 1970s, mostly in an attempt to replicate the experiences of the Tennessee Valley Authority (TVA) in the United States. The TVA was considered to be a good example of river basin development in the 1950s and 1960s, but since then its shortcomings have become increasingly apparent, and also the potential replicability of TVA-type institutions in developing countries has been seriously questioned since the late 1960s. Some Latin American countries, and a few other countries like India, tried to replicate the TVA experiences, but without much success.

The approach to use river basins as a management unit in the region could also be partly explained by the then prevailing national policies that favoured a regional planning approach which could create development poles to ease the pressures on the urban and industrial centres and also simultaneously contribute to the economic development of the poorer regions of a country. The TVA model was generally viewed as a possible way to achieve further development and industrialization of the countries. Several regional development corporations were established on the basis of river basins, e.g. river basin commissions in Mexico towards the end of the 1940s and the beginning of the 1950s (Barkin and King, 1986; Garcia, 1999).

The approach to manage river basins as a unit of development and/or management was, however, not extensive. The general concept received wider acceptance in the 1990s, when the interest in river basin organizations became more widespread not only in Latin America but also in many other parts of the world. This interest, however, stemmed not from the use of river basin units as poles of decentralized development, as was the case earlier, but mainly due to a general shift of world opinion towards integrated water resources management. It was felt that a broader approach, based on integrated management compared to infra-structural development *per se*, might provide a better solution to the existing water scarcity and quality problems. This accelerated interest resulted in the establishment of river basin organizations in several Latin American countries (Garcia, 2000).

The French and the British experiences on river basin management were noted with considerable interest in many Latin American countries. However, these European experiences were never critically and objectively analysed to determine to what extent these could be the most optimal units for water

---

\* This paper was published in *Water Development* 17(3):289-301

management, and their relevance and potential replicability under differing physical, environmental, social, economic, legal and institutional conditions of Latin America. This accelerated interest in river basins has already resulted in the formation of several regional institutions like the Latin American Network for Watershed Management, and regional networks such as the Latin American Network of Basins Organizations (LANBO).

At the regional level, many bilateral and multilateral commissions were created, like the Bermejo and Pilcomayo Commissions, Inter-Governmental Plata River Commission, the Amazon Cooperation Treaty, etc. (Biswas, *et al.*, 1999; Cordeiro, 1994). At the national level, there was a general trend towards the establishment of river basin organizations in several Latin American countries during this period. However, even though many central institutions have started a process of decentralization (mainly for the agricultural sector), for all practical purposes a centralized top-down management structure along sectoral lines continues to be in place, in spite of the creation of many organizations at the river basin level.

### **LATIN AMERICAN EXPERIENCES: THE CASES OF BRAZIL AND MEXICO**

Geographical, economic, political, social, legal and institutional considerations have been the main drivers for the improvement of the water management practices in different Latin American countries. Furthermore, it should be noted that Latin America is not a homogeneous region, and nor are all the countries at the same level and stage of socio-economic development. In addition, the level of overall expertise available to manage water efficiently may vary tremendously from one Latin American country to another. Thus, any single institutional model is highly unlikely to be equally applicable for efficient river basin management for all the countries. In spite of this fact, the region as a whole appears to be moving towards river basin management, although one cannot prejudge *a priori* the results of this shift at present. The concept of idealized situations, where things were designed to be “as they should be”, is also gradually giving way to a more pragmatic approach, where watershed management activities must conform to constraints imposed by real situations, where things are “as they are” (Garcia, 2001).

Historically and traditionally, the Latin American countries have been heavily centralized in terms of planning, management and decision-making, and the water sector is not an exception to this general trend. Hence, simple adoption of a policy advocating decentralization in terms of river basin management organizations is unlikely to succeed. The mind-sets of senior officers of the water ministries must change, but there are no signs that this is happening at present in all the countries that are establishing new institutions for river basin management. They must believe that decentralization and delegation of authority are essential for improving the water management practices. Unless the current decision-makers of the centralized institutions genuinely believe in the benefits of decentralization, any attempt to decentralize will continue to remain rhetorical for all practical purposes. Politically such statements have proved to be useful at least over a short-term, but the process itself is unlikely to succeed, as often appears to be the case at present. In addition, irrespective of the consideration as to what may be the best unit for river basin management, human and financial resources will continue to remain important constraints for rational planning and management of water resources in Latin America, whether the process remains centralized or becomes decentralized. Centralized or decentralized institutions cannot function efficiently without management and technical expertise, as well as timely availability of necessary funds.

In Latin America, Brazil and Mexico are the only two countries where river basins organizations are legally mandated at present. Analyses of river basin management practices from these two countries are discussed next as an illustration of the present status of the application of the concept.

### **Brazilian Experiences**

Brazil is one of the most advanced countries of the region in terms of river basin management. Geographically, Brazil is by far the largest Latin American country. It has three large river basins (Amazon, Tocantins and São Francisco) and two other groups of river basins (Plata and the remaining rivers that flow to the Atlantic). The Plata river basin includes the Paraná, Paraguay and Uruguay rivers. Finally, the Atlantic river basin complex includes the following: Atlantic North, Atlantic Northeast, Atlantic East I, Atlantic East II and Atlantic Southeast (Tucci and Clark, 1998).

Historically, the regional economic development in Brazil has been heavily dependent on the hydropower sector, which has received many special privileges compared to the other water sectors like irrigation, industrial and municipal water supply, and navigation. In fact, during the late 1970s, most of the dams in the country were constructed primarily for hydropower generation. They were thus basically single purpose developments, and multiple uses of water did not receive adequate attention. Accordingly, the institutions responsible for generation and management of hydropower became very powerful, both politically and financially, certainly at a level that was significantly higher than the irrigation-related institutions.

Brazil is a federal nation. In terms of legislations, many of the Brazilian states have formulated their own laws, mainly because of the delay in developing a national water law by the federal government. Along with the legislation, most of the states also progressed towards the establishment of river basin committees. Legal and institutional frameworks are currently being developed on important issues like the establishment of water agencies, committees, norms, information systems, introduction of water tariffs, water permits, etc. The institutional framework at present includes the National Water Resources Council, with the authority to manage and plan the water resources at the national, regional and state levels. It approves the guidelines for the permits for water use and withdrawals. It is also the final arbitration stage for inter-stage conflicts. Water agencies act as executive secretariats for the river basin committees and implement their decisions. The responsibility for the management of water resources in the country is vested in the federal government. Thus, it has the majority voting power in the Council, 50% plus one vote, in terms of decision-making (Garrido, 2001; Porto *et al.*, 1999).

The National Water Law was approved in 1998. However, the law for the State of Sao Paulo already existed from 1991; the State of Ceara, approved its law in 1992, and during the subsequent three years, five other states followed their example. Issues like integrated water resources management, river basins as management units, provisions for public participation and provisions for water pricing, were common in the laws of several of the states (Porto *et al.*, 1999).

In the case of the State of Sao Paulo, the Water Resources Law was approved by the State Congress for the 1992-96 period. This time period, however, did not coincide with the terms of the Governor and the State Congresspersons, which began in 1995. Fortunately, however, this overlap allowed sufficient time for the newly elected representatives to get acquainted with the approved plan, and then prepare a new plan for the following 4-year period. A regular evaluation of the plan is being done through an annual report prepared by the executive office of the State Water Resources Council for each management unit. During the development process of the plan, there were frequent interactions between the State Plan and the basin plans developed for the various management units. The State Plan provided the overall direction and technical and economical mechanisms for the orientations of the basin plans and programmes. The basin plans, on the other hand, focused on programmes for sustainable development of the specific management units. Other important points in the process were decentralization of the planning process which enabled the water management units to propose their own development programmes, ensured consolidation and integration of the basin plans at the State level and the consideration of interfaces with other states, regional, municipal and urban plans. Once the State plan is formulated, it is reviewed by the State Congress, and following its approval, it becomes a law (Braga, 2001).

Under the Brazilian law, the river basin committees are considered as coordinating units which bring together the different stakeholders to discuss the various problems and decide on possible solutions with the objective of protecting the natural resources within the river basin, especially in terms of water resources. The committees can act within the entire river basin, including sub-basins, any tributaries to the main streams, and group of neighbouring river basins or sub-basins.

The composition of the river basin committees varies in the different states (Porto, 1998). In the state of Sao Paulo, the committees consist of representatives of three groups: state government, municipalities, and stakeholders (professional associations, universities and organized groups interested in the region). Each group has one-third of the representatives. In the state of Santa Catarina, 20% of the representatives are from the state government, 40% from the municipalities and organized civil society, and 40% from the stakeholders. In the state of Ceara, there is no specific number for the seats for any of the sectors: the only stipulation is that the state government and the municipalities should have the same number of representatives.

In the state of Ceara, it is COGERH, a bulk water company at the state level, which currently plays the role of water agency for all the state river basins. It was after the COGERH showed positive results in the management of bulk water (with the participation of stakeholders) and after water users were better organized at the reservoir level, that COGERH organized the river basin committees (Porto & Kelman, 2000). This is an interesting case, which shows that traditional river basin organizations are not always what is needed for an efficient water resources management. What is necessary instead is an efficient organizational structure which helps to solve the specific water problems of a region.

Some examples of efficiency of river basin organizations are demonstrated by experiences in the states of Sao Paulo and Ceara. The state of Sao Paulo is divided into 20 water management units according to watershed or basin boundaries and social and economic indices. For example, in the Piracicaba river basin, agreements have been reached on water allocation for minimum flows, industrial withdrawals and effluent dilution, during the monthly meetings of the commissions between water supply utilities, power sector companies and industrial sector. In the state of Ceara, 80% of the conflicts have been sorted out not in the courts, but within the committees (Porto, 1998).

A preliminary assessment of the water resources of the state of Sao Paulo indicated that the management units located in the eastern part should have priority in implementing integrated water resources planning. It was decided that the management units for the Upper Tietê, Piracicaba and Baixada Santista rivers should be treated simultaneously. Thus, a plan was prepared (HIDROPLAN), which took into consideration the multidisciplinary nature of water resources planning and its interrelations with other sectors of the economy. The plan was conceived to be dynamic, and was based on different scenarios for future water demands for different uses in the watershed, including wastewater management, pollution control, electricity generation, urban water supply, etc. Seven development alternatives were generated for this plan, from which the most optimal one was finally selected (Braga, 2001).

It has been recognised in Brazil that in order to implement water management at the river basin levels, issues like decentralization, water permits and water pricing should be promoted, and appropriate legal and institutional frameworks need to be developed. Even when there are no perfect processes, a more efficient water resources management can be achieved, if it is realized that the institutional frameworks should respond to the specific needs of the regions, accommodating hydrologic, social, political and cultural differences.

### **Mexican Experiences**

In Mexico, water demands have historically been met through the construction of new infrastructure, without questioning either the validity of consumption patterns or the efficiency of the existing water use



practices. Therefore, adequate considerations have not been given to the dual problem of water scarcity and the increasing costs of supplying it.

At the end of the decade of the 1940s, the Mexican government embarked on large-scale water-based regional development programmes. The first river basin commissions (Papaloapan, Grijalba, Tepalcatepec and Balsas) were established to coordinate the activities of the different ministries working in the several states of the region, where the programmes were initiated. The funds for this large-scale investment programmes were allocated to the commissions, as well as a wide spectrum of responsibilities. The commissions were designed to be dependent on the federal authority responsible for water: they had no autonomy. These river commissions proved to be reasonably effective instruments for the implementation of the regional policies of the country. Their tasks included not only financial matters at the regional levels, but also planning and coordination activities, which were earlier the responsibility of ministries and governments at the state level.

The main investment programmes of the commissions included initiatives like water resources, construction of irrigation projects, programmes on flood control and hydropower generation. However, they were also responsible for expenditures for roads, schools, public health issues, and so on, in the regions. The power, and thus efficiency, of the several commissions has depended historically on the priority the region has had at the national level. Their main weaknesses, however, have been that they were created as coordinating and advisory units, with no power to force any public or private institutions to comply with any legislations, or to question any unwarranted environmental and social impacts (Barkin & King, 1986).

Later, during the 1960s and 1970s, large-scale rehabilitation projects were undertaken to increase the productivity of the existing irrigation districts. Plans for large-scale river basin transfers (Cutzamala and Lerma-Balsas systems) were developed to expand the irrigated areas in the north-west of the country, as well as to ensure a source for future water supply to the Mexico City Metropolitan Area (Tortajada, 2000a).

The apparent abundance of financial resources in the country during the late 1970s and early 1980s reinforced the notion that water could be supplied at any cost, even if the cost was not covered by the consumers who benefited from increasingly subsidized water services in the cities as well as in irrigated areas. However, the economic and financial crisis of the 1980s had a definite impact on water development. As the federal government faced serious budget constraints, most water investment programmes were reduced to a minimum, certainly far below of what was needed to meet increasing demands, not to mention closing existing gaps in water services. Available resources for investment programmes were further reduced by increased federal subsidies for operating and maintaining water services in cities and irrigated areas. In addition, these subsidies were insufficient, which further contributed to the progressive deterioration of water infrastructures.

In 1989, the National Water Commission of Mexico (CNA) was created by a Presidential Decree as the sole Federal authority to deal with water management as an autonomous agency. Initially it was part of the Ministry of Agriculture and Water Resources. However, shortly after the Earth Summit at Rio de Janeiro in June 1992, CNA was moved from the earlier Agriculture and Water Resources Ministry to the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP, 1997), now Ministry of Environment and Natural Resources (SEMARNAT). Even though institutionally CNA is part of SEMARNAT, for all practical purposes, it has continued to function as an independent agency.

The policy framework for water resources management in Mexico is defined by several laws. The main one is the Mexican Constitution (1917), which states that water resources of the country are national property. It stipulates that they are under the control of the Federal government. The Law on National Waters (1992) and the Federal Law on Water Excise Taxes set the regulatory, economic and social frameworks for water management. The Law of National Waters establishes the broad objectives for the development and

implementation of the plans and the policies for water resources management. The responsibility for implementing the law has been assigned to the CNA. The Law for Ecological Balance and Environmental Protection (LGEEPA) (SEMARNAP, 1997) defines the environmental regulations, and the General Health Act establishes the standards for drinking water.

The Regulations of the Law of National Waters was amended in December 1997 (Anon., 1997), with the objective of defining the structure of the river basin councils, as well as to enforce the participation of the appropriate authorities and the water users in the development, implementation, updating and evaluation of the river basin planning processes. According to Article 13 of the Law,

Following a decision by its Technical Council, the Commission (CNA) shall establish basin councils to coordinate and liaise with the Commission, Federal, State and Municipal departments and agencies; and representatives of users of the hydrological basin in question, with a view to formulating and implementing programs and actions to improve water administration, development of water infrastructure and the respective services, and the preservation of basin resources. Within the scope of the basin councils, the Commission shall agree with the users on any temporary limitations to existing rights in the event of emergencies, extreme scarcity, over-exploitation or declaration of protected areas. In such circumstances, residential use shall have priority.” (Anon., 1997).

The amendments of the Law also consider concessions and water rights. Following these modifications, the government transferred the control of the irrigation districts to the farmers, who became responsible for the operation, maintenance and administration of the irrigation systems. The Law also allowed private investment for the construction of irrigation and drainage infrastructures.

At present, the river basin councils are expected to manage water resources from integrated and regional perspectives, and involve water authorities at the federal, state and municipal levels, as well as the various users. For operational purposes, the basin councils define four territorial levels: basin, sub-basin, micro-basin and aquifers, where the bodies are respectively known as councils, commissions, committees and groundwater technical committees (COTAS) or *Comites Tecnicos de Aguas Subterraneas* (Dourojeanni, 2001).

By law, the River Basin Councils have to approve the river basin plans which, once integrated within the National Water Master Plan, become mandatory for the federal government, and indicative for the local and the state governments and water users. Bottlenecks and necessary actions and resources needs are to be identified and evaluated and unrealistic or unfeasible situations are expected to be fed back into the regional planning process (Tortajada, 2000b). With the objective to manage the water resources of the country in a more coordinated way, Mexico has been divided in regions and sub-regions, with 13 regions defined on the basis of the hydrology of the country, and 102 sub-regions on the basis of political jurisdictions. Each sub-region included a number of municipalities of the same state, so that regional programmes could be planned at the sub-regional level. At present, there are 314 hydrological basins, 37 hydrological regions and 13 administrative basins in the country. About 25 river basin councils, out of the 26 that were planned, have already been established, but are mostly not functional yet.

After 70 years of continuous hierarchical water management and planning practices, the country still lacks knowledge, experience and expertise as to how best to structure the councils from a decision-making viewpoint, and also to ensure that the relevant interest groups can coordinate among themselves within the overall framework of the councils. Among many other constraints faced by these river basin councils are the lack of knowledge and expertise on the economic, social and environmental aspects of water; no clear understanding as to the process by which water policies could be formulated for the country and what such policies should contain; reluctance by the central authorities to disseminate reliable data and information on the status of the water quantity and quality in the country, lack of appreciation by the authorities on the

importance of stakeholders' participation, need for the use of proper economic instruments like water pricing and demand management, high levels of corruption, etc. (Castelan, 2000).

Most of the river basin councils at present are not yet operational: they are in the process of organization. The councils continue to be coordinating units that can only make recommendations to the authorities and the users. Even though the Law of National Water stipulates that the river basin councils can develop and implement programmes for the construction of hydraulic infrastructures which could be considered to be strategic, the fact remains that because the councils have not yet been fully functional, they do not have any say in the planning, design or operation of any major water infrastructure in the country. If and when they become fully operational, it is yet to be seen as to whether the central authorities will allow the councils to use their decision-making powers on important issues, or if they will continue with their traditional centralized decision-making.

It should be noted that in the most advanced basin council in Mexico, the Lerma-Chapala, master planning and resulting infrastructure operations have been subject to joint decision-making processes in which the CNA no longer exercises the sole responsibility. The recent surface water agreement in the Lerma-Chapala basin, originally proposed by the CNA-dominated technical working group, required several modifications by the concerned states and users before it was accepted. While the CNA still plays a dominant role, this case appears to indicate that counterbalancing objectives have made limited inroads in the decision-making process (Scott, 2001).

In theory, the basin councils have representatives from the federal and the state governments from the water and other sectors like the Federal Power Commission, Mexican Oil Company, academia, NGOs, and regional committees for the users of the different sectors (industrial, agricultural, drinking water providers, services, etc.). Specific commissions and committees can be established within the councils only when there are specific problems, i.e., evaluation, regional considerations, or groundwater. However, it should be noted that the users of water are only those who have titles to withdraw and use water, and citizens and organized civil society cannot be part of the discussions at the basin level, until and unless they are first acknowledged and invited by CNA. Recent experiences indicate that CNA invites only those parties that are acceptable to this institution (Tortajada, 2000c). Unfortunately, stakeholders with independent, and even objective views are not invited to participate. Another main constraint is that representation of the water users. Even though participants from different sectors attend the meetings, regrettably they do not necessarily represent the views of the majority of the stakeholders of their sectors.

Within the councils, not all members have the right to vote: only the representatives of the users, and the state governments and the President of the council have voting rights. The rest of the participants have only the right to express their opinions, which would not be taken into consideration, until and unless CNA considers them to be appropriate (Castelan, 2000). The basin councils can be considered within the country as virtual bodies. In the case of the Lerma-Chapala basin, until very recently, most of the member states of the basin councils declined to participate in any meetings arguing that the legal framework did not give them any rights or responsibilities. At present, however, and irrespective of the fact that neither the legal nor the institutional frameworks have been modified, the representatives of the different sectors have realised that their participation is essential, if changes in the regions are to be achieved. Such attitudinal changes are likely to result in more participation and in more autonomy for the stakeholders, who are gradually becoming actors instead of being spectators (Guerrero-Reynoso, 2000).

By law, the basin councils are primarily coordinating agencies at present, whose only role is to make recommendations to the federal government and the users on specific issues. Unfortunately, however, as noted earlier, their creation responds more to broader decentralization trends at the national level which still have not been achieved, rather than the realisation of the needs to manage water resources more efficiently within a regional perspective. The main constraint regarding river basin management is not that the councils

are not entitled to develop any regulations or execute any administrative or legal action. If the councils were operational, they would have a very important role to play as coordinating bodies. The main problem is that the overall operational framework to manage water resources at the basin level is still not functional in the country. The legislation exists, but it is still not clear what would be the operational functions of the councils, or how the councils are to be included in the administrative structure of the country at the administrative level with state and municipal governments, so that they could complement and support each other. So far, only 1 out of the 25 river basin councils that have been created is operational. In most cases, the councils do not even have staff or offices, not to mention implementable plans or financial support (Guerrero-Reynoso, 2000).

The present problems of water scarcity in many river basins arise not only because of lack of water but also due to unacceptable water quality and poor management practices. The demands from all different uses and users are increasing rapidly, but the management expertise and financial resources of the concerned institutions are increasing only incrementally. Unless these trends are reversed, the water situation of the country is likely to get worse. Additionally, the main focus of water planning and management is still vested in one single institution at the central level, which has been unable thus far to respond to the increasing needs of the sector. Even though 25 river basin councils have been established thus far, the legal framework to give them autonomy, funds and responsibilities has yet to be developed. The Mexican government has still not formulated, let alone implemented, strategies to decentralize the functions, responsibilities and funds from CNA, and transfer them to the basin councils and/or to the appropriate authorities at the regional, state or municipal levels. On the basis of their performances so far, the existing basin councils cannot be considered to be viable units for water management at the regional levels. At best, they could be considered to be advisory institutions that are subordinate to the interests of CNA. Fundamental changes will be necessary if they are to become successful institutions for regional water management (Castelan, 2000; Guerrero-Reynoso, 2000).

In the case of the Lerma-Chapala basin (specifically in the states of Guanajuato and Queretaro, two of the five states which are part of the basin), new institutional arrangements have been put in place for the management of water resources. Bodies known as COTAS (Technical Committees for Groundwater according to CNA, and Technical Water Committees, according to the State Commission of Water and Sanitation in Guanajuato, now Guanajuato State Water Commission) have been established with the objective of reducing serious over-exploitation of the aquifers. This is done through the development of new criteria for water allocation, with the participation of several water users. Even though this is an innovative alternative, it is still not enough, since only two of the states that are part of the basin (Guanajuato and Queretaro) have COTAS, which, in addition, are managed with totally different approaches.

According to the CNA, the COTAS should depend on the federal government, financially as well as in terms of authority. This naturally limits their actions and efficiency. However, the government of Guanajuato has supported the COTAS as a true means for decentralization, both from institutional and financial viewpoints. The main problem is that the CNA is still not willing to give up its decision-making role and economic power. The COTAS are not empowered with any legal authority, and thus are not likely to enforce any agreements or contribute to the reduction of the over-exploitation of the aquifers in the state (Marañón-Pimentel and Wester, 2000). It is worth noting that when the state of Guanajuato developed its own master plan, which was formulated by the local experts, considering the local problems and proposing local alternatives, it faced very strong opposition from the CNA throughout the plan formulation process. It is evident that the central government is only willing to transfer programmes, but no resources or authority (Guerrero-Reynoso, 1999).

It is urgent to modernize the water sector of Mexico, not only in terms of laws and institutions, but also in terms of overall management practices. The problems have become more complex due to the inadequate

management and technical capacity, and the slow, and often inappropriate, responses of the sole central institution responsible for water management. Fortunately, however, the country as a whole is changing. The regions are asking for a greater role in the planning, management and decision-making since water projects affect the lives of the people through various pathways. These are undoubtedly positive indications that may improve the institutional efficiencies to manage water rationally in the coming years. Additionally, a new Administration took over in Mexico in December 2000. However, it is still early for the Administration to define an institutional strategy for water management for the coming six years, which is its present life. It is now evident to any objective analyst that the “business as usual” is not a strategic option that can be adopted for the future, especially if the nation wishes to improve its present dismal water management record in terms of quantity, quality, equity, environment and socio-economic performances.

## **CONCLUDING REMARKS**

River basin management institutions in Latin America are predominantly based on the British and the French models. Direct technology transfer from Western Europe to Latin America is replete with examples of limited successes and failures, since Latin American conditions are very different compared to those pertaining in France or England. Thus, unless the Western European river basin models are adopted carefully to suit the conditions of the specific Latin American countries, such institutions are unlikely to succeed. Regrettably, very little serious and objective work has been done so far to decide how these European models could be modified to suit the regional conditions. In fact, research on institutional aspects of river basin management in Latin America is conspicuous by its absence.

Even though the current momentum in Latin America is moving towards the concept of river basin management, one cannot prejudge the results of this shift. Integrated river basin management is a very complex subject, and there is no clear consensus among the water experts as to what issues are to be integrated, through which processed and by whom. Until the results from these new management units are available, and they are compared with other alternative institutional arrangements, no definitive conclusions can be drawn as to which should be the preferred route. Among the main constraints in the region is the general lack of interest of the institutions to seriously consider social and environmental implications of their actions, and to analyse their performances objectively and critically. It is now clear that these constraints are often contributing to the reduction of the overall cost-effectiveness of projects, and equitable distribution of their benefits and costs. Such neglects may even contribute to the long-term deterioration of the quality of life of the population; wastage of funds invested, and may some times eventually lead to the failure of the projects. However, this lack of interest in environmental and social issues is not necessarily limited to water institutions at the basin level: it often permeates through the entire institutional system of federal and state levels of bureaucracies. In addition, irrespective of the consideration as to what may be the best unit or institution for river basin management, human and financial resources are likely to remain as the main constraints for water resources management in Latin America for many years to come.

Only two countries in the region, Brazil and Mexico, have developed legal and institutional frameworks for river basin organizations as units for water resources management. In other cases, where river basins organizations exist, they are not necessarily within the national policy-making framework, which makes their operation more complex. However, while the existence of legal and institutional frameworks within the national policy-making is important, it does not assure either that the river basin organizations will be fully functional or that they would be supported by the administrative structures of the countries concerned.

Unfortunately, the traditional concept of river basin organizations is now being increasingly considered to be as the only alternative available for decentralized water resources management, primarily because it is the prevailing global trend. In the long run, this may or may not prove to be the best option for the Latin American countries. On the basis of currently available data, it is clear that the units for water management

have to be objectively reviewed, especially as river basins are not the only management units available in terms of the most effective and operational institutional arrangements, even though they are the most widely promoted alternative at present. Management at the regional or state levels may also prove to be appropriate for Latin America. Conclusions should not be drawn *a priori* that the river basin management units are the most efficient alternative.

Until and unless the water institutions of Latin America are reformed and strengthened, it is somewhat unlikely that the water needs of the countries of the region will be met successfully and cost-effectively in a timely manner. In the final analysis, it is the institutions which formulate the water policies, and who are also responsible for their implementation. River basin organizations are not an exception. Without institutional reforms, it is highly unlikely that water management practices can take a new direction, irrespective of whatever units are considered for management. Institutional reforms are urgently needed to meet the evolving water needs of the society, and also to meet the complex challenges of the 21<sup>st</sup> century.

### **ACKNOWLEDGEMENTS**

The comments of Christopher Scott, Luis Garcia, Andrei Jouravlev and Monica Porto on an earlier draft of this paper are gratefully acknowledged.

## References

- Anon. (1997) *Ley de Aguas Nacionales, su Reglamento y Ley Federal del Mar*, 4<sup>th</sup> edn (Mexico City, Mexico, Delma).
- Barkin, D., & King, T. (1986) *Desarrollo Economico Regional* (Enfoque por Cuencas Hidrologicas de Mexico), Siglo XXI Editores, 5<sup>a</sup> edición, Mexico City, Mexico.
- Biswas, A. K., Cordeiro, N., Braga, B., & Tortajada, C. (1999) *Management of Latin American River Basins: Amazon, Plata and Sao Francisco*, Water Resources Management and Policy Series (United Nations University Press, Tokyo).
- Braga, B. (2001) Integrated River Basin Planning and Management: The Upper Tiete Experience in: A. K. Biswas & C. Tortajada (Eds) *Integrated River Basin Management, The Latin American Experience* (New Delhi, Oxford University Press).
- Castelan, E. (2000) Los Consejos de Cuenca en el Desarrollo de las Presas en Mexico, Seminario Internacional sobre Asignacion, Manejo y Productividad de los Recursos Hidricos en Cuencas (International Water Management Institute, Guanajuato, Mexico).
- Cordeiro, N. (1994) El Manejo de Cuencas Hidrográficas Internacionales. Ponencias de los Plenarios del II (Congreso Latinoamericano de Manejo de Cuencas Hidrográficas. Mérida, Venezuela).
- Dourojeanni, A. (2001) Experiences in the Formation of Basin Bodies, in: *Iberoamerica, XI Jornadas de Derecho del Agua* (Zaragoza, Spain).
- Garcia, L. (1999) Review of the Role of River Basin Organizations (RBO) in Latin America, , (Washington, D.C, Inter-American Development Bank).
- Garcia, L. (2000) Institutional Framework for Integrated Water Resources Management in Latin America. Some Experiences from the Inter-American Development Bank. (International Workshop on Water Policies and Institutions, Salvador, Brazil).
- Garcia, L. (2001) Experiences in the Preparation of Watershed Management Projects in Latin America, in: A. K. Biswas & C. Tortajada (Eds) *Integrated River Basin Management, The Latin American Experience* (New Delhi, Oxford University Press).
- Garrido, R. (2001) Brazilian Water Resources Management: a panoramic view, in: A. K. Biswas & C. Tortajada (Eds) *Integrated River Basin Management, The Latin American Experience* (New Delhi, Oxford University Press).
- Guerrero-Reynoso, V. (1999) Hacia una Gestión Integral, Descentralizada y Participativa del Agua: Experiencia y Propuestas del Estado de Guanajuato. (Seminario sobre Enfoques Innovadores para el Manejo del Agua, México D.F., México).
- Guerrero-Reynoso, V. (2000) Proposal for the Decentralization of Water Management in Mexico by means of Basin Councils. (International Workshop on Water Policies and Institutions, Salvador, Brazil).
- Marañón-Pimentel, B., & Wester, P. (2000) Respuestas Institucionales para el Manejo de los Acuíferos en la Cuenca Lerma-Chapala, México, IWMI, Serie Latinoamericana 17, México.

Porto, M. (1998) The Brazilian Water Law: A New Level of Participation and Decision Making, *International Journal of Water Resources Development* 14 (2), pp. 175-182.

Porto, M., Porto, R. & Azevedo, L. G. (1999) A Participatory Approach to Watershed Management: The Brazilian System, *Journal of the American Water Resources Association* 35 (3), pp. 675-683.

Porto, M., & Kelman, J. (2000) Water Resources Policy in Brazil. *Rivers* 7 (3), pp. 250-257.

Scott, C. (2001) Personal communication.

SEMARNAP (1997) *Ley General del Equilibrio Ecológico y Protección al Ambiente, Delitos Ambientales*, ISBN-968-817-385-1, México, D.F., México.

Tortajada, C. (2000a) Water Supply and Distribution in the Metropolitan Area of Mexico City, in: J. I. Uitto & A. K. Biswas (Eds) *Water for Urban Areas, Challenges and Perspectives* (Tokyo, UNU Press).

Tortajada, C. (2000b) Sustainability of Water Resources Management in Mexico, Third World Centre for Water Management, Mexico City, Mexico.

Tortajada, C. (2000c) River Basins: Institutional Framework and Management Options for Latin America, WCD Thematic Reviews, Institutional Processes V5, Third World Centre for Water Management, Mexico.

Tucci, C., & Clarke, R.T. (1998) Environmental Issues in the la Plata Basin, *International Journal of Water Resources Development*, 14 (2), pp. 157-173.