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# Water management *and river basins* in Latin America

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The sustainability of development remains an academic concept unless it is linked to clear objectives that must be attained in given territories and to the management processes needed to achieve this. Management of the natural resources located within the area of a river basin is a valuable option for guiding and coordinating processes of management for development in the light of environmental variables. In order to turn environmental policies into concrete actions it is necessary to have suitable management bodies, which are normally very complex. The establishment of such bodies means generating a public/private system which is not only financially independent, socially oriented and sensitive to environmental aspects, but must also act in a democratic and participative manner. In the past, the idea of establishing bodies to guide the management of the natural resources of a river basin (especially water, of course) has aroused the interest of the countries of the region, with varying results. This interest has now become an urgent necessity, in view of the greater competition for multiple water use and the need to check pollution and manage the environment correctly. This article considers some of the essential elements which must be taken into account when proposing to set up such bodies, puts forward some concepts on management at the river basin level and identifies the various ways in which the subject can be approached, and offers some recommendations for improving policy formulation and the functioning of integrated systems for the management of water resources and river basins.

# I

## Sustainable development and river basins

One of the biggest concerns at present, at least to judge from policy statements, is to find viable development options based on equitable and lasting economic growth. The latter consideration has gained in importance in recent years because of the realization that many alleged advances, especially in terms of changing production patterns, have been outweighed by the damage they cause to the environment.

The greater awareness and understanding that now exists of mankind's interaction with the environment, and the vulnerability of forms of development which do not take this into account, have been made more explicit by the addition to the word "development" of the qualifying adjective "sustainable". Since sustainability should be implicit in the very concept of development, this adjective should be only a transitory addition that will be needed only until the vital importance that development should be of a lasting nature is definitively incorporated in the concept.

On the other hand, the sustainability of development remains only an academic idea or abstract aspiration unless the concept is linked both with clear objectives that must be attained within a given area that contains the natural elements and resources needed for the subsistence of the human race and with the management processes needed to achieve those objectives. Political intentions must be transformed into concrete policies for implementation, and it is here that the greatest challenges arise.

In the Latin American and Caribbean region, there has been widespread reference to environmental problems, theories have been put forward on environmental issues, laws have been enacted, and even some Ministries of the Environment have been set up. What has not been done, however, is to lay the necessary bases for the management of each of the natural resources—water, soil, forests, fauna, minerals and energy— or of certain key natural areas such as coastal strips, river basins and deserts.

This means that very broad goals have been set without deciding on the necessary steps for reaching them. Territorial organization for the management of each resource and later of the environment in general; organization and training of the population; research on ecosystems; the establishment of systems of management for given areas; the strengthening of public institutions (especially the municipalities) to provide support for environmental management; awareness and heightening of the economic value of natural resources; the keeping of natural heritage accounts, and the preparation of operating manuals and rules are essential aspects for making real progress in the management of natural resources and the environment in general.

The management of natural resources in the context of the dynamic evolution of a river basin, more generally known as river basin management, is one of the possible options for organizing the participation of users of natural resources within the process of environmental management. A river basin is uniquely fitted to serve as the basis for the coordination of the actions of all those involved in the use of a shared resource—water—and for the evaluation of the effects of environmental management measures on that resource. Water quality largely reflects the environmental management capacity within the basin in question.

A first step towards river basin management is to limit action to the management of the water resources existing within the area of the basin. Water management is a complex process designed to control the cycle of a natural resource whose availability is erratic and irregular over time and space. Furthermore, water is vulnerable to the treatment it receives, since it can easily be polluted, thus affecting all its actual or potential subsequent uses.

The aim of this process is to solve conflicts among multiple users who, whether they like it or not, depend on a shared resource. Consequently, even though they may have water use concessions or rights, they nevertheless affect and depend on each other. The supply

usually comes from a common system, to which surpluses and effluents are returned. Surface, ground and atmospheric water resources, together with the areas of evacuation, thus form a single unit.

The actions taken have enormous repercussions on human health, the environment and production, so that they must be approached in an outstandingly technical manner. The high cost of the works involved, together with the long lead times of water projects, make it all the more necessary that manage-

ment should be in the hands of experts whose tenure does not depend on political changes.

Finally, the water management process requires that many different agents should act in a coordinated manner in spite of their differences of approach and the fact that some of them are not aware of the effects of their decisions on the hydrological cycle. This is why it is so important to have stable coordination mechanisms and, at the very least, a permanent river basin centre or authority.

## II

### Characteristics of water and watersheds

A watershed is an area which is defined by nature itself,<sup>1</sup> essentially by the limits of the run-off areas of surface water converging towards a single water-course. The watershed, its natural resources and its inhabitants have physical, biological, economic, social and cultural qualities which endow them with their own special characteristics.

Physically, a watershed represents a natural area of collection and concentration of surface and ground water and therefore has an essentially volumetric and hydrological connotation. At the same time, both the watershed and, above all, the water collected in it represent a source of life for mankind, though it can also be a source of danger when extreme natural phenomena take place or it is affected by pollution.

In mountainous areas, river basins are natural arteries for communications and trade integration, either along the rivers that run through them or the peaks that separate them. In other words, there are close-knit mechanisms of interaction among their inhabitants which endow them with special economic and social conditions.

In river basins with a big flow of water and wide, relatively flat valleys, the line of the river also becomes an area of interrelation of the inhabitants, especially through the use of the river for navigation, transport and communications.

The territory of the river basins facilitates relations among those who live in them, even though they may be grouped together in different communes or other politico-administrative subdivisions, because of their common dependence on a shared water system and road network, and because they face common dangers. When there are no systems for reconciling the interests of the various actors who depend on a river basin, there are bound to be conflicts among them.

All this is particularly true in inhabited mountain watersheds, but it is also true in broad river basins where there are water use projects that benefit the inhabitants as a whole and thus create a sense of interdependence among them.<sup>2</sup>

In river basins, it is all too easy to see the negative effects of human actions on the environment, especially in the form of water pollution. This is recognized, for example, in the explanation of the reasons for the establishment of watershed agencies in France: it is noted that water is an element which serves as the home and sustenance of the animal and vegetable kingdoms, and that watercourses or bodies of water and their banks form a very special biological whole. Thoughtless human actions affecting any one of their component elements upset this

<sup>1</sup> In the words of Guillermo Cano and Joaquín López, "God established the watersheds as natural limits of river basins. For their political and administrative needs, however, men have traced other dividing lines which generally intersect and do not coincide with the natural divisions" (Cano and López, 1976).

<sup>2</sup> A problem in Spanish is that there are no generally accepted terms which distinguish clearly between watershed and river basin, which are usually represented by the same term, "cuenca", possibly qualified by some clarifying adjective.

precarious balance, and the entire natural environment suffers as a result. Consequently, harmonious management of water resources requires: i) above all, recognition of the fact that a watershed or hydrogeological basin forms a single unit; ii) awareness that recognizing and preserving this unity is an essential condition for satisfying in the best possible manner the water demands of the different users; iii) definition of specific objectives appropriate to each area or territory, and execution of the works and

actions needed to attain such objectives; iv) acceptance of the idea that all users have a legitimate right to water and that, consequently, each of them is also subject to corresponding even-handed limitations on their own water use.

A river basin is a natural unit which lends itself well as an administrative area for the coordination of management processes designed to ensure sustainable development. Water management processes, however, involve their own forms of complexity.

### III

## The river basin as a territorial option for directing environmental management processes

The territory covered by a river basin is not, of course, the only area within which development actions can be directed and coordinated in order to take account of environmental considerations. The limits of the surface waters which form the river basin do not necessarily coincide with those of the ground water, obviously do not cover the areas of the seas and oceans where much of the hydrological cycle is generated, and are not so relevant in relatively flat areas or extremely arid regions.

The use of the territory of a river basin for environmental management purposes is therefore merely one option, whose validity will depend on the geographical characteristics of the environment. It is an important option from the environmental standpoint because, as already noted, it furthers coordination among the users of a single shared resource, such as water, and above all facilitates monitoring of progress in pollution control, through its effects on water quality. This does not mean, however, that the territory of a river basin is the only space needed for management of natural resources or the environment in general.

This observation is important for doing away with the mistaken belief held by some persons that the entire development of a region or its environmental management can be carried out solely on the basis of limits corresponding with those of river basins. It could be said that taking account of the limits of river

basins is a necessary condition for incorporating environmental aspects, especially those relating to water and its "associated" resources, but it is not sufficient as an area of jurisdiction for managing human development.

In this sense, it is vital that all management projects at the river basin level should be carried out with due regard to their relations with management systems that operate on the basis of other limits, especially political and administrative ones, among which the municipalities are of prime importance. It must be clearly understood that in order to carry out river basin management processes successfully it is essential to coordinate the actions of the various public and private authorities operating in the area of the basin.

Thus, river basin management projects which take account of the municipalities, such as that carried out with the participation of 74 such authorities in the River Chicamocha basin in Colombia (Acero Suárez, 1993, pp. 13-17), have a much greater chance of success if the municipal authorities are responsible for the execution of some actions in the project. Likewise, a municipal programme to improve the environment or prevent negative effects on it must also take into account the influence of river basins partly or wholly corresponding to its area of jurisdiction.

At the level of larger river basins, the same relationship should exist between the authorities of areas

with political and administrative limits and those of areas with natural limits. Thus, for example, those in charge of a project for the development or integrated management of a major river basin should coordinate their activities with the authorities responsible for the development of the

broader region in which the river basin is located. There have been many cases in which the lack of such coordination has resulted in one of the two authorities (i.e., the river basin or regional authority) absorbing the other, or else there has been a situation of permanent conflict between the two.

## IV

### Definitions and scope of management processes at the river basin level

Management at the river basin level has made a great deal of progress in the region, but in spite of these advances there is still no consensus on the name to be given to such management. The lack of clear concepts in this respect still militates against the exchange of experience among countries, leads to overlapping of functions, and above all hinders the formulation of policies and laws on this subject.

Table 1 summarizes and orders the concepts and terminology used in dealing with the subject of management at the river basin level in Latin America and the Caribbean. It has been laid out as a matrix relating the stages in such management with the objec-

tives of that process, defined in terms of the amounts of elements and resources covered by the management. In this way, it seeks to facilitate understanding of the actions that can be coordinated in a river basin and the objectives pursued through such coordination. It has also been considered useful to try to clarify some additional difficulties raised by certain differences in terminology between English and Spanish, for which purpose some terms are given in both languages. It is hoped that this attempt to clarify the terminology will help to secure a clearer understanding of the concepts behind river basin management objectives.

TABLE 1

Management at the river basin level: stages and objectives

Management stages	Objectives of management		
	Use and management of water resources of the basin	Use and management of all natural elements and resources of the basin	Integrated use and management of all elements and resources and of man-made infrastructure for the development of the basin
Initial stage	Studies and formulation of plans and projects	Studies and formulation of plans and projects	Studies and formulation of plans and projects
Intermediate (investment) stage <sup>a</sup>	Water resources development ( <i>Desarrollo o aprovechamiento de recursos hídricos</i> )	Natural resources development ( <i>Desarrollo o aprovechamiento de recursos naturales</i> )	River basin development ( <i>Desarrollo de cuencas</i> )
Permanent (operational) stage <sup>b</sup>	Water resources management ( <i>Administración de recursos hídricos</i> )	Natural resources management ( <i>Manejo de recursos naturales</i> )	Environmental management ( <i>Gestión ambiental</i> )
Watershed management ( <i>Manejo de cuencas</i> )			

Source: Prepared by the author.

<sup>a</sup> Investment in order to develop the basin with a view to using and managing its natural resources to promote human development.

<sup>b</sup> Operation and maintenance of man-made works and management and conservation of natural elements and resources.

The bodies responsible for each of the management actions in question may be known as corporations, companies, agencies, commissions, authorities, programmes or projects, directorates, organizations, boards or associations. The general functions and

legal attributes of each of these forms of organization are laid down in each country's legislation, to which must be added the specific organizational requirements of management processes and suitable provisions for facilitating public and private participation.

## V

### The evolution of management systems at the river basin level

The subject of river basin management has been associated historically with the main cultures and civilizations which have evolved –and sometimes disappeared– thanks to the availability or otherwise of water. City dwellers, who make up most of the population in many countries, have gradually been losing sight of this dependence on water and water-courses, to such a point that they have come to ignore it completely because they always have ample water at their disposal all the time. They have also fallen into the habit of demanding that the supply of water be increased, instead of seeking to reduce water consumption through more rational use. Nor do they really understand that water is a scarce resource whose availability fluctuates over time and whose control demands great investments that must be planned years ahead.

Every so often, however, a flood, a prolonged drought or some flagrant instance of water pollution remind them of this dependence, but the effect does not always last long enough to cause them to organize themselves and take action to balance water supply and demand in the long term, and above all to establish stable management systems with guaranteed financing.

specific or sectoral demands for water: permitting or improving navigation, supplying water for population centres or irrigation, controlling flooding, alleviating droughts and building hydro-electric power stations.

The next step involved operating and maintaining the works thus constructed. This form of management was limited to the actual systems constructed, and there was little interest in multiple water use or “river basin management” (i.e., managing the natural resources of the basin). Thus, various systems of water management at the river basin level arose in the region, most of which were only interested in the sectoral uses of the water, as in the case of irrigation (through, for example, Supervisory Boards in Chile and Irrigation District Technical Administrations in Peru).

Beginning in 1940, commissions (in Mexico) and corporations for the integrated development of river basins (i.e., for regional development at the river basin level) were set up. These corporations set out from the construction of water projects to embrace extensive areas under their jurisdiction and make investments in a number of sectors.

Much more recently (1970), the concept of “water-

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