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WATER FOR THE AMERICAS: CHALLENGES AND OPPORTUNITIES

THE LA PLATA RIVER BASIN

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EXECUTIVE SUMMARY

La Plata River Basin extends over 3.1 million km^2, comprising the Paraná, Paraguay and Uruguay systems and including important parts of Argentina, Bolivia, Brazil and Uruguay, and the whole territory of Paraguay. Thirty-seven large cities, more than 100 million inhabitants (nearly 60 per cent of the total population) and about 70 percent of the GDP of those countries, and seventy-five large dams, are some figures that demonstrate the social and economical importance of the basin.

The economies of Argentina, Brazil and Uruguay show a relative more significant production of industrial goods and services, while those of Bolivia and Paraguay remains more broadly based on agricultural production. Potential hydropower in La Plata Basin has been estimated as 92,000 MW, about 60 percent of which has either already been realized or is in process of being so. The waterways of the drainage system provide an important transportation artery linking the five countries.

Population growth and the expansion of the agricultural frontier have contributed to alter the environment and create ongoing problems, such as erosion of productive land, silting of waterways and reservoirs, soil and water pollution, and loss of habitat for fish and wildlife.

In February 1967 the Foreign Affairs Ministers decided to create the Intergovernmental Coordinating Committee of the Countries of La Plata Basin (CIC). On 23 April 1969 they signed the Treaty of La Plata Basin, agreeing to unite efforts with the objective of promoting its harmonious development and the physical integration. The Treaty is broadly comprehensive as regards its competence on plans and programs, but it is not an exclusive option for riparian states. It was in 1973 that a push toward the realization of joint projects was begun, bi- and trilaterally, by creating a diversity of institutions. At present, the CIC has a new “Program of Action” and is carrying out a project, with the support of GEF, through UNEP, and OAS, whose general objective is to strengthen the efforts of the five countries to implement their shared vision for the environmentally and socially sustainable economic development of La Plata Basin, specifically in the areas of the protection and integrated management of its water resources and adaptation to climatic change and variability.

THE LA PLATA RIVER BASIN

Characteristics of La Plata River Basin

Geographical, hydrological and climatological characteristics

La Plata River Basin is one of the great river systems of the world. Draining approximately one-fifth of the South American continent, extending over some 3.1 million km^2, and conveying waters from central portions of the continent to the southwest Atlantic Ocean, La Plata River system rivals the better-known Amazon River system in terms of its biological and habitat diversity, and far exceeds that system in economic importance to southern and central South America (UNEP-GEF 2003).

La Plata Basin includes almost all the southern part of Brazil, the south-east of Bolivia, a large part of Uruguay, the whole of Paraguay, and an extensive part of northern Argentina (Figure 1).

The Basin is comprised of three large river systems, namely, the Paraná, the Paraguay and the Uruguay Rivers. Table 1 shows the respective lengths of the main watercourses and drainage areas, divided by countries and totals. In addition, water that infiltrates into the groundwater system from within the Basin provides recharge for the Guarani Aquifer, one of the largest continental groundwater reservoirs in the world.

In terms of discharge, the Paraná River is the most important in the Basin, with a mean annual flow of about 17,700 m^3/ s. The Upper Paraná River lies wholly within Brazil and, further downstream, the river forms the frontier between Brazil and Paraguay and, later, between Argentina and Paraguay. After joining the Paraguay River, the Paraná River remains within Argentinean territory.

The Paraguay River feeds the Pantanal, which extends over 700 km in length with an area of 140,000 km^2 within the Paraguay Upper Basin. Further downstream of the Pantanal, the Paraguay River receives flows from the Pilcomayo and Bermejo Rivers. Most of the Paraguay River Sub-basin is an immense alluvial plain with very low gradients and subject to extensive seasonal flooding. Mean annual flow is about 3,800 m^3/s.

Figure 1. La Plata River Basin.

Source: WWAP 2009

Table 1: Lengths of main watercourses and approximate division of areas of the three sub-basins of the Paraná, Paraguay and Uruguay Rivers, between the five countries of La Plata River Basin

Source: adapted from UNEP-GEF 2003

Area (km^2)				
	Paraná	Paraguay	Uruguay	Total for country
Argentina	565,000 (37.5%)	165,000 (15.0%)	60,000 (16.4%)	790,000 (29.7%)
Bolivia	*	205,000 (18.7%)	*	205,000 (6.6%)
Brazil	890,000 (59.0%)	370,000 (33.9%)	155,000 (42.5%)	1,415,000 (45.7%)
Paraguay	55,000 (3.5%)	355,000 (32.4%)	*	410,000 (13.2%)
Uruguay	*	*	150,000 (41.1%)	150,000 (4.8%)
Total Sub-basin area	1,510,000	1,095,000	365,000	3,100,000(**)
% of La Plata Basin	(48.7%)	(35.3%)	(11.8%)	(100%)
Length of main watercourse (km)	4,300	2,500	1,600	

(**) Total area in this line includes the area of the La Plata River Sub-basin itself, 130,000 km^2, divided between Argentina and Uruguay.

The Uruguay River rises in Brazil. The Negro is its larger tributary, joining the Uruguay River not far from the La Plata River. After its confluence with the Negro River, the Uruguay River becomes wider, effectively forming an extension of the La Plata River. Its mean annual flow is about 4,300 m^3/s.

The Paraná River delta width varies from about 18 km to more than 60 km, and its area exceeds 14,000 km^2. The delta is formed by the enormous volumes of sediment transported from the Paraguay River to the Paraná River, primarily via tributaries like the Bermejo River, and by the hydrological effects of the Uruguay River and tidal influences in the La Plata River.

The La Plata River extends for 250 km from the Paraná River delta up to its mouth in the southwest Atlantic Ocean Large Marine Ecosystem. This mouth is defined by a line, about 230 km long, between a point near Punta del Este in Uruguay to a point near Punta Rasa in Argentina. The river is shared between Argentina and Uruguay.

Rainfall within the sub-basins varies from less than 700 mm per year in the west to more than 1,800 mm per year in the Brazilian coastal ranges in the east. Rainfall is seasonal, and varies with location within the Basin and altitude. In the northern portions of La Plata River Basin, rainfall regimes are essentially tropical, with rainfall confined to an approximately three-month period during summer (December-January). In the southern portions of the Basin, rainfall is more evenly distributed through the year.

Mean annual temperatures within the Basin also vary from less than 10º C in the southern and western portions of the Basin to greater than 30º C in the northern portions of the Basin. Evaporation rates are high, ranging from between 600 and 800 mm per year in the extreme eastern portions of the Basin to between 1,400 and 2,000 mm in the remainder the Basin.

The history of the Paraná River shows many occurrences of low-flows followed by floods. Recent research has detected a fluctuation with period about ten years. In addition, some climate studies show evidence that streamflows are correlated with “El Niño” events. For example, in the middle reaches of

the Paraná River, the four largest discharges on record followed the four “El Niño” events of 1983, 1905, 1992 and 1998.

Besides fluctuations in climate, there is also some evidence of trends in climate. Over a large part of La Plata Basin, annual minimum temperatures are increasing by about one degree per century; in some parts, and there is evidence – as mentioned before - of positive trends in monthly and annual rainfall in the second half of the 1970s (UNEP 2003).

Social and economic characteristics

The economic heartland of Latin America is superimposed upon this geographic basin and its unique natural resources. Seventy-five large dams and fifty-seven large cities -each with a population in excess of 100,000 persons, including Buenos Aires, Sucre, Brasilia, Asunción and Montevideo, the respective capital cities of Argentina, Bolivia, Brazil, Paraguay and Uruguay- are found within this basin. Nearly 60 per cent of the total population of the five countries is living there. Its total population has grown from 61 million in 1968 to more than 100 million in 2000 (UNEP-GEF 2003, UNEP 2004, WWAP 2009).

Population density averages about 24 persons per km^2, but vary widely across the Basin, with the majority of the population concentrated in the non-mountainous areas of eastern Argentina, Brazil and Uruguay. Paraguay and the mountainous areas of Bolivia have much lower population densities, reported to be about 6 to 7 persons per km^2. The urban population in La Plata Basin increased from an average of 45 per cent at the beginning of the sixties to an estimated present average of 86.6 per cent. The State of São Paulo, Brazil, for example, has a population of 36 million, of which about 92 percent lives in urbanized areas.

These urban concentrations need water for domestic use, while incomplete treatment of urban wastewater affects both water quantity and water quality in the Basin. In addition, poor people from rural areas are attracted to the urban centers by the possibility of a better life in cities, only to find that

there is nowhere to live except along river margins. Thus, the likelihood of flooding and public health degradation is increased (UNEP-GEF 2004).

In 2007 the per capita Gross Domestic Product (GDP) at constant market prices of the five countries, reported by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC 2009), were about US $ 9,400 in Argentina, US $ 1,100 in Bolivia, US $ 4,200 in Brazil, US $ 1,500 in Paraguay and US $ 7,250 in Uruguay. About 70 percent of the GDP of the five countries is generated within this drainage area (UNEP 2004).

The relative levels of industrialization vary among the countries. The economies of Argentina, Brazil and Uruguay show a relative more significant production of industrial goods and services, while the economy of Bolivia and Paraguay remains more broadly based on agricultural production.

Cereals, soybean and oleaginous are the main crops grown in the Argentinean plains; soybean and sugar cane in southern Brazil; soybean and maize in Bolivia; soybean, cotton and grains in Paraguay, and cereals and forage in Uruguay. Presently, soybean is the most important crop, representing around 50% of the total harvested area in Argentina and Paraguay, almost 30% in Bolivia and 26% in Brazil. In several areas of Argentina, Brazil and Uruguay farming is complemented with cattle raising (UNEP 2004).

Potential hydropower in La Plata Basin has been estimated as 92,000 MW, about 60 percent of which has either already been realized or is in process of being so. This value is expected to increase as national demands for energy grow. More than 90 percent of the energy used by Brazil comes from hydropower, with the greater part of it being generated by impoundments on the Paraná River and its tributaries. The binational installations currently producing hydro-electricity are: Itaipú on the Paraná River (its production being shared between Brazil and Paraguay), Yacyretá on the Paraná River (shared between Argentina and Paraguay), and Salto Grande on the Uruguay (shared between Argentina and Uruguay). On the international reach of the Paraná River, border between Argentina and Paraguay, a

dam -known as Corpus Christi- is proposed to be constructed, downstream from Itaipú. Another development is being planned at Garabí on the Uruguay River (between Argentina and Brazil).

The waterways of the La Plata River drainage system provide an important transportation artery linking the five Basin countries, and form a continuum across which the full range of the human condition is displayed. The Paraguay and Paraná Rivers -natural transport corridor running north-south from the heart of South America to the Atlantic Ocean, by the La Plata River- were navigated from the sixteenth century onwards by the Spanish fleet, and the city of Asunción, on the Paraguay River bank, since 1537 was a center for expedition departures in colonial times. To a lesser extent, the Uruguay River has also provided a transportation route (UNEP-GEF 2003).

Only in 1988, encouraged by agricultural expansion in the Brazilian states of Mato Grosso, together with the mining development in Brazil and Bolivia and economic growth in Paraguay, did interest reappear in improving the conditions of the waterways. The required improvements should imply ensuring a whole year's minimum depth, structuring difficult stretches and buoying the waterway with day and night signals. The main navigable reaches include:

a) the Paraguay-Paraná Rivers waterway (known as “Hidrovía Paraguay-Paraná”, or simply “Hidrovía”) from Cáceres Port in Mato Grosso to Nueva Palmira Port in Uruguay, covering a distance of 3,600 km. There are plans to improve navigation along portions of this waterway by, among other works, deepening the channel. However, environmental concerns over this development, particularly with respect to the Pantanal, have limited the whole implementation of the “Hidrovía” to date.

b) the Tietê-Paraná River waterway. It passes through a highly industrialized region of Brazil which produces 35 percent of the Brazilian GDP. This reach has locks through which products can be transported between São Paulo, Brazil, and the Itaipú reservoir;

c) the Uruguay River waterway, downstream of the dam at Salto Grande. There is a navigable reach of the Uruguay River shared by Uruguay and Argentina. In addition, the river upstream of Salto Grande is also navigable to São Borja in the Brazilian State of Rio Grande do Sul.

Environmental problems

Population growth and the expansion of the agricultural frontier are some of the main factors that have contributed during the last decades to alter La Plata Basin environment and create ongoing problems, such as erosion of productive land, silting of waterways and reservoirs, soil and water pollution, and loss of habitat for fish and wildlife (Cordeiro 1999).

Population growth

Population growth and increase in social mobility resulting from migration from the countryside and the more impoverished areas to the urban areas have given rise to new metropolis, and several mid-sized cities. In the rapidly growing industrialized cities of the La Plata Basin, many urban centers lack basic economic and social infrastructure. Further, damage to water resources and risks to human populations can also result from industrial wastewater and toxic spills in intensively industrialized areas.

Erosion and sedimentation

There are some areas of high sediment production in the Paraná and Paraguay basins. One of the most severe erosion occurs in the upper basin of the Bermejo River, in the Andean region of Argentina and Bolivia. Another area of high erosion and sedimentation is the Upper Pilcomayo River basin in which 90 million metric tons of sediment are annually deposited on the wide flood plain of the Chaco producing an extensive inland delta. In the Upper Paraguay River basin in Brazil, most of the sediment from the headwaters is deposited in the Pantanal. In the Paraná river basin the largest volumes of sediment are eroded from sedimentary rock, mainly sandstone.

The expansion of the agricultural frontier is one of most severe cases of erosion in the region, induced by man's activities. Deforestation in the Basin has left some areas with only a small percentage of the

original forest cover. In the Brazilian State of São Paulo, the area under primary forest has fallen from 58 percent at the beginning of the twentieth century to about 8 percent at its close; in the State of Paraná, forest cover fell from 83 percent in 1890 to 5 percent in 1990. In 1945, 55 percent of the eastern part of Paraguay was forested; by 1990, only 15 percent was under forest cover. (Cordeiro 1999).

Because of the intensification of agricultural and industrial production, many areas formerly planted with coffee and food crops were converted to soybeans for export and sugarcane for the production of fuel alcohol. The extent of lands utilized for cereal production has widened to include areas that are marginal for that type of crops, where intensive production has increased the risk of soil degradation. This is of great concern; soil organic content has fallen by 50 percent from its value at the start of the twentieth century, reducing the capacity of the soil to hold water. Direct seeding with minimum cultivation is now leading to some reduction in soil loss.

The impacts of erosion are evidenced primarily by the sedimentation of existing reservoirs and certain reaches of the river system. There has also been loss of productivity of croplands and pastures, and the destruction of land suitable for reforestation. Increased sedimentation in the main rivers and secondary basins has increased the cost of dredging in the La Plata River.

Pollution

Water pollution is caused primarily by the great increase in crops and industrial production, and by population growth. A large part of fertilizers and pesticides used in farming is carried by runoff into watercourses. This toxic pollution is not only posing risks for populations that depend on the rivers productivity for their livelihoods but threatens the biodiversity of the maritime front of the La Plata River (Cordeiro 1999).

Natural hazards

Severe flooding, with loss of life and extensive damage to infrastructure and economic production, is a frequent occurrence, especially in the Paraná and Uruguay sub-basins. The Paraná River and its

tributaries -including the Iguazú River, for example- have many riverside towns that are frequently flooded. That is the case of the Argentinean cities of Resistencia, Corrientes, Rosario and Santa Fe, which suffer severely from flooding. During the "El Niño" event of 1982 and 1983, more than 40,000 people were affected in more than 70 towns along the reach of the Uruguay River within the Brazilian State of Rio Grande do Sul. And, in the La Plata Basin as a whole, losses associated with that "El Niño" event were estimated to amount to more than US$ 1 billion (UNEP-GEF 2003).

Fish and wildlife

The Pantanal can be mentioned as an example of critical areas for sustainable development activities. Due to its location at the center of South America, it is a bio-geographical meeting point of several endemic floral and faunal units. The Pantanal is habitat for a unique and extremely rich array of wildlife: more than 230 species of fishes, 80 species of mammals, 50 species of reptiles, and more than 650 classified species of aquatic birds (Cordeiro 1999).

The principal factors causing environmental problems in this sub-basin are soil erosion, caused mainly by the large-scale, mechanized production of soybeans and rice, and water pollution caused by the intensive use of agrochemicals. This problem is exacerbated by the compaction of the soil by heavy farm machinery and the resulting lack of percolation of storm water. The Pantanal is also being affected by land clearing in the areas of inflow and along river banks, by pollution from ever-growing agribusiness, and by uncontrolled urban and industrial discharges into the river system. Throughout the basin, fish are threatened by overfishing and, most recently, by the dumping of hazardous chemicals, especially large quantities of mercury used in gold mining.

Associated with these existing problems are the potential effects of specific development projects, including the "Hidrovía", where it is necessary to quantify possible negative influences caused by the rectification and dredging of river stretches in specific areas.

Institutional Framework

The La Plata Basin Treaty system

At the standpoint of La Plata Basin structure, forty years ago, each of the five countries of the region had contrasting approaches to regional development, emerging from each country's different historical, geographical, social, and political background. Nonetheless, this did not exclude the existence of common goals. At that time the main issues were the utilization of water slopes for hydro-electric power generation, subsidiary attention to navigation, and little concern for water quality and other topics (adapted from: del Castillo Laborde 1999).

The first meeting of the Foreign Affairs Ministers of the five countries comprising La Plata Basin was held in Buenos Aires in February 1967. As a result of that meeting, the Ministers issued a declaration, saying "that it is a decision of our governments to carry out the joint and integral study of La Plata Basin, with a view to the realization of a program of multinational, bilateral and national works, useful to the progress of the region".

As a first step they created the Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata (CIC) (*Intergovernmental Coordinating Committee of La Plata Basin Countries*), with the aim of drawing up a statute for its definitive constitution. Further, the declaration ruled that, to achieve the objective of the integral development of the basin, that study should take into account -in relation to water resources- in the main the following subjects: facilities and assistance to navigation; establishment of new fluvial ports and the improvement to existing ones; hydroelectric studies with a view to energy integration of the basin; installation of water services for domestic, sanitary, and industrial uses, and for irrigation; floods or inundations and erosion control, and the conservation of animal and vegetal life.

During the second meeting of Ministers, held in Santa Cruz de la Sierra in May 1968, the Statute of CIC was approved and it was entrusted to draw up a treaty in order to enforce the institutionalization of the basin. At the same time, it was agreed to carry out preliminary studies in relation to concrete projects presented by the member countries. Among the projects shared by the five member countries, the following should be noted (Pochat 1999):

A-1 Construction of a port in Bolivian territory on the Paraguay river and its connection to the railroad network (Bush port).

A-2 Hydrometeorology and future establishment and performance of the regional network of hydro-meteorological stations.

A-3 Inventory and analysis of basic information on the basin's natural resources and related subjects.

A-4 Study of problems to be solved and projects of measures to be taken (dredging, obstacle removal, signaling, buoyage, etc.) in order to allow permanent navigation and to secure its maintenance in the Paraguay, Paraná, Uruguay and La Plata rivers.

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A-7 Assessment of the ichthyologic resources of the basin.

On 23 April 1969, during their first extraordinary meeting held in Brasilia, the Ministers signed the Treaty of La Plata Basin which, in its Article I, only paragraph, says:

"The Contracting Parties agree to unite efforts with the objective of promoting the harmonious development and the physical integration of La Plata Basin and of its area with direct and considered influence.

Single paragraph: With that purpose, they will promote within the ambit of the basin, the identification of areas of common interest and the promotion of research, programs and works, as well as the formulation of operative agreements or juridical instruments they consider necessary and that tend to:

(a) give facilitation and assistance as regards navigation;

(b) promote reasonable utilization of water resources, especially by means of the regulation of watercourses and their multiple and equitable development;

(c) achieve the preservation and the improvement of animal and vegetal life[1];

[1] The inclusion of this purpose in the Treaty of La Plata Basin, three years before the UN Conference on the Human Environment, held in Stockholm in 1972, shows an advanced concern of the LaPlata Basin countries for environmental issues. However, that concern only started to be reflected in concrete actions since November 1985 when, in an extraordinary meeting, the Undersecretaries or Special Representatives of the Foreign Affairs Ministers agreed to

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(h) promote other projects of common interest and especially those that have relation to the inventory, assessment and development of the natural resources of the area;

(i) integral knowledge of La Plata Basin.

The basic organization was then constituted by the Conference of Foreign Affairs Ministers, the Intergovernmental Coordinating Committee (CIC) and a Secretariat. The Conference resolutions do not have mandatory character as regards member states, but they are applicable only in reference to the functioning of La Plata basin bodies. Among other things, they are compulsory when approving the budget, amending statutes or incorporating new organs.

Asunción Declaration on the Uses of International Rivers

In the meetings of CIC during 1970, Argentina and Brazil expressed their different interpretations of the Basin Treaty. Argentina wished to draw a set of general rules applicable to the basin water resources. Brazil requested the acceptance of its own technical judgment as enough guarantee for other riparians in relation to existing and planned hydroelectric power plants. It maintained that a country possessing the sources of a drainage basin could not willingly limit itself on the uses of the waters and the only acceptable restraints could be those arising from technical reasons and its principles of legal responsibilities. It needs to be noticed that this position is incorporated in Article V of the Basin Treaty, which states that "Any joint activities undertaken by the Contracting Parties shall be carried out without prejudice to such projects and undertakings as they may decide to execute within their respective territories, in accordance with respect for international law and fair practice among neighboring friendly nations" (del Castillo Laborde 1999).

There were understandable arguments for these claims. Long reaches of the Paraná River sub-basin, situated in Brazilian, Argentinean and Paraguayan territories, have relevant conditions for

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concentrate efforts in several important subjects, including "Water Resources and Other Natural Resources" among them, as it will be seen afterwards.

hydroelectricity, such as appropriate slope, important flow, basaltic structure, and embanked stretches. Since 1960 Brazil had launched the construction of numerous dams in the basin, in a restless building effort which is still current and will extend into the future. Paraguay and Argentina, lower riparians, had planned to construct two important dams in their shared stretch at the same period in the 1970s.

Uruguay is not a riparian state of the Paraná River and Paraguay adopted a waiting role. For that reason, Argentina held its isolated position versus Brazil as regards the Paraná River and pressed the incorporation of general international law rules applicable to the uses of international water resources as suitable rules for La Plata Basin (del Castillo Laborde 1999).

In a conciliatory success the Foreign Affairs Ministers established the following basic principles for water management applicable to La Plata Basin riparian states in the "Asunción Declaration on the Uses of International Rivers", approved in June 1971:

(a) In contiguous rivers, as riparians share their sovereignty, every use of the watercourse should be preceded by bilateral agreement of riparian states.

(b) In successive international rivers, where riparians do not share their sovereignty, each state is able to use the watercourse according to its needs provided the uses thereof do not cause appreciable harm to another basin state.

(c) Riparian states agree to exchange hydrological and meteorological data and cartographic results from field measurements.

(d) There is an emphasis on the improvement of river navigability and a warning that future works should not hamper navigation.

(e) States are required to take into consideration the living resources of basin waters in works planning.

Whereas the Asunción principles are constrained, they were enough to bring objective standards into being and from that circumstance many other agreements became possible for water undertakings in the basin (del Castillo Laborde 1999).

Though not a treaty, the Asunción Declaration expressly set on behalf of riparian states the rule of not causing "appreciable harm" in the utilization of international water resources. This, however, was not the only rule that downstream riparians, mainly Argentina, wished to incorporate as mandatory principles for basin undertakings. It maintained that the principle of equitable and reasonable use of freshwater resources and the rule of previous consultation were also applicable as general international law rules regulating the use of international basins. The other riparians, especially Brazil, were prepared to allow only those restrictions incorporated by a treaty for each particular use.

These different positions became an issue at the Stockholm Conference of the United Nations on the Environment, held in 1972[2], and the general principles on international shared resources were incorporated as United Nations General Assembly Resolutions 2995 (XXVII) and 2996 (XXVII) of that year, and were followed up by Resolutions 3129 (XXVIII) and 3281 (XXIX)[3], whose Article 3 recognized the rule of previous consultation (del Castillo Laborde 1999).

Corpus- Itaipú Agreement

A particularly significant fact was the signing, on 19 October 1979 - by the Governments of Argentina, Brazil and Paraguay - of the Tripartite Agreement on Corpus and Itaipú, with the purpose of establishing rules in order to harmonize the Brazilian-Paraguayan development of Itaipú with the Argentinean-Paraguayan of Corpus, both on the Paraná River. This agreement was the result of a negotiation process, during the period 1977-79, on firm technical grounds, prepared by the delegations of the three countries involved. On its terms, the operating elevation of Corpus reservoir should not exceed 105 m above sea level and Itaipú power plant would operate with 18 turbines for a maximum

[2] The United Nations Conference on the Human Environment,(Stockholm, 5-16 June 1972) established -among other principles- that "States have,….. , the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (UN, 1972a) and recommended "Nations agree that when major water resource activities are contemplated that may have a significant environmental effect on another country, the other country should be notified well in advance of the activity envisaged" and "The net benefits of hydrologic regions common to more than one national jurisdiction are to be shared equitably by the nations affected" (UN, 1972b)

[3] Available at http://www.un.org/documents/resga.htm

water flow of 12,600 m^3/s. According to the treaty, the operation of Itaipú should not cause fluctuations on the water level of the Paraná River greater than 0.50 m/hour and 2.00 m/day, and the surface velocity should not exceed 2m/s in the confluence of the Paraná and Iguazú rivers, where Argentina, Paraguay and Brazil meet.

It can be said that the Corpus-Itaipú agreement has a significant historical value since it put an end to the controversy concerned with the Paraná River energy utilization (COMIP 1992, Pochat 1999).

Satellite organization

The La Plata Basin Treaty is broadly comprehensive as regards its competence on plans, projects, works, and programs in the catchment's area. Nevertheless, it is not proposed as an exclusive option for riparian states, but as a framework agreement that could add special benefits to its global scheme. Accordingly, Article VI states that "The provisions of this Treaty shall not prevent the Contracting Parties from concluding specific or partial bilateral or multilateral agreements designed to achieve the general objectives of the development of the Basin".

It was in 1973 that a push toward the realization of joint projects was begun, bi- and trilaterally. Thus, on 26 April 1973, Brazil and Paraguay subscribed the treaty where Itaipú Binacional (*Itaipú Binational*) was created with the purpose of constructing Itaipú development. On 19 November 1973 Argentina and Uruguay signed the Tratado del Río de la Plata y su Frente Marítimo (*Treaty on the La Plata River and its Maritime Front*). This treaty settled the controversial situation about the exercise of jurisdiction over that vast river waters. Apart from jurisdictional matters, the treaty deals with navigation, fishing, bed and subsoil, pollution prevention, pilotage, works, scientific research and rescue operations, among other aspects of the river system. It also set up two permanent commissions, the Comisión Administradora del Río de la Plata (CARP) (*Administrative Commission for the La Plata River*) and the Comisión Técnica Mixta del Frente Marítimo (CTMFM) (*Joint Technical Commission for the Maritime Front*) for the adjacent maritime zone and the overlapping common fishing zone.

On 3 December 1973 the Entidad Binacional Yacyretá (*Yacyretá Binational Entity*) was created, by agreement between Argentina and Paraguay, with the purpose of constructing Yacyretá development. Subsequently, on 26 February 1975, Argentina and Uruguay agreed on the establishment of a special body for their shared stretch of the Uruguay River. The regulation of water uses, namely navigation, works, pilotage, bed and subsoil resources, fishing, pollution prevention, jurisdiction and settlement of disputes procedures are expressly dealt with. The Administrative Commission set up under this agreement, is known as Comisión Administradora del Río Uruguay (CARU) (*Administrative Commission for the Uruguay River*) (del Castillo Laborde 1999).

In 1980, Brazil and Argentina agreed upon the use of their shared stretch of the Uruguay River and decided to build the Garabí dam as a joint project.

It should be added to this system of binational commissions and entities those established before 1973: the Comisión Técnica Mixta de Salto Grande (CTM) (*Joint Technical Commission of Salto Grande*), created by Uruguay and Argentina in 1946 to carry out a joint hydraulic project, Salto Grande dam; and, in 1971, the Comisión Mixta Argentino-Paraguaya del Río Paraná (COMIP) (Argentinean-Paraguayan Joint Commission of the Paraná River), in charge of the administration of the stretch shared by both countries and of the development of Corpus Christi multiple-purpose project (Barberis 1988).

A repetition of the activity pattern of the 1970s can subsequently be seen in the creation of the Comisión Mixta Uruguayo-Brasileña para el Desarrollo de la Cuenca del Río Cuareim (CRC) (*Joint Uruguayan-Brazilian Commission for the Development of the Cuareim/Quaraí River Basin*), in March 1991; the Comisión Binacional Administradora de la Cuenca Inferior del Río Pilcomayo (*Administrative Binational Commission of the Lower Basin of the Pilcomayo River*), by Argentina and Paraguay, in September 1993; the Comisión Trinacional para el Desarrollo de la Cuenca del Río Pilcomayo (*Trinational Commission for the Development of the Pilcomayo River Basin*), by Argentina, Bolivia, and Paraguay, in February 1995, and the Comisión Binacional para el Desarrollo de la Alta

Cuenca de los ríos Bermejo y Grande de Tarija (COBINABE) (*Binational Commission for the Development of the Upper Basin of the Bermejo and the Grande de Tarija Rivers*), by Argentina and Bolivia, in June 1995 (Pochat 1999) and, more recently, in 2006, the creation of the Comisión Mixta Brasileña-Paraguaya para el Desarrollo Sustentable de la Cuenca del Río Apa (*Joint Brazilian–Paraguayan Commission for the Sustainable Development of the Apa River Basin*).

For its part, in the navigation field, the Comité Intergubernamental de la Hidrovía Paraguay-Paraná Puerto de Cáceres-Puerto de Nueva Palmira (CIH) (*Intergovernmental Committee for the Paraguay-Paraná Waterway Cáceres Port-Nueva Palmira Port*) was created. In this case, it is interesting to notice that the Waterway Program was incorporated into the System of the Treaty of La Plata Basin in October 1991, although keeping the structure of the CIH. One of the most important achievements of this Committee was to produce the Waterway Transport Agreement, approved by member states in 1992 and entered into force on 13 February 1995. The Transport Agreement, with eight Protocols, is a common navigation code for waterway users applicable to the five riparian states.

And, in the financial field, it should be noted that the Fondo Financiero para el Desarrollo de la Cuenca del Plata (FONPLATA) (*Financial Fund for the Development of the La Plata Basin*) was created during 1976 within the framework of the Treaty to lend financial support to the activities envisioned in the Treaty.

While the diversity of institutions highlights the interest in resolving shared problems when they affect two or more countries, it also highlights the fragmentation and segmentation that prevails, often to the detriment of the "basin vision" that led to the Treaty. Few of these institutions communicate either directly or through the CIC, which should coordinate the activities of all those bodies; the reality is that they act autonomously. There is an important task to fulfill here, in order to bring together the pieces of this complex system.

Mercado Común del Sur (MERCOSUR/MERCOSUL) (*Southern Common Market*)

The signature of the Treaty of Asunción, in 1991, creating the Southern Common Market (MERCOSUR/MERCOSUL), called into question the continuity of the CIC. However, the Conference of Foreign Affairs Ministers of the La Plata Basin, held in Montevideo in December 2001 reaffirmed the CIC and created the office of Secretary General (revolving among the countries). This Conference also created a [Technical] Projects Unit "...under Article I of the Treaty...to revitalize the operating system of the organism, including the creation of linkages with other technical and financial institutions within La Plata Basin..." (UNEP-GEF 2003).

Group of Experts and Technical Counterparts

It should be noted the efforts of experts in the different disciplines related to water resources, responding to the challenge of a basin with the complexity of La Plata, trying to solve fundamental issues in the search of sound knowledge about the behavior of its rivers, in normal and extraordinary situations, the most adequate way to utilize them, and the concern for preserving the basin's quality. As an example of the activities carried out by the technical experts within La Plata Basin organization, the following facts have been selected (Pochat 1999):

The initial Declaration of the Foreign Affairs Ministers in 1967 had already proposed that each country would appoint their own technical advisers, since the CIC was an organization run by diplomats.

In 1969, the Ministers recommended to the CIC that they should constitute a Group of Experts in order to "consider extensively the subject of water resource" and establish "that the respective Group of Experts should present its report as soon as possible, by considering the importance and complexity of the issue". The corresponding meetings dealt with a combination of technical issues and their possible diplomatic consequences.

Subsequently, in December 1984, the Ministers subscribed the "Declaration of Punta del Este", by which they convened an extraordinary meeting of Undersecretaries or Special Representatives of the Ministers, with the aim of analyzing and evaluating the institutional political state of the system of La Plata Basin. That meeting, held on 18 and 19 November 1985, agreed with the necessity of reactivating

the System on the basis of a pragmatic approach that gave it greater operating agility, allowing the concentration of efforts in four important subjects, among others: "Water Resources and Other Natural Resources", "Navigation", "Fluvial and Terrestrial Transport" and "Border Cooperation".

The Second extraordinary meeting of Ministers, held in Buenos Aires in April 1986, established, among other issues, to concentrate the joint cooperation efforts of the Member Countries in those priority subjects, as well as to generate technical cooperation by means of direct understanding among the national organisms competent in specific subjects. For that purpose the Governments would nominate the responsible "Technical Counterparts" in selected areas. These "counterparts" developed a productive activity, particularly related to Hydrological Warning and Water Quality.

The effort has been rewarded with very positive results, such as the uninterrupted performance during more than two decades of the Hydrological Warning System, always kept active through a daily response in addition to the occurrence of particular phenomena, as well as the tasks carried out jointly to prepare the "Methodological Guide for the Operation and Evaluation of La Plata Basin Water Quality Network" (Pochat 1999).

However, it must be admitted that many difficulties have come up, and these difficulties have prevented the implementation of many very interesting proposals and projects, with some partial completions. Certain limitations arose from the way the institutional system of the basin was organized. As Barberis (1988) has noted, the system constituted on three levels (Conference of Ministers of Foreign Affairs, Intergovernmental Coordinating Committee, Groups of Experts or Technical Counterparts) did not work satisfactorily. One of its fundamental problems was due to the lack of a permanent technical organization. The CIC was a body composed of diplomats, whose training sometimes did not allow them to consider deeply the multiple subjects submitted to their consideration and decision. This circumstance has been the cause about the need to have a body which can provide technical knowledge for the CIC in order to adopt a political decision suitable to each case.

The former Groups of Experts and Technical Counterparts were not able to make up for that failing. It frequently occurred that groups were not integrated by experts only, but diplomats participated as well. This often gave discussions on each subject the characteristics of a negotiation, thus moving away from its technical approach.

Another problem in the system lies in the fact that the resolutions of the meetings of Ministers and of the CIC, addressed to the member states have, in general, the character of mere recommendations and, consequently, they lack a legal obligatory force (Barberis 1988). To that it should be added that when the resolutions concern subjects foreign to the usual competence of the Ministers of Foreign Affairs, the technical bodies of each government generally do not pay much heed to their recommendations.

Another problem was the lack of specific funds for the financing of the programmed activities. The results obtained were only possible because of the economic contributions of the organizations where the intervening experts came from and, generally, they were not included in a budget specially assigned to those activities. Nor could the promised financing from international agencies be obtained owing to the absence of concrete projects with an adequate level of development. This was also a consequence of the fact that the experts were only able to dedicate a small amount of time to the tasks agreed in the respective meetings.

The development of La Plata Basin established by the Treaty has lost a great part of its original vigor and the works presently carried out in the basin are mainly the fruit of the activities of the bilateral or multilateral commissions or entities.

In order to revitalize the Basin System, in carrying out the original objectives conceived by the Ministers at their first meetings, it is necessary to look for solutions to the obstacles stated above.

Present challenges

For La Plata Basin institutional system, the present circumstances offer a good possibility for improvement. The governing document of the CIC approved by the Meeting of Foreign Ministers during December 2001, established that the CIC would be comprised of two regular representatives and

two alternates from each Basin country. One of these representatives is political, invested by their government with plenipotentiary authority, and the other representative is technical, being a project specialist. The technical representatives constitute the Projects Unit mentioned before.

Program of Action of CIC

Subsequently, the CIC approved its "Program of Action", selecting those initiatives that help strengthen its capacity for the integrated management of La Plata Basin. To this end, and with the goal in mind of improving the quality of life of the Basin's inhabitants, priority would be given to implementing the following activities within the timescales periodically determined by the CIC (UNEP-GEF 2003):

Action 1: Enhance knowledge of water resources and their management to reduce vulnerability to floods and droughts, and to mitigate their impact on communications, transportation, production, and trade in the region.

Action 2: Promote integrated management of water and soils to improve the quality of life of the inhabitants, preserve the health of the population, and maximize production in the region while preserving the quality of its waters, among institutional stakeholders and civil society in the member countries.

Action 3: Promote integration within the region.

Action 4: Harmonize and coordinate data and information gathering related to the region and dissemination of that information through the General Secretariat.

Action 5: Environmental preservation.

Action 6: Harmonization of policies.

Action 7: Training.

A Framework for Sustainable Water Resources Management

In September 2001 a process was initiated by the countries of the La Plata Basin, beginning with a technical meeting convened by the CIC, in order to seek support for the idea of formulating a strategy

for water resources management within the Basin. The representatives of the five countries agreed to require to the Global Environment Facility (GEF), through the United Nations Environment Programme (UNEP), some funding to identify and formulate an appropriate project to achieve that goal.

Subsequently, in June 2002, as an outcome of the initial financial assistance of GEF, they instructed the Secretary General of the CIC to elaborate a proposal to develop a Framework for Sustainable Management of the Water Resources of La Plata Basin (UNEP-GEF 2003).

GEF initiatives within La Plata Basin have been implemented within the Bermejo River sub-basin, the Upper Paraguay River sub-basin, the La Plata River and its Maritime Front and the Guarani Aquifer. While each of these interventions, in isolation, has addressed key environmental and developmental issues within the Basin, the range of projects so executed ignores the connectivity of the La Plata Basin as a hydrological entity. The CIC project, therefore, has been designed to provide a framework to better integrate and more widely disseminate the outputs and results of the projects currently being executed in the component sub-basins of this larger hydrologic unit. At the same time, this project is consistent with the Program of Action agreed by the countries within the framework of the CIC.

Project General Objective

The general objective of the project is "to strengthen the efforts of the governments of Argentina, Bolivia, Brazil, Paraguay, and Uruguay to implement their shared vision for the environmentally and socially sustainable economic development of La Plata Basin, specifically in the areas of the protection and integrated management of its water resources and adaptation to climatic change and variability" (UNEP-GEF 2003).

Coordinated and locally executed by the CIC, the project will harmonize and prepare for further implementation, in co-operation with the Basin countries, a program of strategic actions for the sustainable management of La Plata Basin.

Project Short-term and Intermediate Objectives

Specifically, the project has been designed to: i) strengthen the technical capacity of the CIC in planning and coordinating the integrated and sustainable development and management of the environment of La Plata Basin; ii) advance the practice of integrated water resources management and adaptation to climatic change, by increasing the knowledge and decision-making capacity of the country-based institutions and technicians responsible for the scientific analysis and prediction of climatic change phenomena and their social, economic and environmental impacts; iii) implement a common strategic Vision of the Basin as a basis for planning, sustainable development, and integrated management of water resources in the Basin, basis for an agreed Mega-Transboundary Diagnostic Analysis (Mega-TDA) that identifies the root causes of the principal environmental problems of La Plata Basin in order to characterize, quantify, and define the strategic actions necessary for their resolution; iv) formulate agreed and integrated watershed management programs, based upon the Mega-TDA, a shared Framework Strategic Action Program (FSAP), and a common vision of Basin, that will advance the definition of, and agreement on, high-priority actions needed to formulate and implement policies, develop capacities and management instruments, and channel investments that not only protect the shared resources but also allow efforts to advance the economic and social development of the Basin in sustainable form; v) identify the water resources that are at the greatest environmental risk (i.e., to identify critical areas and issues, and so-called “hot spots”), and define and prioritize projects for execution aimed at the restoration and protection of critical transboundary waters, taking into account both scientific information and information on cost and feasibility of remedial measures generated by the Bermejo, Upper Paraguay-Pantanal, Guarani, and Maritime Front Global Environmental Facility- International Waters (GEF-IW) projects; and vi) integrate the work of groups, and facilitate the participation of responsible institutions, interested organizations, and stakeholders in each country, to prepare and execute the recommended actions in a sustainable and coordinated manner.

Conclusions

By considering the above-mentioned facts and comments, it can be seen that La Plata system has a sound institutional background and a long performance that provides valuable experiences and lessons in order to strengthen its organization and improve its future development. The present circumstances are also favorable to meet these goals. The new structure for CIC approved in December 2001 by the Conference of Foreign Affairs Ministers of La Plata Basin -creating the office of Secretary General and the [Technical] Projects Unit “to revitalize the operating system of the organism”– is in the process of consolidation. The existence of a comprehensive Program of Action, with numerous varied initiatives, will help to increase its capacity for the integrated management of La Plata Basin. The availability of products of the preparation phase of the Project devoted to develop a Framework for Sustainable Management of the Water Resources of La Plata Basin -carried out with the financial support of GEF- will also contribute to the idea of formulating a strategy for water resources management within the Basin.

Those favorable conditions should be accompanied by the reinforcement of the office of the Secretary General, improving its present technical capacity with the establishment of a permanent technical team, integrated by a small but qualified group of experts in the main disciplines CIC has to deal with. This permanent team will provide the technical support to the Secretary General in carrying out the all the actions that CIC should commit itself as the organ that “promotes, coordinates, and monitors the progress of multinational activities to develop the resources of La Plata Basin so as to promote the harmonious and balanced development of the region”, as contemplated by the respective Program of Action.

The challenges to be faced are very large. All the positive actions that have enabled countries making up the basin to speak the same "water" language should be supported. But it is necessary to go further, to be more ambitious, for strengthening the concept of basin as a unit that led to the 1969 Treaty and facing its future sustainable development by working together in an integrated way.

Some lessons learned

The existence of a broadly comprehensive river basin treaty such as the Treaty of La Plata Basin- and the establishment of a coordinating committee -such as CIC- have shown to be an adequate general framework for promoting the harmonious development and physical integration of a basin of the size and complexity of the La Plata.

On the other hand, a treaty of this kind is not an exclusive option. There exists the possibility of creating bi-, tri- or multilateral organizations, within that general framework, for dealing with specific matters. This approach has allowed the implementation a diversity of joint projects.

In order to improve the performance of such an institutional system, it would be necessary to strengthen the capacity of CIC for coordinating the activities and fostering synergies among of all those organizations, by constituting a permanent technical team and ensuring adequate financial support.

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References

Barberis, J.A. 1988. La Plata River Basin. Interregional Meeting on River and Lake Basin Development with Emphasis on the Africa Region. Addis Ababa.

Comisión Mixta Argentino-Paraguaya del Río Paraná (COMIP) 1992. Aprovechamiento Energético del Río Paraná. Documentos y Tratados. Buenos Aires.

Cordeiro, N.V. 1999. Environmental management issues in the Plata basin, in Management of Latin American river basins: Amazon, Plata and São Francisco, ed. by A. K. Biswas , N. V. Cordeiro, B.P.F. Braga and C. Tortajada. United Nations University Press. Tokyo.

del Castillo Laborde, L. 1999. The Plata basin institutional framework, in Management of Latin American river basins: Amazon, Plata and São Francisco, ed. by A. K. Biswas , N. V. Cordeiro, B.P.F. Braga and C. Tortajada. United Nations University Press. Tokyo.

Pochat, V. 1999. Water-resources management of the Plata basin, in Management of Latin American river basins: Amazon, Plata and São Francisco, ed. by A. K. Biswas , N. V. Cordeiro, B.P.F. Braga and C. Tortajada. United Nations University Press. Tokyo.

United Nations. 1972a. Declaration of the UN Conference on the Human Environment. Available at http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=97&ArticleID=1503&l=en

United Nations. 1972b. UN Conference on the Human Environment, Recommendations for action at the international level. Available at

http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=97&ArticleID=1506&l=en

United Nations. Economic Commission for Latin America and the Caribbean (ECLAC). 2009. Statistical yearbook for Latin America and the Caribbean, 2008. Santiago. Available at http://websie.eclac.cl/anuario_estadistico/anuario_2008/docs/ANUARIO2008.pdf

United Nations Environment Programme (UNEP), Global Environment Facility (GEF). 2003. Concept Document for Sustainable Water Resources Management in the La Plata River Basin, prepared by the Intergovernmental Coordinating Committee of La Plata River Basin Countries (CIC) and the General Secretariat of the Organization of American States (GS/OAS).

United Nations Environment Programme (UNEP). 2004. Patagonian Shelf, GIWA Regional Assessment 38. Mugetti, A., Brieva, C., Giangiobbe, S., Gallicchio, E., Pacheco, F., Pagani, A., Calcagno, A., González, S., Natale, O., Faure, M.,Rafaelli, S., Magnani, C., Moyano, M.C., Seoane, R. and Enríquez, I. University of Kalmar, Kalmar, Sweden. Available at

http://www.giwa.net/publications/r38.phtml

World Water Assessment Programme (WWAP). 2009. Argentina, Bolivia, Brazil, Paraguay and Uruguay: La Plata River basin, The United Nations World Water Development Report 3, Case Studies Volume: Facing The Challenges. Paris: UNESCO, and London: Earthscan. Available at http://www.unesco.org/water/wwap/wwdr/wwdr3/case_studies/pdf/WWDR3_Case_Study_Volume.pdf