Major Infrastructure Projects, Biodiversity and the Precautionary Principle: The Case of the Yacyretá Dam and Iberá Marshes

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This article discusses the legal and policy issues arising from the possible seepage of waters from the Yacyretá Hydroelectric Project into the neighbouring Iberá Marshes in Argentina. The Yacyretá Dam is a major infrastructure project conceived during the 1970s by the Governments of Paraguay and Argentina. The process of design, development and construction also saw heavy involvement by various multilateral financial institutions. After becoming partially operational in the early 1990s, local stakeholders began to express concern over the abrupt rise in the water levels of the adjacent Iberá Marshes and the possible relationship of this phenomenon to the Yacyretá Dam.

The situation has raised a multitude of legal and environmental policy concerns involving the status of Yacyretá as a bi-national enterprise, subject not only to international law, but also to the legal requirements regarding environmental protection in each Member State, including the commitment to multilateral environmental agreements (MEAs), such as the Ramsar Convention and the Convention on Biological Diversity (CBD). The issue of possible seepage from the project, and its negative effects on an internationally recognized wetland ecosystem, have also brought into the limelight practical issues, such as the applicability of the precautionary principle in light of the decision to increase the dam’s reservoir levels in order to achieve its full operational status.

Current efforts by a broad range of stakeholders have made a breakthrough in bringing the dam’s management to the negotiating table with a view to assessing the need for further environmental studies in order to put the seepage hypothesis to scientific test. This exercise is a textbook case of the potential long-term environmental problems that can be created by large regional infrastructure projects, conceived and designed at a time when environmental concerns were not considered as major considerations. It also highlights the need to devise adequate decision-making structures to address the concerns of sustainable development of all stakeholders involved.

BACKGROUND AND HISTORY OF THE YACYRETÁ DAM

The Yacyretá Dam is a joint undertaking by the Republics of Argentina and Paraguay designed to produce hydroelectric power from the Paraná River in South America. Its location is approximately 90 km downstream from the cities of Encarnación in Paraguay and Posadas in Argentina.

In addition to the production of hydroelectric energy, the Yacyretá Project was conceived as a multi-purpose infrastructure project aimed at improving navigation on the Paraná River, moderating the negative effects of periodical flooding, as well as providing irrigation to some of the adjacent farming areas.

Negotiations between the Governments of Argentina and Paraguay regarding the development of infrastructure on the Paraná River began during the early years of the twentieth century. After prolonged discussions, the Treaty of Yacyretá was signed in 1973 and a bi-national entity, Ente Binacional Yacyretá (EBY), was set up with a view to designing, building and operating the entire project. Civil engineering

1 Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 2 February 1971).
3 In February 1926, a protocol was entered into by the Governments of Argentina and Paraguay in Washington DC dealing with the potential development of the Apipe Rapids. See Argentine–Paraguayan Protocol regarding the use of the Waterfalls at Apipe (Washington, 1 February 1926). In January 1958, Paraguay and Argentina signed an agreement committing the parties to study and research the feasibility of developing enhanced use of the Paraná River at the location of the Apipe rapids and Yacyretá Island. The agreement provided for the creation of a mixed technical committee to oversee the execution of these studies. See Agreement Between the Argentine Republic and the Republic of Paraguay Concerning a Study of the Utilization of the Water Power of the Apipe Falls (Buenos Aires, 23 January 1958).
and construction started in 1984 and was partially completed in 1992. In 1994, the reservoir behind the dam was filled to a height of 76 metres above sea level and the project gradually came on stream, generating energy 2 years later.

Although the dam is currently operating all 20 of its turbines, the project is not yet operating at its full capacity, given that the reservoir has yet to be filled to its maximum capacity of 83 metres above sea level. Technical concerns have been raised regarding the prolonged operation of the project at less than maximum reservoir levels, due to the possibility of additional wear and tear of the turbines, caused by greater vibration. Furthermore, the fact that the project is not operating at full capacity has signified a considerable loss to EBY in foregone energy sales.5

The Yacyretá Project was conceived in an entirely different political and social context than that which exists in this day and age. The terms of the Yacyretá Treaty reflect the priorities and beliefs held by the region’s leadership during the latter half of the twentieth century. Economic development was high on the agenda of national priorities, as demonstrated by the general trend in favour of import substitution and industrialization policies designed to assist and develop locally based industries. In this context, energy infrastructure and active support for heavy industry held a privileged position on the political agenda of most Latin American countries. The Yacyretá Project was one of a generation of major infrastructure work designed to accelerate the development agenda in the region.6

In the political context, social governance in the 1970s was a far cry from the current rules of the game. Although the actual signature of the Yacyretá Treaty involved one democratically elected administration (Argentina) and one authoritarian regime (Paraguay), the overarching political tendency of the times was heavily dominated by the presence of military regimes and Cold War thinking.

During the decades in which Yacyretá and other similar projects were designed, economic development planning and energy policy were often the purview of public sector officials, who were influenced by regional strategic and military implications of natural resource development. Environmental considerations nearly always played second fiddle to the priorities of natural resource development. The dominating view, not only in Latin America, but also throughout much of the developing world, was the stress on economic and infrastructure development as a means of 'catching up' with industrialized countries. The region’s natural resources were to be ‘rationally exploited’ or used as a means to achieving the goal of development.

This socio-political context, in which energy and other infrastructure projects that were considered strategic for development were carried out in the region during the years that the Yacyretá Project was conceived and designed, had its counterpart within the multilateral aid community. Major development banks, such as the Inter-American Development Bank (IADB) and the World Bank, very often held similar institutional views regarding the importance of financing infrastructure development and natural resource uses, as those existing in host countries.7

During the 1980s and 1990s, environmental considerations, and a broader and more inclusive conception of stakeholder involvement in decision making, gained ground on the political agendas of the region and at senior levels of the multilateral financial institutions. In part, this probably reflects the global paradigm shift towards greater environmental awareness in the aftermath of key milestones such as the publishing of the Brundtland Report8 and the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992.9

In part, enhanced environmental awareness was also a consequence of increased knowledge regarding the potentially negative aspects of an unrestrained development agenda. In particular, public concern for the environment and some of the problem issues arising from dams slowed the pace and involvement of multilateral financial institutions with this kind of infrastructure project.10 Between 1970 and 1985, for example, the World Bank funded on average some 26 dam projects each year. During the 1990s, this figure dropped to around four per year. Although this drop in dam finance may also be due to the restrictions imposed on financing some projects in high-risk countries, there is no doubt that increased awareness of social and environmental concerns also played a part in the downward trend.11

5 The Yacyretá Project was designed to produce 2700 MW for both countries with the installation of 20 turbines. The total estimated cost of the project is around US$8 billion. Other estimates vary considerably. At present the Yacyretá Dam has a generating capacity of 3200 MW. However, due to the level of the reservoir it is effectively producing at 70% capacity.

6 The Paraná river basin has been heavily affected by the construction of large dams. In addition to the Yacyretá Dam, there are several other initiatives upstream, such as Itaipú, a similar bi-national complex involving Paraguay and Brazil.


10 N. Dubash et al., Un Hito en la Gobernabilidad Global?: Evaluacion Independiente sobre la Comision Mundial de Represas (World Resources Institute, 2003).

As a response to both internal and external pressures, aid agencies and multilateral financial institutions shifted the focus of their project management to reflect environmental considerations. Environmental screening and assessment considerations were initially built into the lending policies of multilateral banks, followed by more thorough environmental impact assessment (EIA) requirements, often including greater stakeholder involvement at the decision-making stage, and enhanced transparency and accountability throughout the execution of the projects.

Major infrastructure development projects financed by multilateral financial institutions, such as the IADB and the World Bank, came under much closer scrutiny, in part reflecting the environmental concerns raised by local communities and non-government organizations (NGOs).

In the case of the Yacyretá Project, the long delay in its completion, together with high cost over-runs and serious concern over unforeseen or inefficiently managed environmental problems, has been the main cause underlying closer involvement and scrutiny by the World Bank and, to a lesser extent, the IADB. In 1996, the project was subject to review by the World Bank’s Inspection Panel mechanism, after an NGO in Paraguay, Sobrevivencia, highlighted some of the environmental problems arising from the relocation of affected local communities. After a long investigation, the panel made a series of recommendations to improve overall environmental management and ensure greater accountability of the project’s operators to stakeholders.

In 2000, the World Bank presented the recommendations of its ‘Blue Ribbon’ Independent Panel of Experts aimed at improving the environmental performance of the project. Among other issues related to improvements in the resettlement programmes, the recommendations highlighted two aspects as requiring paramount attention:

- periodical updating and revision of the facility’s Environmental Management Plan; and
- implementation of an effective conflict-resolution mechanism.

Clearly, the political and legal context in which these major infrastructure projects were designed lacked adequate institutional mechanisms for dealing with the environmental concerns, which have come to the foreground with increased citizen awareness in the region. Evidence of this is provided by the various recommendations regarding the need for the creation of effective conflict-resolution systems for dealing with complex issues, such as those raised by the seepage hypothesis in the case of the Yacyretá Project.

While domestic environmental legislation in both Argentina and Paraguay has evolved substantially during the last decade, internal judicial remedies are not always the most effective tools for dealing with problems such as the interrelationship between the Yacyretá Reservoir and the Iberá Marshes. Domestic litigation involving a bi-national entity, such as EBY, and the harmonious interpretation of international law in the light of a country’s constitutional provisions (in this case Argentina), and recently enacted national and local environmental regulations will always be a long and difficult road to pursue, when compared with dispute-settlement resolution mechanisms more suited to dealing with the types of conflict likely to arise from environmental issues.

THE TREATY OF ASUNCIÓN AND THE LEGAL STATUS OF THE YACYRETÁ PROJECT

The Yacyretá Treaty between Argentina and Paraguay was signed at Asunción in December 1973 and sets out the principal objectives of the parties to the agreement regarding the development of a joint project on the Paraná River in the vicinity of Yacyretá Island, with a view to achieving the various goals of energy production, navigation improvement and flood control.

12 During the early 1990s, the World Bank approved four loans totaling US$895 million for population resettlement and improved environmental management (see World Bank, Foro Nacional CAS, Yacyretá: Conflictos y Opciones (World Bank, 2000)). Between 1978 and 1994, the IADB committed financing in four separate operations to the tune of US$840 million towards the project. Additional financing was provided by a consortium of private banks under a syndicated loan organized by the IADB (see W. Van Gelder, et al., The Impacts and Financing of Large Dams (AIDEnvironment and PROFUNDO, WWF, November 2002)).


14 See World Bank, Foro Nacional CAS, n. 12 above. The IADB also commissioned a review panel report on Yacyretá, which was approved by the Bank’s Board of Directors in February 1998. The findings of the report also indicated the need for the creation of an effective dispute-resolution mechanism for dealing with the various conflicts between stakeholders and EBY (see Independent Investigative Mechanism, Yacyretá Hydroelectric Project: Report of the Review Panel (Washington DC, 15 September 1997).

15 Yacyretá Treaty, n. 4 above, Article 1. The treaty was ratified by both countries in 1974 (ratified by Law 20.646 of Argentina). The treaty also contains several schedules dealing with issues such as the by-laws of the EBY, provisions for compulsory purchase of lands affected by the project and a budget estimate for the total investment. Schedule C to the treaty sets forth the rules governing the sale of energy and provisions for assignment of energy produced and not effectively used by one of the parties.
As described above, Argentina and Paraguay agreed to set up a jointly owned, equal participation entity to operate the project. This entity, EBY, is empowered under Article 2 of the treaty with full legal and financial powers to carry out all necessary studies and execute all technical operations required to develop and operate the project from a technical and economical standpoint. Originally, the capital contributions of Paraguay and Argentina to EBY were paid by the State-owned energy companies of the parties.16

The text of the treaty also provided the basis for financing the project. In addition to the capital contributions of each party, through the respective State-owned utilities, EBY, in accordance with Article 10 of the treaty, may obtain credit for the execution of the project. The parties may either jointly or separately provide sovereign guarantees in order to secure the required infrastructure loans for the execution of the project.

The assets of the project are jointly owned by the parties and in no way modify the accepted existing boundaries between Argentina and Paraguay at the time of the treaty’s approval.17 Free navigation of the Paraná River, including the use of sluices and locks, is recognized as a right pertaining to all vessels of the parties and such installations as required for the purposes of navigation are to be considered as an integral part of the jointly held assets of the project.18

The treaty provides for sharing of energy on an equal footing basis.19 However, both parties enjoy a right of first refusal for the purchase of any portion of the other party’s share of energy, not effectively used for internal consumption. Both parties commit to purchase, in whatever proportion as may be decided, the total volume of energy produced by the project. In practical terms, Argentina’s energy requirements are greater than those of Paraguay and, hence, most of Paraguay’s share under the treaty is taken up by Argentina in accordance with the energy distribution rules stated in Article 15 and Schedule C to the treaty.20

The treaty contains a general rule regarding applicable jurisdiction, which bears considerable relevance when dealing with the legal issues arising from environmental issues, such as the possible seepage of water from the reservoir to the adjacent wetlands. Article 19 of the treaty states in general terms that the jurisdiction applicable to all legal entities and individuals involved with Yacyretá will be that of Buenos Aires in Argentina and Asunción in Paraguay, depending on their respective domiciles.

A simple analysis of the Yacyretá Treaty’s provisions as regards jurisdiction is fairly straightforward in the overall creation of a legal entity with sufficient powers to act and bind itself under public law for the purposes of administering the hydroelectric complex. In no way, however, does the treaty provide for an overall exemption from other applicable national or local regulations. This is specifically stated in the second paragraph of Article 19 where each party shall apply its own legislation ‘taking into account the provisions of this treaty.’21

Mutatis mutandis, as regards environmental issues, the same general rules of jurisdiction also apply to EBY. In other words, MEAs, constitutional provisions, and national and local legislation will fully apply to actions taken regarding the Yacyretá Project, in accordance with the rules of consistency and taking into account the various provisions of the Treaty of Asunción.

THE IBERÁ MARSHES

The Iberá Marshes are a unique combination of wetland ecosystems situated in the Province of Corrientes in the north-east of Argentina. The region covers some 12,000 hectares and lies between the Uruguay and Paraná rivers just south of the Yacyretá Dam reservoir and the border separating Argentina and Paraguay. The marshes are one of the largest in Argentina and represent one of the most important wetlands sites in South America from a biodiversity perspective.

16 Agua y Energía Sociedad del Estado de Argentina was subsequently privatized during the 1990s in the context of major structural reforms in the energy sector. Most publicly owned generating facilities, including various hydroelectric projects such as Pichi Picún Leufú and Piedra del Agüila, were successfully put up for privatization in Argentina during a decade marked by deregulation and free market policies. Privatization in the energy sector of Paraguay has been far less successful than the political process in Argentina. Notwithstanding various proposals for the privatization of the Yacyretá Dam, the entity retains its public status as a bi-national body governed, to a large extent, by international law (see US Energy Information Administration, Regional Energy Report (September 1997). Available at <http://www.eia.doe.gov/emeu/cabs/argentina>). With a current political shift away from economic liberalization in Latin America, privatization of the Yacyretá Dam remains highly unforeseeable, in particular, given the complex legal engineering and diplomatic determination required to deregulate an entity substantially subject to public law.

17 The boundaries and limits were established under the terms of the 1876 treaty signed between Argentina and Paraguay after the Chaco war involving both South American nations and Brazil. See Buenos Aires Treaty (Buenos Aires, 3 February 1876).

18 Yacyretá Treaty, n. 4 above, Article 7.

19 Ibid., Article 8.

20 Ibid., Schedule C, Section IV, states that in the event of assignment of either party’s energy share, compensation must be paid by the assignee on a US dollar basis, calculated as a percentage of the total investment as originally budgeted for the project.

21 See J. Lima and M. Vieito Ferreiro, ‘El Amparo por Mora y su Aplicación al ámbito de los contratos (Con especial referencia a la Entidad Binacional Yacyretá)’, La Ley (1997-B), at 375.
While not nearly as large as other wetlands such as the Pantanal in Brazil, the exceptional features of the Iberá Marshes have led the National Parks Administration of Argentina to consider them a separate eco-region. Among other reasons, the fact that the marshes have been kept isolated and undisturbed over the centuries has contributed to the uniqueness and variety of the wetlands' fauna and flora. The system as a whole can be described as a 'macro-system' comprised of marshes, lagoons and swamps, with occasional outcroppings of land riding on a vast plain. The wetlands are mostly fed by rainfall and drain through the Corriente River into the Paraná far downstream of the Yacyretá Dam.

Some 3000 years ago, during the Pleistocene Era, the system was connected to the main course of the Paraná River. Since then, as the Paraná River’s rhythmical regime of periodical flood pulses became more predictable, the marshes became isolated from the river and most of its inflow became derived from rainfall. The water balance became a result of the input from rainfall, minus the outflow through the Correntes River and evapotranspiration resulting from the marshes' biomass.

One of the most remarkable characteristics of the Iberá ‘esteros’ is the massive carpets of floating vegetation, which shift position periodically with the weather. These islands or ‘embalsados’, as they are known regionally, are made up of decomposing vegetation and organic matter that provide support for a diverse number of plants and animals. Deep-rooted plants, such as seibo (Erythrina cristagalli) or laurel (Nectandra falcifolia) of some considerable size can be found on these floating islands. The highly organic and acid soils that develop through this natural interaction make for an ecosystem that acts very much like a tropical peat bog.

The high biodiversity of the marsh ecosystem is evidenced by the important number of species that inhabit the region. Because of its isolation, most economic development has bypassed Iberá and therefore avoided the ensuing ecosystem stresses that have been so devastating in other wetland systems in the developing world. The exact figures may vary in accordance with field studies, but some 44 mammal, over 40 reptile, 35 amphibious and over 250 species of birds have been recorded in the marshes, in addition to a remarkable diversity in fish species. The marshes are home to some endangered species such as the pampas and marsh deer (Blastocerus dichotomus and Ozotocerus bezoarticus), the Paraná otter (Lontra longicauda) and two separate species of caiman (Caiman latirostris and Caiman yacare). In addition to this, Iberá harbours several feline species, anteaters, tapirs and monkeys.

Wetlands are considered to be among the most productive and diverse ecosystems on Earth. However, in addition to biodiversity as such, wetlands also provide a broad range of environmental services and social benefits. The difficulty in quantifying these benefits is one of the ongoing dilemmas for decision makers and has been the subject of long-standing academic controversy. The fact that some environmental services provided by rich ecosystems, such as habitat for endangered species or the existence of biodiversity per se, are hard to value in economic terms has always been a weakness when making the public-policy case for conservation.

The Iberá Marshes provide a number of environmental benefits, which can be broadly considered as collective goods. Carbon sequestration in the biomass, the marshes’ action as a vast natural water-purification system and flood control mechanism due to the retarding effect of wetlands as reservoirs are just some examples of these intangible environmental services. In addition to these services, the surrounding fringes of the wetland support farming, ranching and some forestry activities. Over the last few years, there has also been a marked increase in tourism and services directly related to the region’s environmentally unique qualities. Bird watching, sport fishing and eco-tourism have all spurred the development of lodges and facilities catering to an increasing number of visitors from all over the world.

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22 C. Bertonatti and J. Corcuera, Situación Ambiental Argentina 2000 (Fundación Vida Silvestre Argentina, 2000), at 76.
23 From 1998 until 2001 a consortium of European and Latin American universities carried out an ambitious project aimed at studying and developing sustainable management plans for various wetlands in the Mercosur region. The resulting report, G. Canziani et al. (eds), Los Esteros del Iberá: El Manejo Sustentable de los Recursos de Humedales en el Mercosur (Fundación Vida Silvestre Argentina, 2003), available at <http://www.yenys.com.ar/pdfs/Ibera-libro2003.pdf>, provides invaluable material and data regarding the hydrology of the marshes and its importance in regulating the ecosystem.
24 ‘Esteros’ is the name in Spanish given in the region to a wetland system subject to periodical flooding.

There is a rising concern among the local communities, who make their living from the various farming and service activities that Iberá supports, regarding the potential consequences of an increase in the water levels of the marshes.

**LEGAL STATUS OF THE IBERÁ MARSHES**

The marshes have been the object of many conservation-related initiatives for over 60 years. In view of the marshes’ biodiversity and unique characteristics, Iberá has been considered a high-priority area on the conservation agenda at a regional level.\(^\text{29}\) In 1939, an attempt was made to convert the marshes into a national park. Field studies were carried out and economic estimates for expropriation were made; however, the project did not make it into law. Again, in 1949, attempts were made to turn the marshes into a park in accordance with the 5-year plans in vogue at the time. Further unsuccessful attempts were made in 1959 and 1960, and the idea of creating a natural reserve under federal jurisdiction was re-floated in 1970, 1971 and 1974.

In 1983, the Province of Corrientes enacted Law 3771, declaring some 13,000 hectares in and around the marshes a provincial nature reserve. In 1993, the legislation regarding the status of Iberá as a provincial reserve was perfected and subsequently strengthened with sundry regulations on eco-tourism in the marshes (Law 4240), Environmental Impact Assessment (Law 5067), and, more recently, a Comprehensive Water Code (Decree/Law 191/93).

In January 2002, a portion of the marshes and lagoons in the area were designated as wetlands of international importance under the Ramsar Convention. Notwithstanding the existing provincial regulations and Ramsar status of part of the marshes, enforcement of environmental and land-use regulations, as is the case in much of Latin America, tends to be weak due to scarce human and financial resources, and lack of political commitment to uphold the law.\(^\text{30}\) Recent efforts to involve the private sector in conservation efforts, by harnessing opportunities provided by sustainable tourism, may prove to be a turning point in the structural weaknesses that plague efforts to ensure robust enforcement in the region.\(^\text{31}\)

**IS SEEPAGE FROM THE YACYRETÁ RESERVOIR FLOODING THE IBERÁ MARSHES?**

In 1995, farmers in the vicinity of Ituzaingó within the Iberá Marshes Provincial Nature Reserve reported widespread flooding of fields and filed requests to the local authorities for authorization to build drainage channels in order to alleviate damage to agriculture. After investigating these claims, the Corrientes Water and Environment Institute (ICAA), a public agency entrusted with regulation of environmental and water-use issues, confirmed the details of flooding on the farms, as well as an overall increase in the water level of the marshes of around 80 cm since 1989.\(^\text{32}\) Farmers in other parts of the area reported similar cases of flooding of land adjacent to the marshes. Overall, several districts within the Iberá Marshes watershed were affected by the increase in water levels.

In view of the unexplained and notable increase in the ecosystem’s water levels, some scientists began to investigate the possibility of a connection or relationship between the Yacyretá Reservoir and the marshes. Support for the seepage hypothesis underlying the flooding of the marshes lay in the following considerations:

- the increase in the water levels of Iberá could not satisfactorily be explained or attributed to rainfall;
- the changes in water levels coincided with the work schedule of the Yacyretá Dam, including the initial closure of the Paraná River and filling of the dam’s reservoir;
- the surface temperature of the marshes began to show unprecedented and hitherto non-existent thermal anomalies, indicating the potential upwelling of waters into the lagoons and marshes; and


\(^\text{30}\) C.A. Rodríguez, El Marco Jurídico del Iberá (Universidad Nacional del Nordeste, 2003), 228.

\(^\text{31}\) For example, the Global Environmental Facility Project on Management and Conservation of Biodiversity in the Iberá Marshes Reserve (GEF/UNDP/ARG02/G33), currently under execution by Fundación ECOS, a regional NGO, aims at strengthening institutions with a view to boosting the possibilities of developing sustainable tourism; personal communication with M. Leichner, Fundación ECOS (see also the website available at <http://www.ecosiberar. org>).

\(^\text{32}\) Confirmed in formal presentations by the authorities of the ICAA to the EBY at the Experts Panel summoned in July 2000. The research conducted by Canziani and others (see G. Canziani et al., n. 23 above) has extensive documentation on the rise in water levels, based on the measurements made at the Colonia Pellegrini.
• the review of the geological features, including underground water sources, in the area provided additional support for the hypothesis of potential water seepage and leaks from the reservoir.

The first consideration is possibly the most persuasive. Scientists found it practically impossible to account for such a sharp rise in the water level in so short a time period by rainfall. A team led by Graciela Canziani, a researcher at the National University of the Center of the Province of Buenos Aires, compared the average water levels for the decade 1990–2000 with previously existing records and found a marked difference as a result of the increase in the volume of water retained in the marshes after 1990.33 The team, led by Canziani, developed a closed system hydrological model in order to calculate the input of water from rainfall variables, and the output via evapotranspiration and discharge via the Corriente River, in addition to considering the underlying water storage capacity of the marsh ecosystems. The findings revealed a close correlation between the general behaviour of the Iberá system’s water levels, vis-à-vis rainfall volumes, except for the inordinate rise after 1989.

The evidence of this anomaly and lack of plausible explanations within the framework of the hydrological balance, such as a potential decrease in the outflow due to silting or blockages in the Corriente River, prompted a closer look at possible sources of the extra volume of water entering the marshes after 1989.

Attention was then turned to the hypothesis of a substantial amount of groundwater entering the marsh, thus accounting for the increase in water levels. In this regard, the coincidence between the work schedule for the closure of the dam and opening of the main spillway, and the rise in water levels showed substantial correlation.

In addition to the above two considerations, scientists also looked at the evidence of substantial variations in the water temperature of the marsh ecosystem. Satellite images indicated areas of colder waters in different parts of the wetland, indicating possible upwelling of colder waters from an underground source.35

Having considered the three items indicating evidence of abnormal increases of water into the marshes from an underground source, investigations turned to the potential passages or pathways whereby water might flow from the reservoir to the marshes. Preliminary research was conducted on regional geological conditions with a view to assessing the possibility of seepage or underground flows through highly permeable sedimentary formations or fractures in the underlying rock.

Three possible areas were identified as potential pas sageways whereby water could conceivably flow from the vicinity of the reservoir and dam into the marshes:

• fractures in the basalt bedrock;
• very low density saturated sediments overlying the bedrock and acting as a connecting medium; and
• the ancient riverbed of the Paraná River carved out of the basalt and subsequently covered with permeable sediment.36

The concern of local communities, conservation-oriented NGOs and local governments affected by the flooding phenomenon, and the indication of a possible connection between the reservoir and the marshes, gained momentum in the late 1990s. Obviously, the existing evidence for the seepage hypothesis uncovered by the various researchers involved was circumstantial and a long way from constituting watertight, legally valid proof worthy of standing up in a court of law. Flooding of the marshes could also conceivably be a consequence of unknown and complex natural processes, such as variations in the vast Guarani aquifer or variations in hydrology due to climate change.

EBY’s response to the issue and to the repeated requests for more detailed information, or the performance of more detailed assessments to confirm or discard the seepage hypothesis was initially non-committal and tended to dismiss or downplay the importance of the problem.37

EBY did, however, commission studies to review the issue of seepage, with varying results. One of the

33 See Blanco and Parera, n. 25 above, at 19.
34 The research team led by Canziani discovered two peaks or ‘pulses’ of water inflow to the marshes, coinciding with the diversion of the Paraná’s main course to build the dam between April 1989 and October 1990, the end of civil works and filling of the reservoir in 1993. See Blanco and Parera, ibid., at 21.
35 D. Ruiz Moreno, Nuovi sviluppi nella modellistica ecologica attraverso dati satellitari, presentation delivered at the School of Mathematical, Physical and Natural Sciences, University of Siena, Italy (June 2002).

assessments concluded that seepage might occur via saturated sedimentary deposits, and that the volumes involved would be in proportion to the water levels of the reservoir. Another of the studies, while contemplating the possible existence of seepage, considered that the volumes of water involved in the process would be practically negligible.  

In answer to the increasingly vociferous demands for explanations from government agencies, landowners and NGOs, EBY convened an expert panel to evaluate the hypothesis of an interrelationship between the dam and the marshes. The panel met in August 2000 and concluded that the seepage, if existent, would be minimal and of very little significance in comparison to the inflow from rainfall. The panel of experts did not, however, carry out or consider the need for any field studies aimed at obtaining data and relied exclusively upon mathematical models.

Clearly, the entire issue revolves around the levels of scientific uncertainty that apply to the existence or denial of the seepage hypothesis. This uncertainty stems from insufficient field data, from a lack of in-depth knowledge regarding the hydrogeology of the region and from the erratic behaviour of underground aquifer systems. There is also scientific uncertainty relating to climate change and insufficient understanding of complex global and regional weather patterns, affected in some cases by the ‘El Niño’ phenomenon.

Faced with empirical evidence of a substantial increase in the marshes’ water levels, common sense points to the only significant anthropocentric activity adjacent to Iberá, the Yacyretá Dam, as the cause. Common sense, however, is not the level of proof required to sustain a serious indictment of EBY’s environmental record, and is, therefore, not a sufficiently persuasive argument to act upon from a public-policy perspective, given the issues and interests at stake.

EBY, on the other hand, has acted in accordance with a traditional civil law approach by thrusting the burden of proof upon the various parties affirming the seepage hypothesis. EBY does not, however, have concrete evidence or field studies that are conclusive enough to eliminate convincingly any and all possibilities of seepage. In light of the requirements of any reasonably proactive environmental policy, the level of knowledge and understanding of local hydrology is also insufficient to provide a satisfactory explanation for the substantial increase in the water levels of the Iberá Marshes, from causes extraneous to the dam. There is a relatively uncontroversial fact (increased water levels), and considerable scientific ignorance and uncertainty regarding the precise reasons for the phenomenon.

RESPONSIBILITY OF EBY AND THE PRECAUTIONARY PRINCIPLE

The circumstances described so far are probably one of the most recurring topics in environmental law and raise the question of how to deal with complex scientific uncertainties, in the context of traditional judicial proceedings, alternative dispute-settlement mechanisms or policy making.

The status of a bi-national entity, such as EBY, under international law in the context of the evolution of environmental law within the parties to the Yacyretá Treaty is a matter of debate. The exact extent of EBY’s responsibility for the environment vis-à-vis local environmental regulations and the role of the precautionary principle as a guideline for public policy or judicial decisions are open to debate.

To answer these questions, it is worth taking a brief look at the provisions of the Argentine Constitution regarding the legal status of international law and other provisions dealing with environmental protection.

Under the Constitution reformed in 1994, treaty law holds paramountcy over national legislation, but the Constitution itself sits at the summit of the legal pyramid in conjunction with a small set of international agreements regarding human rights, as enshrined in Article 75(22).

In a narrowly construed sense, the Treaty of Yacyretá would prevail over other national, provincial or local legislation, in view of the order of normative hierarchy established in the Constitution. This has been the

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38 See Entidad Binacional Yacyretá, Estudio Hidrogeológico Macro-regional del Área Costanera del Río Paraná en el Tramo entre la Presa Yacyretá y el Arroyo Yabebiry, Informe Final (C. Lotti and Associati SpA, 3 October 1999); Entidad Binacional Yacyretá, Proyecto Yacyretá: Informe sobre la interrelación del Embalse Yacyretá y los Esteros del Iberá, Informe Ejecutivo (Harza y Consorcios-CIDY, 30 June 2000).
39 Entidad Binacional Yacyretá, Minute No 444 (8 February 2001), Resolution 4557/01.
40 Presentation made by Vicente Barros at the meeting of the Independent Technical Group in Ituzaingó, Corrientes, Argentina (May 2003).
position adopted by some legal analysts and, by and large, one consistently upheld by EBY over time. To recognize this position, in extremis, would be to accept that a bi-national entity is unfettered by domestic legislation and, therefore, entitled to a certain degree of legal immunity, where domestic legislation is concerned. Taken to an extreme, the powers conferred on EBY by the treaty would constitute a virtual exemption from all existing environmental requirements, whether derived from the Constitution or other legal instruments.

In a broader sense, however, this legal position does not stand up to scrutiny, considering the other provisions contained in the Constitution. The amendment of 1994 incorporated an explicit ‘Right to the Environment’ clause in Article 41, espousing the concept of sustainable development. Article 41 also establishes the obligation of remedying environmental harm when this occurs due to human actions. Given that the Constitution stands at the top of the legal pyramid (together with international law on human rights), the Yacyretá Treaty should be interpreted in accordance with Article 41 of the Constitution and its ensuing environmental laws. Furthermore, this interpretation is not inconsistent with the rules set out under the Treaty of Yacyretá, whereby all domestic legislation applies to the entity (within the respective national jurisdictions), ‘taking into account the provisions of the treaty’.

Failure to comply with this interpretation would lead to the following paradox. The constitutional supremacy of international over national law would lead to the breach of one of the key rights recognized under the Constitution itself. One of the key requirements of any legal system is that of internal consistency. Actions taken in the context of the Yacyretá Treaty must therefore be in harmony and consistent with the constitutional protection granted to the population regarding the right to a healthy environment. Furthermore, any actions or decisions taken by either of the parties to the treaty should also be consistent with other international agreements to which either party is obligated. In the case of the Iberá Marshes, due consideration should also be given to the consistency with other multilateral environmental agreements, such as the CBD and the Ramsar Convention.

The exact extent of EBY’s responsibility for the environment vis-à-vis local environmental regulations is no doubt still a legally and technically debatable issue, in particular given the complex and as yet unclearly defined division of functions between the Argentine Federal Government and the provinces in environmental matters.

In all probability, a balanced legal view would consider that past actions of EBY, prior to the Constitutional amendment and subsequent enactment of environmental legislation, would be exempt from any attempt to apply retroactively environmental requirements, or hold the entity or either of the parties to the treaty responsible for environmental requirements which were non-existent at the time that the project was designed. In most cases, requirements such as EIA for major infrastructure projects financed by multilateral financial institutions only became obligatory in the mid to late 1980s, which was a considerable time after the project was designed.

An entirely different legal scenario becomes apparent when considering the current dilemma faced by the dam’s operators and financiers. In view of the awareness and knowledge gained in respect of the increase in the wetlands’ water level, and the existence of a plausible hypothesis for its causes, is there not a strong case for an exhaustive investigation in order to either confirm or eliminate the seepage hypothesis, before filling the reservoir to its full level? In addition to common sense, there are also solid legal grounds for carrying out these investigations in accordance with the precautionary principle.

Argentina, like many countries in Latin America, has included the precautionary principle or approach in its domestic legislation. The precautionary principle is recognized as such by the Argentine General Environmental Law enacted by Congress in 2002, pursuant to the provisions of Article 41 of the Constitution. It is therefore a binding guideline for public and private decision making when faced with a context of uncertainty.

The precautionary approach, as defined in the 1992 Rio Declaration on Environment and Development, states:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

42 Office of the National Ombudsman, Yacyretá y el Sistema Iberá: Presunta Relación entre el Comportamiento del sistema Iberá y el Embalse Yacyretá (Office of the National Ombudsman, 2002).
43 See Yacyretá Treaty, n. 4 above, Article 19, and see Lima and Vieito Ferreiro, n. 21 above.
The Municipality of Ituzaingó filed an injunction against EBY seeking an interim order to halt any further increase in the level of the reservoir, until a full environmental impact study had been carried out, paying special attention to the issue of the possible seepage and irreversible consequences. Much of the plaintiff’s reasoning was based upon the legal duty of EBY to heed the precautionary principle. The case is currently pending a decision by the Supreme Court. Given the inter-jurisdictional nature of the case, involving a province, the Federal Government and an entity created by treaty, and the public international law issues at stake, the Supreme Court holds original jurisdiction. It is expected that a considerable part of the legal reasoning behind any decision to be handed down will have to address the applicability of the precautionary principle.

THE YACYRETÁ/IBERÁ FORUM AS A CONSTRUCTIVE ALTERNATIVE TO TRADITIONAL CONFLICT-RESOLUTION MECHANISMS

The issue of public participation has been one of growing concern for the parties and direct stakeholders, as well as a wider range of groups involved with biodiversity and nature conservation at both the local and global levels. The problem has been compounded in the past by the lack of adequate institutional mechanisms for dealing with problems such as those in the Iberá marshes. When the Yacyretá Treaty was signed by Argentina and Paraguay, the need to address environmental and social issues raised by ordinary citizens or local governments was never considered to be of major concern. No provisions were thus made in the treaty or in subsequent management decisions to contemplate the need for addressing stakeholder involvement.

In order to strengthen the position of the various affected parties and focus on the Yacyretá Project in a constructive and open fashion, as opposed to the more confrontational and militant advocacy methods used in the past, stakeholders representing farmers, academia and research institutions, environmental NGOs and the public sector joined forces in a loose association called the Iberá–Yacyretá Forum. What is perhaps remarkable in this process, involving advocacy action and active negotiations with a bi-national organization with international law status, such as EBY, is the active participation of public sector representatives, as evidenced by the strong presence of the Municipality of Ituzaingó in the forum.

The Iberá–Yacyretá Forum was set up in 2001 as the tangible outcome of a workshop dealing with the issue of seepage involving stakeholders and EBY. Since its initial meeting, the Forum has held several meetings with the explicit aim of ensuring that the project’s managers and operators commit to an open, independent and wide-ranging assessment of the seepage hypothesis, and in the event of confirmation, estimation of its magnitude. One of the key aims of the Forum, ever since its inception, has been the need for full transparency and accountability of the process, whereby further investigations are carried out. This involves ensuring that terms of reference for field studies, procurement mechanisms and oversight of the actual investigation are open to full public scrutiny. Overall, the issue of transparency has been a long-standing matter concerning both countries and the bi-national entity, not only in the context of environmental issues, but also in the arena of social problems, such as relocation and settlement.

Early in 2003, the Forum and EBY agreed to hold a technical session, whereby scientists and experts from both parties could review existing background studies and data, and attempt to find common ground where possible, or at least identify areas of discrepancy. The encounter also provided a chance for the respective experts to provide technical justification for the studies and fieldwork underlying each position. Although the experts did not reach consensus on the existence or extent of seepage, the exercise proved to be a valuable experience in contrasting the relative merits

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48 The wide-ranging composition of the Forum illustrates its social legitimacy as an umbrella group gathered together for a single galvanizing concern. Public sector groups, among others, included in the Forum are the Municipality of Ituzaingó, the National Water Institute and the Corrientes Water and Environment Institute. Academic institutions include the National University of the North East, National University of Misiones and Salvador University, and private sector organizations include the Batel-Batelito Watershed Committee, PECOM Forestal and the Rural Society of Ituzaingó. Environmental NGOs were represented by Fundación Vida Silvestre Argentina, Fundación Proteger-Coalición Ríos Vivos and the Network of Ecology Associations.


50 The Executive Secretariat is currently held by the Fundación Vida Silvestre Argentina.
and justification of the arguments for and against the hypothesis. Most relevant of all is perhaps the fact that the meeting was held with the presence of outside observers, including the local chapter of Transparency International (Poder Ciudadano).

In October 2003, at a specific ‘Yacyretá/Iberá/Seepage’ meeting convened by the Federal Congress of Argentina, EBY expressed an interest in working with the Forum on developing a common set of terms of reference for the execution of studies and research aimed at testing the seepage hypothesis with field tests, where necessary. In addition to this, the Forum and EBY agreed to ensure that the full procedure was subject to outside, independent scrutiny as a means of avoiding bias, prejudice, influence, political pressure or corruption. At the time of writing, the Forum and EBY are engaged in an ongoing and constructive discussion aimed at fine-tuning the terms of reference and hiring procedures for the independent experts. No restraints regarding documentary evaluation, interviews or previous research are to be placed upon the independent experts when carrying out their research or expressing their conclusions.

LESSONS FOR THE FUTURE

The Yacyretá case highlights a number of recurring features in environmental conflicts involving complex technical issues and multiple stakeholders. At this stage, as regards the actual issue of seepage, it is practically impossible not to maintain a sceptical, nearly ‘agnostic’ point of view regarding the evidence on both sides of the table. There is not enough to prove the hypothesis, and yet neither is there sufficient evidence to the contrary. The circumstantial evidence of the increase in water levels is, however, significant. As a matter of public concern, it is clearly the duty of EBY and the respective national governments to apply the precautionary principle and address the uncertainty with eyes wide open.

If, after serious, transparently conducted and public evaluation, the hypothesis is rejected, local governments, NGOs and stakeholders may consider other possibilities in order to understand the changes and eventual responsibility for the rise in the marshes’ water levels. Under this scenario, EBY will be able to affirm that it is not related to the problem and proceed with the long-awaited increase in the levels of the reservoir. Financial institutions also stand to benefit from a project that, after many inconveniences and cost over-runs, will finally be more easily able to afford repayment derived from increased revenues.

However, the outcome may well demonstrate the plausible link between the project and the flooding of the marshes. Although this would clearly be a vindication of the efforts of the Forum and civil society, this scenario would also provide EBY with an opportunity to take necessary mitigating measures for a problem that, if it proves to exist (as may well be the case) cannot be ‘brushed under the carpet’. At the end of the day, if it is demonstrated that the flooding is a consequence of seepage from the dam, the governments involved will have to make some hard choices and political decisions. Should the respective countries decide to give priority to energy generation, even if this implies environmental impairment, such a determination should be taken with full knowledge of the trade-offs involved and the impacts that it will have on future generations.

The case also highlights the need for an effective dispute-resolution mechanism for complex issues such as the seepage hypothesis. Traditional legal remedies are probably the least efficient tools to debate issues of such complexity, involving uncertainty and lack of scientific knowledge. In this regard, the forum mechanism that has arisen as a collective response to this challenge represents an important and constructive step towards building alternative dispute-settlement arrangements.

Finally, the issue serves to illustrate the many practical concerns that arise when attempting to translate the aims of the precautionary principle into viable policy options and decision making. The full significance of what the precautionary principle implies in practical terms, insofar as it requires inverting the burden of proof, for example, has still not dawned upon many policy makers who are still accustomed to making decisions in a traditional rationalist fashion. Dealing with uncertainty has never been easy, and no doubt many of the questions that have come to light during the development of a long-term project, such as Yacyretá, were never even raised at the time of design. However, dealing with uncertainty is one of the key challenges in addressing sustainable development issues and must be tackled.

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