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# International law and transboundary dams: lessons learned from the Binational Entity ITAIPU (Brazil and Paraguay)

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The international river Paraná flows through Brazil, Paraguay and Argentina, and holds two major binational dams: the upstream ITAIPU dam (Brazil-Paraguay) and the downstream Yacyreta dam (Argentina-Paraguay). In the past years, the South American region was strongly affected by adverse environmental challenges exacerbated by climate change, like wildfires and severe droughts, which in turn drastically affected the water flow of the Paraná river, a river used for multiple purposes, inter alia the production of energy. The hydropower obtained from ITAIPU is one of the main sources of energy for Paraguay and the Southern part of Brazil. At the same time, the downstream parts of the river is used for navigation purposes, which is crucial for land-locked Paraguay to export its agricultural products, and for water consumption, as is the case for Argentina. The present case study will show how in spite of these challenges, South America has been an successful example of transboundary water cooperation, especially by using the international water law guidelines aimed at achieving reasonable and equitable utilization of an international river.

## KEYWORDS

transboundary cooperation on water resources, international law, Paraguay, Brazil, South America, international rivers, dams

## Introduction

The following aims to highlight the key role of transboundary dams, such as Itaipu, for achieving a successful transboundary water cooperation. I shall provide a brief summary of the context of how Itaipu came about and what it represents today in terms of energy generation; then discuss its role in cooperating with other stakeholders to overcome the challenges of the worst drought ever recorded in South America, by upholding international law and implementing the principle of equitable and reasonable uses of an international river. Finally, I will mention Itaipu's further actions to fight the impacts of climate change.

In 1973, Brazil and Paraguay signed the Itaipu Treaty by which the two countries decided to pursue international cooperation to use their shared international river Paraná.<sup>1</sup> The principal aim was to produce hydropower by constructing a dam on their shared border. The Itaipu Dam, initially designed to have 18 turbines of 700MW each, started operating in 1984, and in 2007 two more turbines were added, completing 20 turbines in total to produce energy. Today, with an installed capacity of 14000MW, the dam has one of the world's highest renewable energy productions, and satisfies around 85% of Paraguay's electricity demand and 15% of Brazil's demand. The difference of the two countries in terms of territory size and

1 Treaty between the Federative Republic of Brazil and the Republic of Paraguay for the Hydroelectric Development of the Hydraulic Resources of the Paraná River, Belonging in Condominium to the two Countries, from and including the Salto Grande de Sete Quedas or Salto de Guairá to the Mouth of the Iguazu River, 26 April 1973, (hereinafter Itaipu Treaty).

population is significant. For from Itaipu's whole energy production, 92% of the total produced energy has been used by Brazil and 8% by Paraguay.

To manage the dam, the Itaipu Treaty also created the Binational Entity ITAIPU, a joint binational autonomous body run by a binational Board of Directors, in charge of executive actions, and a binational Governing Council whose task is to set the fundamental guidelines and approving key decisions of Itaipu's Board of Directors pursuant to the Itaipu Treaty. The Board of Directors is composed by a Brazilian and a Paraguayan General Director, and a Brazilian and Paraguayan Director in five main Directions of the Entity: Legal, Finance, Administrative, Technical and Coordination. All Directors, twelve in total, form part of the Executive Board of Directors. Similarly, the Governing Council is composed by six members of each country directly elected by the Presidents of Brazil and Paraguay respectively, and by one member of the Foreign Affairs Ministry of each country who has voice but no vote in the binational Governing Council meetings.<sup>2</sup>

## How the Itaipu project came about

The beginning of the Itaipu project was marked by common worries of downstream-upstream countries regarding the project's impact on river flow. In 1966, Brazil and Paraguay had already signed the Yguazu Agreement aimed at pursuing hydropower production through the utilization of the Paraná river, and in 1969, Argentina, Brazil, Paraguay, Bolivia and Uruguay ratified the La Plata Basin Treaty, which provided a framework for the integrated development of the basin (Gwynn, 2019). At the time, the corresponding challenges were discussed even at international forums such as the United Nations, and the worries about developing the Itaipu dam on the Paraná river were eventually overcome with the conclusion of another treaty between Argentina, Brazil, and Paraguay, the *Acuerdo Tripartito*, which all three countries signed in 1979. The *Acuerdo Tripartito* defined the acceptable changes in water levels, as well as ensuring environmental protections and water-quality standards. To monitor compliance, the agreement established a mechanism for the three countries to regularly exchange information on hydrological conditions. All these aforementioned agreements, including the Itaipu Treaty, resulted in an institutional framework for cooperation and transboundary water management that was created to make possible and govern the utilization of the international river Paraná.

As most international rivers, the Paraná river has since been used for multiple purposes. It flows through Brazil, Paraguay and Argentina. All three countries use the river for hydropower production. Itaipu itself is located at the end of a chain of more than fifty dams located in upper rivers that flow into the Paraná river. In the Paraná river, the Itaipu dam (Brazil-Paraguay) is located in the upstream of the river, and there is another dam in the downstream of the river, the Yacyreta dam (Argentina-Paraguay). At the same time, the river is used for navigation purposes, which is crucial especially for land-locked Paraguay to export its agricultural products, and it is also used for water consumption, especially by Argentina.

After 50 years of the signature of the Itaipu Treaty, we know today that the benefits of having Itaipu have outweighed the original worries of the riparian countries. For, further to the sheer amount of renewable energy production, Itaipu has contributed to strengthening regional economic integration, by providing the financial resources to develop key infrastructure for both Brazil and Paraguay, such as transmission lines, international bridges, airports, and highways, as well as contributing with crucial actions for the preservation and conservation of the environment, social projects, and renewable energy development projects. Thus, Itaipu is of strategic importance for both countries and the region.

## International cooperation and the implementation of international law to overcome energy and environmental challenges

At a global level, many countries around the world have felt the impact of the energy crisis. And yet, further to the advantages that Itaipu gives to both Paraguay and Brazil in providing a reliable and stable low carbon renewable source of energy, in the case of Paraguay, its share of the Itaipu energy is more than its national demand, making it possible for Paraguay to be one of the few countries in the world to have an interconnected national electricity system that is one hundred per cent renewable.

However, in recent years, and similar to other regions in the world, South America has been strongly affected by adverse environmental challenges exacerbated by climate change, like extreme weather conditions, wildfires, and severe droughts, which in turn drastically affected the water flow of international rivers such as the Paraná. However, I would like to highlight Itaipu's key role in transboundary water cooperation.

During the years of 2020 and 2021 in particular, the water flow of the Paraná was so low that all three countries, Brazil, Paraguay, and Argentina, were affected and had to drastically limit their use of the river. A common reaction of dams during droughts is to keep water in their reservoirs as much as possible. It is an advantage that the Paraná river is a regulated river. In Brazil, the National Operator of the Electrical System (ONS) monitors and regulates the river flow, and together with Itaipu's independent monitoring, the parties involved can plan ahead their actions when knowing the levels of flow of the river.

Year	Generation MWh	Flow of Water (average) m <sup>3</sup> /s	Index of Productivity MW(average)/(m <sup>3</sup> /s)
2018	96.585.596	10.763	1,0445
2019	79.444.510	8.586	1,0794
2020	76.382.003	7.908	1,0870
2021	66.369.253	6.932	1,0981
2022	69.491.828	7.355	1,0875

FIGURE 1  
Itaipu's hydrological data.

<sup>2</sup> Itaipu Treaty, Annex A.

Dams define their index of productivity as the relation between generated energy and turbinated water, i.e. the volume of water that goes through the turbines, measured in cubic meters per second. From Figure 1, we can see an increased index of productivity in recent years in spite of the lower levels of flow of water. The scarcity of water triggered the necessity of more efficient use of the water, which in turn made it necessary to manage the reduced flow as precisely as possible.<sup>3</sup>

Still, the extreme drought of 2020 and 2021 severely reduced the Paraná River's water flow, thus reducing Argentina's water supply and making it difficult to navigate the river for landlocked Paraguay.

This situation raised tensions among the countries over the utilization of their shared international river. One important provision missing in all the mentioned treaties and international agreements in place concerning the use of the Paraná river is that they do not introduce an independent arbitration body to manage disputes. However, this is when the role of the established joint institutions and commissions showed their key importance to all riparian countries (Gwynn, forthcoming).

Facing the countries' tensions that had arisen during the severe drought, the binational Governing Council established by the Itaipu treaty made an important contribution to mitigating said rising tensions of countries in the region.

In this particular case, prompted by a request from Paraguay's Ministry of Foreign Affairs to release more water from the Itaipu reservoir in order to increase downstream flow, the initial concern of any dam would be that releasing water from the reservoir (without turbinating it) would imply a reduction of energy production. However, for this situation, an intergovernmental technical committee was formed both from representatives of the riparian states and key institutions, such as Itaipu, to enable exchange of information and hydrological data. Although Itaipu's main objective is to produce energy, the matter was put for consideration to the highest authority of the binational entity, the Governing Council. Having had the joint work of technical commissions and exchange of hydrological conditions data between all parties involved, and based on international law establishing reasonable and equitable uses of any international river, and aiming for a balance to allow for the operation of the dam whilst permitting the multiple other uses of the river, the Governing Council approved to release just enough water from the reservoir to ease the drought's effects for downstream countries, without compromising energy production. The principles of international water law, such as the principle of reasonable and equitable uses of international rivers, which are customary international law, made up for the lack of such provisions in the existing regional agreements. All this crystallized in what would soon be called the "Water Windows" special operation, which I will elaborate after providing more context on how the principle of equitable and reasonable use relate to sovereignty.

The acceptance of the principle of equitable and reasonable use of an international river implies the implicit rejection of the absolute sovereignty doctrine, and in turn the realization that

state practices reflect limited sovereignty when shared natural resources, like international rivers, are concerned. In international water law, the absolute sovereignty doctrine, which is no longer upheld, had been used by countries which intended to imply that a country can do whatever they want with their portion of the river, independently of whether this affects other countries. In contrast, the principle of limited sovereignty manifests that the interests of the other riparian states must be taken into account when using international rivers. Today, international law is clear on binding states with the principle of equitable and reasonable uses and taking into consideration the riparian states' interests when using an international river. This, however, should not be confused with empowering a state to veto the activities of another state. Instead, international law, provided for in the 1997 UN Watercourses convention, introduces the principle of no harm, which the International Court of Justice has defined in its jurisprudence as the duty of avoiding significant harm done to another riparian state.<sup>4</sup> The two principles, that of equitable and reasonable uses, and that of no harm, complement each other. International law also provides us with procedural mechanisms such as notifications and consultation processes for carrying out activities in international watercourses. The 1997 UN Watercourses Convention clarifies what is reasonable and equitable by listing non-exhaustively factors that have to be taken into account to attend the need of the different riparians.<sup>5</sup>

The Intergovernmental *ad hoc* Commission, whose deliberations and collected data informed the eventual decision of the Itaipu Governing Council to release water, was formed not only by riparian states but also by key stakeholders in the uses of the river, such as Itaipu itself and representatives of the shipping companies. It was therefore broader in terms of scope regarding the parties than the international UN agreements, for the operation included the interests of relevant transnational actors.

The fact that Itaipu's Governing Council based their decisions on the results of such a multi-faceted commission on the one hand and on current developments of international law is groundbreaking. The resulting action was referred to as the "Water Windows" special operation. It was carried out on May 18, 2020, and repeated on August 3, 2020, and May 21, 2021, and released enough water from the Itaipu reservoir to allow for navigation and yet ensure that the energy needs of Paraguay and Brazil were accounted for. In its justification for the special operation, the Itaipu Governing Council made explicit reference not only to the regional treaties and the results of the Intergovernmental *ad hoc* Commission, but also to the international law principle of reasonable and equitable use of international rivers.

This showed not only that an amicable solution in adverse circumstances is possible, but also the South American experience of managing the release of water to balance multiple uses of

<sup>3</sup> Reduced water levels made it feasible to optimize where and in which way the available water would hit the blades of the turbine, thus increasing the efficiency of operation.

<sup>4</sup> *Case Concerning the Gabčíkovo-Nagymaros Project (Hungary/Slovakia)*, Judgment, ICJ Reports 1997, 7; *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment, 20 April 2010, ICJ Reports 2010, 14; *Dispute over the Status and Use of the Waters of the Silala (Chile v. Bolivia)*, Judgment, 1 December 2022, ICJ Reports 2022.

<sup>5</sup> Article 6 of the UN Watercourses Convention.

the international river. The work of technical commissions and exchange of data on hydrological conditions among institutions of all affected countries was critical to the negotiations and success of the Water Windows special operation. Today, the “Water Windows” special operations is often cited as a successful example in regional practices of international cooperation in the utilization of international rivers for diverse purposes.<sup>6</sup>

## Further actions to mitigate the effects of climate change

The “Water Windows” special operation was a success, but in moving forward actions to prevent and mitigate the adverse environmental impacts should continue to be strengthened. Therefore, crucial environmental actions to mitigate these environmental effects and those of climate change continue to be at the heart of Itaipu. Conscious of the interdependence of water and terrestrial ecosystems and biodiversity, environmental actions are part of the daily operations of the Itaipu dam, such as the preservation of natural reserves, reforestation, restoring native fauna and flora, protection and recovery of water sources such as micro watersheds and springs, monitoring water quality and sediments, soil conservation and sustainable agriculture. It also protects more than 100,000ha of forests and fosters programs of environmental education. In turn, these actions are implementing the sustainable development goals that bring economic, environmental and welfare benefits to the whole region. As we can see, today dams can go beyond the aim of merely being producers of energy; they can, and should, also aim to be sustainable.<sup>7</sup>

## Conclusion

In conclusion, international cooperation among states and key actors such as Itaipu is crucial for the uses of transboundary water resources. The principle of equitable and reasonable uses

<sup>6</sup> Presentations at the UN Water Conference, March 22–24, 2023.

<sup>7</sup> See International Hydropower Association, San Jose Declaration on Sustainable Hydropower, issued on 24 September 2021.

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allows for a balance between the multiple uses of an international river that all key actors can benefit from. Sustainable development can be achieved only if key actors, states and non-state actors, work together; meeting our needs today with the protection of our natural resources in such a way that the present generation ensures that future generations can also benefit from these valuable natural resources.

As the effects of climate change become increasingly apparent, so does the imperative of using shared natural resources more efficiently and equitably, and shifting to renewable energy sources. By following in the footsteps of Argentina, Brazil, and Paraguay, with the example of the special operation “Water Windows”, other countries can make important progress toward these goals—and set a powerful global precedent for the use of transboundary resources to foster sustainable development.

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