

# THE GUARANI AQUIFER AND PUBLIC POLICIES AT THE TRIPLE BORDER

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## ABSTRACT

The Guarani Aquifer Agreement is an international treaty, signed on August 2, 2010, under the auspices of Mercosur, that imposes to Argentina, Brazil, Paraguay and Uruguay some legal obligations related to the protection and management of groundwater. The article describes the existing public policies at the Triple Border area regarding the protection of groundwater in the Guarani aquifer, necessary for the fulfillment of the treaty's obligations. As a research technique, the bibliographic and documental research is adopted, especially the analysis of the constitutional and infra-constitutional norms in force. This is exploratory research, as it seeks to identify and describe various public policies from the legal field; and explanatory, as it attempts to interpret the distinct and complex norms in the light of the commitments undertaken at the international level. As conclusions, there is no real articulation among the Federation members, despite the constitutional text. The national policy on water resources almost doesn't mention groundwater resources, that are casted out from planning, social control and the idea of the hydrological cycle's unity, subject only to the discretionary license by the Public Authority. The Paraná policy has the same parameters as the national policy, although it contains some provisions on groundwater. In Foz do Iguazu there are some environmental policies that, if effectively implemented, can contribute positively to the preservation of

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underground waters and, specifically, of the Guarani aquifer, even though municipalities do not have any constitutional competence over fresh water.

**Keywords:** Guarani Aquifer; public policies; environmental policies.

## ***AQUÍFERO GUARANI E POLÍTICAS PÚBLICAS NA TRÍPLICE FRONTEIRA***

### ***RESUMO***

*O Acordo sobre o Aquífero Guarani é um tratado internacional firmado em 2010, no âmbito do Mercosul, que impôs à Argentina, ao Brasil, ao Paraguai e ao Uruguai obrigações relacionadas à conservação e ao gerenciamento das águas do Guarani. O artigo busca analisar as políticas públicas vigentes no âmbito da Tríplice Fronteira relacionadas à proteção das águas subterrâneas do Aquífero Guarani, necessárias para o cumprimento das obrigações previstas no tratado. Como técnica de pesquisa, adota-se a pesquisa bibliográfica e documental, especialmente, a análise das normas constitucionais e infraconstitucionais em vigor. Trata-se de pesquisa exploratória, na medida em que se busca identificar e descrever diversas políticas públicas a partir do campo jurídico; e explicativa, pois intenta interpretar as distintas e complexas normas à luz dos compromissos assumidos internacionalmente. Como conclusões, tem-se que não há uma verdadeira articulação entre os entes da Federação, apesar do texto constitucional. A política nacional sobre recursos hídricos pouco conhece das águas subterrâneas – a despeito de se tratar de uma política nacional e não federal-, alheias ao planejamento, à unidade do ciclo hidrológico e ao controle social, sujeitas unicamente à discricionariedade da outorga pelo Poder Público. A política paranaense tem os mesmos parâmetros da política nacional, embora contenha alguns dispositivos sobre águas subterrâneas. Em Foz do Iguaçu há algumas políticas em matéria ambiental que, se efetivamente implementadas, podem contribuir positivamente para a preservação de águas subterrâneas e, especificamente, do Aquífero Guarani, ainda que não caiba aos municípios qualquer competência constitucional sobre água doce.*

***Palavras-chave:*** *Aquífero Guarani; políticas públicas; políticas ambientais.*

## INTRODUCTION

This work investigates the public policies in force within the Triple Border and their respective legal frameworks concerning the protection of groundwater and, specifically, the Guarani Aquifer, at the three levels of the Brazilian federation. The enforcement of the ‘Agreement on the Guarani Aquifer’ international treaty imposes obligations towards the waters of the aquifer on the Brazilian State, which must be observed both by the Union, the states, and municipalities.

Guarani is one of the largest aquifers in the world and extends over an area of approximately 1 million square kilometers across the territories of Argentina, Brazil, Paraguay, and Uruguay. The aquifer is spread under eight states of the Brazilian Federation: Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Mato Grosso, Mato Grosso do Sul, Goiás, and Minas Gerais. Since it was discovered in the early 1990s, it has been the subject of several pieces of research, practically becoming an icon of the regional integration phenomenon. It was within the framework of Mercosur that the states where the aquifer is present negotiated the terms of an international treaty. Signed on August 2, 2010, the Agreement on the Guarani Aquifer guarantees the sovereignty of the Southern Cone States over the waters of the aquifer but provides little for protection and conservation duties. This depends on national legal systems, which establish public environmental and water resources policies, according to the sharing of competencies provided for in the Constitution.

All political entities within the scope of the Brazilian Federation have competencies in environmental matters and their exercise is paramount for the protection and conservation of groundwater. On the other hand, the Constitution establishes rules for the control and management of water resources to give the states of the Federation the entitlement to groundwater as a public good but reserves the regulatory competence for the general rules on water resources to the Union. 1988 Constitution’s division of competencies resulted in a very complex system, in which the overlapping of competencies may hide the lack of effectiveness of some rules.

This work intends to analyze the public policies in force within the Triple Frontier regarding the protection of groundwater in the Guarani Aquifer, which is necessary for the fulfillment of the aquifer conservation obligations, provided for in an international treaty. Bibliographic research was adopted as a research technique – dialoguing critically with the

knowledge already produced –, as well as documentary research, especially in the analysis of constitutional and infra-constitutional regulations in force. This is exploratory research, as it seeks to identify and describe various public policies from the legal field; and explanatory, as it intends to interpret the different and complex norms in the light of the commitments undertaken internationally.

To achieve its goal, the work is divided into four parts. The obligations established by the Agreement on the Guarani Aquifer and the constitutional division of powers are the subject of the first two parts of this work. In the third are presented the legal frameworks concerning both Brazilian and Paraná state water resources policies. Finally, there is a study on the policies in force in the municipality of Foz do Iguaçu with potential impacts to the quality and volume of waters from the Guarani Aquifer.

## 1 THE GUARANI AQUIFER

The Guarani Aquifer is a large set of geological formations system storing water that extends under the territories of four Southern Cone Countries: Argentina (20.98%), Brazil (61.65%), Paraguay (8.05%), and Uruguay (3.32%). It was discovered in the early 1990s, based on studies by researchers from universities in the Southern Cone, and named in honor of the peoples who originally inhabited the region. Shortly after, the Guarani Aquifer was recognized as ‘the largest freshwater reserve in the world’, and a staple of South American regional integration. In the 2000s, it was the subject of a project financed by the World Bank (through the *Global Environmental Fund* – GEF) and coordinated by the Organization of American States (OAS) in the 2000s.

As of 2004, the ‘High-Level *Ad-hoc* Group’ was formed within Mercosur, created in 2004 by the Common Market Council through Decision no. 25 with the purpose of ‘elaborating a draft Agreement of the Mercosur State-Parties on the Guarani Aquifer, enshrining principles and criteria to best guarantee their rights over the groundwater resource, as States and part of the sub-region’ (MERCOSUR, 2004). It was about establishing general rules for the relations of Argentina, Brazil, Paraguay, and Uruguay and proclaiming the exclusive ownership by the four States to other International Relations actors. The result of the group’s activities was the Agreement on the Guarani Aquifer, signed on August 2, 2010, during the Mercosur Summit in San Juan (Argentina). It took another seven years until all the conditions for the treaty could be put into force,

with the ratification of Brazil through Decree-law No. 52/2017.

The purpose of the Agreement on the Guarani Aquifer was to proclaim the rights of the Argentine, Brazilian, Paraguayan, and Uruguayan States over their respective share of groundwater. There are explicit references to the principle of state sovereignty in the first 3 articles of the 22 that make up the treaty. The treaty defines the Guarani as a “transboundary water resource, part of the sovereign territorial domain” of the four State-Parties (Art. 1), each of which “exercises sovereign territorial domain” over their respective portions of the aquifer (Art. 2) (BRAZIL, 2017). Art. 3 is also relevant, as it speaks of sustainability and the rational use of water:

Art. 3. The Parties exercise the sovereign right to promote the management, monitoring, and sustainable use of the water resources of the Guarani Aquifer System in their respective territories, and shall exploit such resources based on criteria of rational and sustainable use, as well as respecting the obligation not to cause sensitive damage to the other Parties or the environment (BRAZIL, 2017).

It should be noted that the management, monitoring, and sustainable use of aquifer water resources are considered rights, not obligations, of each State. Art. 4 of the Agreement on the Guarani Aquifer enshrines the general principle of promoting the conservation and protection of the aquifer, guaranteeing the “multiple, rational, sustainable, and equitable use of its water resources”. There are no criteria defining what *rational and equitable use* of water resources would comprise, nor is it provided that the priority in the hierarchy of uses should be human consumption, as stated in Declarations and recommendations of multilateral forums and 1997 Brazilian law. Except for Art. 4 and the preamble, the treaty does not include a provision for a ‘conservation’ obligation. The terms ‘preservation’, ‘prevention’, ‘precaution’, ‘risk’, ‘pollution’, and ‘contamination’ are not mentioned in the text of the treaty.

Art. 5 lists a generic duty to notify or enter into consultations with neighbors whenever a state has plans to implement projects which may have transboundary impacts. The treaty provides for the obligation of the parties to adopt “the necessary measures to avoid causing sensitive damage to the other Parties or the environment” (Art. 6) and, if this occurs, the responsible party must “adopt all the necessary measures to eliminate or reduce it” (Art. 7), with no mention of international liability if the damage takes place (BRAZIL, 2017). The absence of any mention of climate change and the impacts that aquifers – and the hydrological cycle as a whole – will suffer is also relevant.

Arts. 8, 9, 13, and 14 contemplate a duty of cooperation for the exchange of technical and scientific information on the aquifer, the use of its waters, and management practices and identification of critical border areas, which require specific treatment measures. The rest of the treaty sets up a complex system of consultations and dispute settlement, in case activities, planned to take place in one State may have an impact on another (BRAZIL, 2017).

The preservation of groundwater quality or the maintenance of the hydrological cycle are not an object of concern for the States where the Guarani Aquifer is present and, consequently, the ‘Agreement on the Guarani Aquifer’ does not deviate from what is perceived as the guiding thread of the relations in which Brazil is inserted – the recurrent affirmation of national sovereignty over the territory and all its resources. It was to be expected, however, that 18 years after the United Nations Conference in Rio de Janeiro, States would have incorporated relevant topics such as climate change and principles like prevention and precaution into their agendas. Furthermore, the agreement is the first on the international scene signed after the approval of the United Nations General Assembly Resolution on the Law of Transboundary Aquifers (Res/GA No. 63/124 of 2008), which establishes a minimum set of rules serving as a parameter for the actions of States in which transboundary aquifers occur (UN/AG, 2008).

Even so, the right provided for in Art. 4 of the treaty – promoting the conservation and protection of the aquifer – and the obligation of Art. 6 – to adopt the necessary measures to ‘prevent sensitive damage to the other Parties or the environment’ (BRAZIL, 2017) – theoretically impose the duty to adopt concrete measures, provided for by law and implemented through policies, on each of the parties’s territory. There is a need to investigate what are the legislative measures of the Brazilian federative entities that establish policies related to the protection of the waters of the Guarani Aquifer. Within the scope of the Triple Border, the investigation assesses the Union, the state of Paraná, and the municipality of Foz do Iguaçu.

## **2 THE COMPETENCIES OF FEDERATIVE ENTITIES PROVIDED FOR IN THE 1988 CONSTITUTION OF THE REPUBLIC**

The 1988 Constitution of the Federative Republic of Brazil establishes a democratic rule of law and divides the public goods and the competencies necessary to achieve the fundamental objectives of the Republic, provided for in Art. 3 (BRAZIL, 1988).

The sharing of public property between political entities is provided for in Arts. 20 and 26. According to Art. 26, I, of the Constitution, are property of the states: ‘Surface or underground waters, flowing, emerging, and in deposit, except, in this case, according to the law, those resulting from works of the Union’ (BRAZIL, 1988). On the other hand, they belong to the Union, according to Art. 20, III, ‘the lakes, rivers, and any streams of water in lands within its domain, or that run through more than one state, serve as limits with other countries, or extend to the foreign territory or come from it, as well as their marginal lands and river beaches’ (BRAZIL, 1988). If transboundary surface waters are reserved for the Union, it is clear that groundwater belongs exclusively to states, even if underlying the territory of more than one state of the Federation. A proposal for an amendment to the Constitution (PEC No. 43/2000) to restrict the dominance of states over groundwater limited to the scope of their territories was processed but rejected by the Senate on August 23, 2010. Therefore, groundwater in general is an asset belonging to the member states (BRAZIL, 2000).

It is worth mentioning that ‘all mineral resources, including those in the subsoil’ are assets belonging to the Union, according to Art. 20, IX, of the Constitution. Based on this, federal legislation on mineral waters from the 1930s is still in force in Brazil, which absurdly promotes a division between groundwater resources: groundwater, which belongs to the states, and the so-called ‘mineral’ waters, which are under the care of the Union (BRAZIL, 1988).

As for material competence, Art. 21, XIX, of the Constitution determines that the Union has exclusive material competence to ‘institute a national system for the management of water resources and define criteria for granting rights to their use’ (BRAZIL, 1988). However, protecting the environment and combating pollution in any of its forms is a common material competence of the Union, the states, the Federal District, and the municipalities: ‘protect the environment and combat pollution in any of its forms’ (Art. 23, VI) (BRAZIL, 1988). It is also a common material competence of political entities to ‘register, monitor, and inspect the concession of rights to research and explore water and mineral resources within their territories’ (Art. 23, XI) (BRAZIL, 1988). Therefore, both the Union and

the states, the Federal District, and municipalities should be able to cooperate towards these actions.

According to Art. 22, IV of the Constitution, the power to legislate on water resources is the exclusive responsibility of the Union. However, in terms of hunting, fishing, fauna, nature conservation, defense of the soil and natural resources, environmental protection, and pollution control (Art. 24, VI); liability for damage to the environment, the consumer, goods, and rights of artistic, aesthetic, historical, tourist and scenic value (Art. 24, VIII), the Union has concurrent competence, being able only to establish general norms, being the states responsible for exercising of supplementary competence concerning the general norms established by the Union (Art. 24, § 2) (BRAZIL, 1988).

Considering the common material competence regarding the environment, it is up to the municipalities to exercise important competencies, provided for in Art. 30:

Art. 30. It is up to the municipalities:

I – legislating on matters of local interest;

II – supplementing federal and state legislation, as appropriate;

III – instituting and collecting taxes within its competence, as well as applying its income, without jeopardizing the obligation to render accounts and publishing balance sheets within the deadlines established by law;

IV – creating, organizing, and suppressing districts, in compliance with state legislation;

V – organizing and providing, either directly or under a concession or permission regime, public services of local interest, including public transport, which is essential;

VI – with the technical and financial cooperation of the Union and the State, maintaining programs for early childhood education and basic education;

VII – with the technical and financial cooperation of the Union and the State, providing health care services for the population;

VIII – promoting adequate territorial planning, through planning and control of the use, subdivision, and occupation of urban land, where applicable;

IX – promoting the protection of the local historical-cultural heritage, in compliance with the legislation and federal and state inspections (BRAZIL, 1988).

Although the main competencies related to the use and conservation of groundwater belong to the Union and the states, one cannot ignore the role assigned to municipalities in the constitution, elaboration, and implementation of public policies concerning environmental protection, pollution prevention, awareness through environmental education, and, above all, the advocacy for the ‘adequate territorial ordering, through planning

and control of the use, subdivision, and occupation of urban land' (Art. 30, VII). Also, considering the competence for services of local interest, important services such as waste management and sanitation are under the responsibility of these entities.

### 3 THE NATIONAL POLICY ON WATER RESOURCES

In the exercise of the competence provided for in Art. 22, IV, of the Constitution, Law No. 9,433/1997 of the National Water Resources Policy. The fundamentals of this policy are:

- I – water is a good of the public domain<sup>3</sup>;
- II – water is a limited natural resource, endowed with economic value;
- III – in situations of scarcity, the priority use of water resources is human consumption and livestock watering;
- IV – the management of water resources must always provide for the multiple uses of water;
- V – the hydrographic basin is the territorial unit for the implementation of the National Water Resources Policy and the performance of the National Water Resources Management System;
- VI – the management of water resources must be decentralized and count on the participation of the Public Authority, users, and communities (BRAZIL, 1997).

We should mention the general guidelines for the action of the National Water Resources Policy, as they refer to the integration of groundwater and surface water management, as well as the need for a systematic and articulated approach between water resources management and environmental, soil, and coastal zone management:

Art. 3 The following are general guidelines for action towards the implementation of the National Water Resources Policy:

- I – the systematic management of water resources while maintaining both aspects of quantity and quality;
- II – the adequacy of water resources management to the physical, biotic, demographic, economic, social, and cultural diversities across different regions of the country;
- III – the integration of water resources management with environmental management;
- IV – the articulation of water resources planning with that of user sectors and regional, state, as well as national planning;

3 One cannot help but comment that the terminology is mistaken. The 1988 Constitution establishes that the environment is an asset for the common use of the people, and assets for the common use of the people are public assets, according to the Civil Code. Also, water is an environmental resource according to the National Environmental Policy Law (Law No. 6938, of August 31, 1981), and as such is part of 'a public heritage to be necessarily ensured and protected, with a view to the collective use' (According to Art. 2, I of Law No. 6,938/1981). Law no. 9,433 fails to address the social, environmental, cultural, and even religious aspects of water, overlooking its real importance (CAUBET, 2004).

V – the articulation of water resources management with land use;

VI – the integration of the management of the hydrographic basin with that of estuarine systems and coastal zones.

Art. 4 The Union will articulate with the States, to manage water resources of common interest (BRAZIL, 1988).

The regulatory framework establishes that the policy's objectives are, firstly, to ensure that current and future generations have the necessary availability of water – echoing principle No. 3 of the 1992 Rio Declaration – in quality standards suited to the respective uses (item I of Art. 2 of Law no. 9,433/1997). Second, the policy aims to promote the 'rational and integrated' use of water resources, with a view to sustainable development (item II of Art. 2 of Law no. 9,433/1997). Finally, items III and IV of Art. 2 of the aforementioned Law establish the prevention and defense against critical hydrological events of natural origin or as a result of the inadequate use of natural resources, together with the promotion of the collection and use of rainwater (BRAZIL, 1997).

Therefore, the federal legislator recognized the importance of groundwater and the need to integrate surface and groundwater management, considering the whole hydrological cycle. We cannot ignore the fact that the quality and quantity of available water resources directly depend on environmental management and other policies, including disaster prevention. The problem is whether the objectives, directives, and foundations of the National Water Resources Policy have the power to be carried out and implemented with the instruments currently available to managers and society.

Policy instruments created by Law No. 9,433/1997 are provided for in Art. 5 of the law: charging for the use of water resources; an administrative act to authorize the use of raw water via grant; the planning through Water Resources Plans; the classification of bodies of water into classes (following Resolution No. 357 of 2005 of the National Council for the Environment – CONAMA), according to the prevailing uses; and an information system on water resources (BRAZIL, 1997).

Comments should be made on the Water Resources Plans, prepared for the hydrographic basins, the states, and the country with a minimum content: the diagnosis of the water resources current situation; the analysis of scenarios according to demography, productive activities, and land occupations; the balance between availability and future demands with identification of potential conflicts; the goals to rationalize use, increase

the quantity, and improve the quality of available water resources; the measures, programs, and projects to be carried out towards the goals; the priorities for granting; guidelines and criteria for collection; and proposals for the creation of areas with restricted uses for the protection of water resources (Art. 7 of Law No. 9,433/1997) (BRAZIL, 1997).

The charge provided for in item IV of Art. 5 of Law no. 9,433/1997 goes against the foundation of the policy according to which water is ‘a good of the public domain, but with economic value’. This instrument is based on the assumption that only if there is a charge for water usage, users will be aware of its real value and, thus, make more rational use of the resource. It should be noted that, while instituting the charge, the law does not establish any guarantee of access to water for people who cannot rise to the status of solvent consumers. The statement that the priority use of water in a situation of scarcity is for human consumption (one of the policy’s foundations) is the only provision that takes the ‘human being’ into account, with no practical way to operationalize this priority. The law does not even address the citizen as the final consumer of drinking water, as it only deals with the category of users, in the sense of economic sectors accessing water resources (Art. 12 of Law n. 9,433/97) (BRZEZINSKI, 2009; CAUBET, 2004). We must, therefore, conclude that

[...] as an infra-constitutional legal treatment, the Brazilian State still perceives fresh water much more as a resource – a catalyst for the economic development of some sectors of its society – than for the maintenance of the quality of life and the very life of its inhabitants – despite how masterfully the federal legislation on hydrological management has been written, which has little or no connection to the social and hydrological reality of the country (AMORIM, 2009, p. 322-323).

Another relevant instrument created by the National Water Resources Policy Law is the grant for the use of water with the objective of ‘ensuring the quantitative and qualitative control of water use and the effective exercise of the rights of access to water’ (BRAZIL, 1997). Water is inalienable, but the grant introduces the granting of the right to use a public good while charging means remuneration for the use of a public good (BRAZIL, 1997). When it comes to non-consumptive use – navigation and leisure, for example – the grant does not imply alienation, but is conceded for pollutant consumptive uses – with the incorporation of water into the production process, for example –, there is no denying that the grant means the authorization for the effective appropriation of water by the user (BRZEZINSKI, 2012; CAUBET, 2004). Water use can only be granted

after the classification of water bodies in classes according to predominant uses (Art. 9 of Law No. 9.433/1997), and after the establishment of priority uses through basin plans (according to Art. 13 of Law No. 9,433/1997), respecting the multiple uses of resources (Sole Paragraph of Art. 13 of Law No. 9,433/1997).

Finally, Law no. 9,433/1997 creates a National System for the Management of Water Resources (SINGREH), which aims to: coordinate the integrated management of water; administratively arbitrate conflicts related to water resources; implement the National Water Resources Policy; plan, regulate and control the use, preservation, and recovery of water resources; as well as promote charging for the use of water (Art. 32). According to Art. 33 of Law no. 9,433/1997, the institutional arrangement of the system comprises the National Water Resources Council (CNRH); the National Water Agency (ANA); the State and Federal District Councils for water resources; river basin committees; the bodies of the federal, state, municipal, and Federal District public authorities competent to manage water resources; as well as water agencies. Each of such institutions has different competencies in the management of water resources, with the basin committees playing a consultative role (Art. 41 of Law No. 9,433/1997) (BRAZIL, 1997).

Popular participation in the decision-making process is not one of the characteristics of the system. Art. 1 of the Law establishes, among others, decentralized management, with ‘the participation of the Public Authority, users and communities’, as one of the foundations of the policy (following item VI of Art. 1 of Law no. 9,433/1997). Citizens could eventually be represented within the category of ‘communities’, since water users, under the terms of the Law, are the economic and productive sectors that use water resources intending to obtain profit or another economic advantage, such as industry, agriculture, mining, power generation, and navigation. As final consumers of water, human beings are not users within the meaning of the legislator. Several studies that delve into the issue of participation in water resources management, including an analysis of the composition of the National Water Resources Council – as well as that of state councils and basin committees – indicate that the National Policy does not allow effective popular participation (BRZEZINSKI, 2012; CAUBET, 2004).

The present work aims to identify which are the specific measures, principles, and instruments for the management of groundwater. The National Water Resources Policy Act almost exclusively relates to surface water.

Groundwater is mentioned in a few provisions of Law No. 9,433/1997. In Art. 12, the Law establishes that the exploitation of groundwater depends on a grant. Also, Art. 49, IV of Law no. 9,433/1997, the drilling of wells to extract groundwater or the operation of wells without proper authorization constitutes ‘a violation of the rules for the use of surface or underground water resources’. Among the possible penalties for infractions is that of Art. 50, IV of the Law that provides for the ‘definitive embargo, with revocation of the grant, if applicable, to *incontinenti* restore water resources, beds, and banks to their former state, under the terms of Arts. 58 and 59 of the Water Code or plugging underground water extraction wells’. In other words, except for the provision of infractions related to wells, the only legal provision concerning groundwater subjects its use to the grant instrument. In this case, the grant is not subject to the plan prepared by the basin committee, as basin committees refer to surface waters. The granting of groundwater, therefore, depends solely on the will of the incumbent; in short, the states of the Federation.

It can be said that the national policy does not privilege the inseparability of surface and groundwater within the hydrological cycle. When outlining the guidelines for public policy, Art. 3 of Law no. 9,433/1997 mentions the ‘systematic management’ of water resources, the integration of water resources management with environmental management and land use; the integration of basin management with that of coastal areas and estuarine systems; and recalls the articulation with the planning of the user sectors and integration between state, regional, and national planning. Yet, groundwater is not mentioned (BRAZIL, 1997).

‘Integration’ is a term used at different times by the law: the federal Executive Authority must promote the integration of water resources management with environmental management (Art. 29, IV); the same must be done by state and Federal District governments (Art. 30, IV); and the Union and states must coordinate in the management of water resources of common interest (Art. 4). Furthermore, according to Art. 31 of Law no. 9,433/1997: ‘In the implementation of the National Policy on Water Resources, the Executive Authority of the Federal District and municipalities will promote the integration of local policies for basic sanitation, use, occupation and conservation of the soil and environment with federal and state policies on water resources ‘ (BRAZIL, 1997). However, there is no provision for instruments concerning the various desired integrations and articulations. According to Rebouças (1999, p. 146), ‘the inclusion of

groundwater in this legal instrument was merely ‘notary’, insofar as it only institutionalizes the empirical and improvised extractivism in force’.

Finally, there is the need to emphasize the fact that Law no. 9,433/1997 does not work with the notion of transboundary waters, except to establish that there must be a representative of the Ministry of Foreign Affairs in river basin committees of the border and transboundary rivers (§ 2 of Art. 39) (BRAZIL, 1997). We can, therefore, conclude that there are no specific policies for transboundary groundwater at the federal level, despite the regulation of the use of mineral waters, which comprises a Union asset, and that the national policy on water resources takes little account of the inseparability of water resources, relegating the issue to state competence policies.

#### **4 THE WATER RESOURCES POLICY OF THE STATE OF PARANÁ**

The 1988 Constitution assigns the ownership of groundwater to the states of the Federation. There are no reservations regarding groundwater exceeding the territory of more than one member state, as there are for surface waters. Therefore, in Brazil, the waters of the Guarani Aquifer technically belong not to the Union, but to the eight states where it occurs.

In Paraná, the legal norm that establishes the State Policy on Water Resources is Law No. 12,726/1999, which has objectives, principles, and instruments similar to those of the federal policy. Observe that, among the foundations of the state policy, a 2009 reform (by Law No. 16,242) amended Law No. 12,726/1999 to recognize that ‘II – water is a limited natural heritage endowed with economic, social, and environmental value’ (Art. 2, II), adopting the expression ‘heritage’ instead of ‘resource’ and adding social and environmental values to the economic values (PARANÁ, 1999).

State policy dedicates a specific chapter of the Law to ‘groundwater deposits’, with the following definition:

Art. 26 The foundations, objectives, general guidelines for action, and the instruments of the State Policy on Water Resources, established by this law, apply to groundwater deposits.

§ 1. Groundwater is the water that flows naturally underground, in a way that is susceptible to human extraction and use.

§ 2. The regulations and rules resulting from this law consider the interconnection between groundwater and surface water, as well as the interactions observed in the hydrological cycle (PARANÁ, 1999).

State legislature is somehow concerned about the preservation of the physical, chemical, and biological quality of groundwater:

Art. 27 Given its strategic importance, groundwater must be subject to a permanent preservation program to enable its best use.

§ 1. The preservation and conservation of these waters imply a rational use, implementation of measures that avoid their contamination, and promotion of their balance, with other natural resources, in physical, chemical, and biological terms.

[...]

Art. 29 Whenever needed, the Public Authority shall establish protected areas for the underground water extraction sites, to enable their preservation, conservation, or rational use, under the terms defined in this law.

§ 1. The competent entity of the State Public Authority shall carry out the necessary surveys for the constitution of a register of deep tubular wells for the capture of groundwater, inserting it together with the State System of Information on Water Resources, dealt with in Section VI of Chapter VI of this law.

§ 2. The exploitation of groundwater with no observation of the provisions established by the permanent preservation program referred to in Art. 27 will be subject to the infractions and penalties defined by Chapter XII of this law (PARANÁ, 1999).

As with the national water resources policy, the policy of the state of Paraná also focuses on the use of surface water; with a few specific rules for groundwater. According to § 2 of art. 27, the proposal for the use of groundwater will be up to ‘the competent body’ of the state water resources management system ‘to develop a policy for the use of natural groundwater deposits within the state of Paraná, to be submitted for approval by the State Council of Water Resources, as well as proceeding with the assessment of underground water resources and inspecting their exploitation, adopting preventive measures regarding their contamination’ (PARANÁ, 1999). Chapter X of Law no. 12,726/1999<sup>4</sup> outlines the composition of the referred system but does not attribute the specific competence to develop the ‘proposals for the use of groundwater’ to any of these bodies mentioned

4 Art. 33. The State Water Resources Management System (SEGRH/PR) comprises:

I – the State Water Resources Council – CERH/PR, as a central deliberative and normative collegiate body;

II – the Secretary of State for Sustainable Development and Tourism – Sedest, as the central coordinating body; (as listed under Law 19848 of 05/03/2019)

III – Instituto das Águas do Paraná, as a managing executive body;

IV – the Hydrographic Basin Committees, as deliberative and normative regional and sectorial bodies of the State’s hydrographic basin; and

V – the Hydrographic Basin Managements, as technical and administrative support units for the Hydrographic Basin Committees.

Single paragraph. In addition to observing the cost limitation imposed in § 5 of Art. 22 of Law No. 12,726 of November 26, 1999, Instituto das Águas do Paraná must guarantee the full performance of the functions defined by this law, ensuring the adequate use of resources from the State Water Resources Management System – SEGRH/PR (PARANÁ, 1999).

in Art. 27. Likewise, Art. 28 provides:

Art. 28. The implementation of industrial districts and large irrigation, colonization, or other projects dependent on the use of groundwater or which may have a relevant impact on them, must be carried out by hydrogeological studies to assess the potential of their water reserves and for the correct dimensioning of the flows to be extracted, subject to the prior approval of the competent bodies, to the other provisions of this Law, as well as the norms that may be established by the State Council of Water Resources (PARANÁ, 1999).

It is not clear who will carry out the hydrogeological studies that must precede certain developments, nor which body should grant its ‘prior approval’. As groundwater is not subject to the basins plans, diagnosis, planning, granting<sup>5</sup> of the right of use, and monitoring of those uses are all attributions of the Executive Authority, according to Art. 31 of Law no. 12,726/1999:

Art. 31. In implementing the State Policy on Water Resources, it is incumbent upon the Executive Authority:

I – taking the necessary measures for the implementation and operation of the State Water Resources Management System;

II – granting the rights to use water resources, regulate; as well as supervise its uses, within its sphere of competence;

III – implementing and managing the State Water Resources Information System;

IV – promoting the integration of water resources management with environmental management;

V – carrying out the technical control of the water supply works.

Single paragraph. The Executive Authority of the State and Municipalities of Paraná will promote the integration of local policies for basic sanitation, use, occupation, and conservation of the soil and environment with federal and state policies on water resources (PARANÁ, 1999).

Ten years after the enactment of the state policy law on water resources, a state agency linked to the State Secretariat for the Environment (currently, the State Secretariat for Sustainable Development and Tourism – SEDEST) was created, called Instituto das Águas do Paraná (Law No. 16,242/2009), which became the executive managing body of the State Water Resources Management System, among its other functions (PARANÁ, 2009). Law no. 12,726/1999 was replaced by the following:

Art. 39-A. It is incumbent upon the Instituto das Águas do Paraná, as the managing executive body of the State Water Resources Management System – SEGRH/PR:

[...]

IX – granting, suspending, and revoking rights to the use of water resources, through

<sup>5</sup> The granting of rights for the use of water resources in the state of Paraná is regulated by Decree No. 9,957/2014 (PARANÁ, 2014).

its own procedures;  
XI – charging for the right to use water resources;  
XVII – carrying out the quantitative and qualitative monitoring of both surface and underground water resources;  
[...] (PARANÁ, 1999).

The charge for the right to use water resources is one of the instruments of the State Policy, according to Art. 53 of Law no. 12,726/1999. However, a provision of Chapter XIII – on general and transitional provisions – provides for a waiver by the state of Paraná:

Art. 53 The State Executive will establish, in its own regulation, within 18 (eighteen) months from the validity of this law, the procedures related to charging for the right to use water, to be implemented gradually in all user sectors.

§ 1. Small rural producers with up to six fiscal modules will be exempt from charging for the right to use water.

(Included by Law 16,242 of 10/13/2009)

§ 2. The benefit provided in the previous paragraph will be extended to other rural producers, provided that consumption is exclusively intended for agricultural and silvopastoral production. (Device enacted by the Legislative Assembly and published on 12/23/2009 by Law 16,242 of 11/27/2009) (PARANÁ, 1999).

The state of Paraná started collecting values for the use of water resources in 2013. It currently collects BRL 4.6 million per year, which is little, compared to the other states of the Brazilian Federation. Minas Gerais raises BRL 39.61 million; São Paulo, BRL 88.33 million; and Ceará raises a staggering BRL 181.33 million (BRAZIL, 2018).

According to the State Plan for Water Resources, groundwater was incorporated into the hydrographic units of water resources management through the subdivision of basins and units into conditionings for the application of water resources management instruments. One of the constraints is the ‘mapping of aquifer units, with emphasis on areas of greater vulnerability to contamination’. Thus, ‘The interpolation of the selected constraints resulted in the subdivision of the state’s hydrographic basins into 51 Strategic Management Areas (AEG), which cut out homogeneous regions to apply the management instruments’ (PARANÁ, 2010b, p. 10-11).

On the other hand, the Plan recognizes that the availability of groundwater does not integrate the water balances (relationship between demand and availability) of the state:

The underground water availability, represented by the volumes of water accumulated in aquifers, is also used to meet the water demands of different users. The exploration limits of these potentials are associated with the maintenance of minimum volumes

in the aquifers to feed surface water courses.

The estimates of underground water availability from PLERH/PR consider that 80% of the hydrogeological potential of each aquifer unit must be preserved. Given the reduced number of information, a more conservative value of 90% was adopted for the Guarani Aquifer.

The underground availability is not observed in the determination of the PLERH/PR balances, due to its strategic reserve character (PARANÁ, 2010b, p. 16).

As for the 'reduced number of information' on the Guarani Aquifer in Paraná, it should be noted that the 26 maps of the aquifer units that occur in the state available on Instituto de Águas do Paraná's website are from the *Atlas de Recursos hídricos do Estado do Paraná*, prepared by the former Superintendence for the Development of Water Resources and Environmental Sanitation (SUDERHSA) and released in 1998 (PARANÁ, 1998).

The Paraná State Secretariat for the Environment recommends that municipalities draw up municipal plans for water resources, providing a roadmap that would serve not only municipal managers but also federal and state authorities:

The integration of public policies within the hydrographic basin still needs to be considered. The integration with environmental management and the articulation of water resources management with the use and occupation of the soil point to a difficult but indispensable path, as life cannot exist without water, and water management cannot do without proper soil management. Integrated management has the planning of water use, control, and protection as an instrument, allowing for the association of broader development goals to the planning process to consider additional sectors besides the water sector, which give raise as well as suffer the impacts of the waters and, therefore, of the decisions taken. This is often the case in the relationship between land and water use. Water protection implies the control of its uses and policies of land use and occupation in the territory of the hydrographic basin [...]

The master plans can contemplate the environmental subject regarding the characterization of the municipality; PPAs (Permanent Preservation Areas); the habitat of endangered species; protected territorial spaces; conservation units; areas of risk or environmental interest; degraded areas; silting of water bodies; vegetal cover; extractive activities; sources of atmospheric emissions; waste generation and disposal. The plans can incorporate the municipality's sanitation situation, the protection of springs, macro and micro drainage and point out guidelines to ensure the city's expansion on a sustainable basis; promote adequate use of natural resources and infrastructure; preserve environmentally fragile areas or areas of great cultural value; improve urban mobility conditions and alleviate neighborhood conflicts (PARANÁ, 2008 p. 3-4).

No policies, programs, or measures specifically related to groundwater from the Guarani Aquifer were identified.

## **5 FOZ DO IGUAÇU AND ITS MUNICIPAL POLICIES WITH IMPACT ON THE PRESERVATION OF THE GUARANI AQUIFER**

The 1988 Constitution establishes no provision for powers related to the water resources exercised by the municipalities. Yet, the exercise of various municipal powers can directly impact the quality and quantity of groundwater, so the Law that institutes the National Water Resources Policy determines the integration between the management of water from the environment, sanitation, and use of the soil and the articulation of policies at different levels of the Federation.

In its Art. 4, IV, X, and XVI, the Organic Law of the Municipality of Foz do Iguaçu provides material competence for environmental preservation; organizing water supply and sanitary sewage services; and carrying out drainage and channeling works for rainwater (FOZ DO IGUAÇU, 1990). It is up to the City Council to legislate on the protection of the environment and the fight against pollution (Art. 11, I, *e*) (GIRÓN; BRZEZINSKI, 2018). Besides detailing the attributions for certain policies, Art. 188 of the Organic Law outlines the general lines of municipal environmental policy, echoing the terms of Art. 225 of the Constitution of the Republic: ‘everyone’s granted the right to an ecologically balanced environment, a good for common use by the people and essential to a healthy quality of life, imposing on the Municipal Government and the community the duty to defend and preserve it for present and future generations’. Paragraph 1 of Art. 188 specifies the tasks of the Public Authority of Foz:

I – Preserving and restoring essential ecological processes [...], protecting rivers and springs, water courses, from sewage discharge; [...]

III – Demanding, pursuant to the Law, a prior environmental impact study, which will be publicized for the installation of work or activity potentially causing significant degradation of the environment;

V – Promoting environmental education [...]and public awareness for the preservation of the environment;

VII – Maintaining permanent articulation with the other municipalities in its region, as well as the State, to rationalize the use of water resources and hydrographic basins, respecting the Guidelines established by the Environmental Legislation (FOZ DO IGUAÇU, 1990).

To implement the environmental policy, Art. 189 of the Organic Law of the municipality establishes the duty to act through planning, control, and inspection of both public and private activities, as both public and private agents can be potential causes of worrying changes in the environment (FOZ DO IGUAÇU, 1990).

The norms for the protection and conservation of the environment in Foz do Iguacu were established by Complementary Law No. 7/1991. Among its objectives is the need to establish minimum standards related to the quality of life and environmental comfort (Art. 3, II). Concerning soil preservation, Art. 99 prohibits ‘depositing, disposing, unloading, burying, infiltrating, or accumulating waste in the soil without prior authorization from the City Hall and federal or state agencies as appropriate’. The Sole Paragraph of this Art. determines that the use of land as the final destination of potentially polluting solid waste must be done properly and approved by the City Hall or state agency, whether on public or private property. One of the few explicit mentions of groundwater is in Art. 100, which provides that sanitary landfills must have adequate measures to guarantee the protection of surface and underground waters (Art. 100 of Law No. 7/1991). Complementary Law No. 7/1991 includes three articles concerning the preservation of water resources:

Art. 103. Dumping and disposing of debris into any stream, canal, lake, well, and fountain is prohibited.

Art. 104. Toilets, pigsties, stables, and other similar uses shall never be present less than 30.00 m (thirty meters) from water courses.

Art. 105. Diverting beds of water currents, as well as obstructing their course in any way, is prohibited.

Single paragraph. Running waters, born at the edge of a land and flowing through it may be regulated and rectified within the limits of the same land, but shall never be diverted from their natural flow or passed on to the detriment of neighbors or public roads.

Art. 106. It is forbidden to build dams without prior permission from the City Hall (FOZ DO IGUAÇU, 1991).

Regarding the discovery of mineral water deposits, Art. 149 of Complementary Law no. 7/1991 provides that this fact must be communicated to the City Hall and the competent Federal Agency (DNPM) ‘to avoid the predatory exploitation of aquifers, as well as their pollution’. Also, ‘the exploration of mineral waters will be carried out employing a specialized

technical opinion regarding its location, taking into account the geological particularities of the municipality'. There are also specific provisions for the exploitation of quarries, gravel pits, clay, potteries, sand, and gravel deposits (FOZ DO IGUAÇU, 1991).

On cemeteries, chapter III of the Law touches on the issue of water and groundwater supply. Art. 180, Sole Paragraph, provides that the location of new cemeteries must be isolated by public places or security lanes, with a minimum width of 14 meters in areas supplied with a water distribution network, or 30 meters in areas not provided with a network. In the area where a new cemetery is to be built, the water table must be at least 2 meters deep and, about neighboring water courses, the level of the cemeteries must be sufficiently high so that the flood waters do not reach the bottom of the graves (FOZ DO IGUAÇU, 1991).

Since the 2000s, the municipality of Foz do Iguacu has had specific legislation on the control of deep underground water for human consumption and use (Law No. 2330/2000). This five-article law deals with the abstraction of deep underground water, through tubular wells intended for human consumption – especially in residential condominiums, hotels, motels, nursing homes, daycare centers, schools, industries, and health establishments – determining that each user who explores a well is responsible and obliged to carry out the water analysis for all physical-chemical and bacteriological parameters (FOZ DO IGUAÇU, 2000). The municipal health surveillance 'may, at its discretion, require the performance of other parameters, as well as the repetition of analyses' (Art. 2, Sole Paragraph) (GIRÓN; BRZEZINSKI, 2018).

Compliant to Art. 182 of the 1988 Constitution<sup>6</sup> and the City Statute (Federal Law No. 10,257 of July 10, 2001), Foz do Iguacu recently approved the Master Plan for Sustainable Integrated Development – PDDIS/FOZ. It is a strategic planning instrument for the development and urban expansion of the municipality, defining the principles, objectives, guidelines, and instruments for carrying out planning actions in Foz do Iguacu. It was instituted by Complementary Law No. 271/2017 and comprises rules on land occupation, transport, housing, taxes, and the environment (FOZ

<sup>6</sup> Art. 182. Carried out by the municipal government, according to general guidelines established by law, the urban development policy aims to sort out the full development of the city's social functions and guarantee the well-being of its inhabitants.

§ 1 The master plan, approved by the City Council, mandatory for cities with more than twenty thousand inhabitants, is the basic instrument of urban development and expansion policy.

§ 2 Urban property fulfills its social function when it meets the fundamental requirements of the city's order expressed in the master plan. [...]

DO IGUAÇU, 2017a).

Art. 12 assigns the duty to ensure environmental protection throughout the territory of the municipality to the Municipal Government and the community. Art. 13 of the law establishes guidelines for the implementation of the Plan, being relevant for the present work items VI and VII, according to which ‘recovery of areas and springs degraded by the municipality’ and ‘depollution of water bodies in the municipality, surface and underground, monitoring and preserving their quality’ (FOZ DO IGUAÇU, 2017a).

The municipal environmental system is outlined by Art. 99 of Complementary Law no. 271/2017. The environmental system must articulate public policies for environmental management and protection, basic sanitation, water resources, collection and disposal of solid waste, green areas, and urban drainage. The environmental system (Art. 104) comprises: the natural heritage of the municipality; the municipal environmental sanitation system; and the municipal environmental system. Art. 105 lists the ‘reference elements’ for the natural heritage of the municipality:

- I – The municipal hydrography with its rivers, streams, corners, and affluents;
- II – River banks, streams, and their sources;
- III – Underground water reserves;
- IV – Remainings areas of forests, native forests, and Private Natural Heritage Reserves;
- V – The natural relief (FOZ DO IGUAÇU, 2017a).

These are important legal provisions to support an effective integration and systematic management of water resources with the management of other environmental goods. However, despite the relevant aspects of integrated environmental management addressed in these provisions, there is no regulatory standard for Complementary Law No. 271/2017 and, therefore, no evidence of the implementation of the planned policies (FOZ DO IGUAÇU, 2017a).

It is also worth mentioning that the municipality has specific rules regarding basic sanitation services and solid waste management. The basic sanitation service has general guidelines established by the Union through Law No. 11,445/2007 (BRAZIL, 2007). The Master Plan of the Municipality of Foz do Iguaçu has an explicit provision on the set of operations that make up sanitation – water supply, sanitary sewage, drainage, solid waste management, as well as control and monitoring of environmental pollution – should serve to improve the well-being of the population in the municipality and prevent the degradation of its natural resources (FOZ DO

IGUAÇU, 2017a).

The Municipal Basic Sanitation Plan and the municipal basic sanitation policy were established by Complementary Law No. 198/2012, in compliance with the federal law that imposes the national guidelines. The municipal policy mentions the essential character of the service and the control by the municipal government, but there is no provision regarding the preservation and conservation of surface or underground water (FOZ DO IGUAÇU, 2012a). Regarding groundwater, the Municipal Basic Sanitation Plan makes the following diagnosis:

The region comprises one of the largest strategic freshwater reserves in the world, the Guarani Aquifer. At some points, it reaches temperatures of up to 80 °C, with an average of 50 °C, enabling a range of multiple uses, such as drying grains, generating steam in industrial boilers, air conditioning, spas, and preventing frosts, etc. Considering the agricultural vocation of the area, and a strong desire to implement a consistent agro-industry, allowing for the addition of greater exchange value to existing primary production, besides the socioeconomic aspect of job creation, the water supply under appropriate conditions for this purpose (thermalized and with low pumping costs), achieves a strategic value for the intended development policy. Most of the temperatures used in the agroindustry oscillate between 37° C and 70° C, corresponding to water for washing carcasses and environments, drying grains, air-conditioning incubators, aviaries, etc. biomass, oil, or electricity. It gives rise to significant costs, in addition to the environmental pollution resulting from the waste products generated by the fuels traditionally used, which produce CO<sub>2</sub>, H<sub>2</sub>S, heavy metals, deforestation, and flooding by dams. The wells in this aquifer have an average productivity of 300,000 l/h, allowing it to carry out up to 6,000 wells in the State of Paraná. The emergence of the Itaipu Reservoir does not seem to have affected the quality of groundwater, as it is a discharge area for the aquifers, despite the lack of historical hydrochemical data from the catchment units that allow the assessment of eventual changes.

The hydrochemical characteristics of the waters of the aquifers in the region show differences depending on the different existing lithologies. All water from the tubular wells, sampled and analyzed by public bodies or private entities, proved to be fit for human consumption. Some waters are mineralized and commercialized, as found in the municipalities of Foz do Iguaçu and Santa Helena (FOZ DO IGUAÇU, 2012b, p. 27-28).

Considering the ‘agricultural vocation’ of the western region of Paraná and the dependence of this sector on irrigation techniques, state authorities must act strongly towards controlling extraction and monitoring the grants granted. There are no predictions in this regard at the municipal level.

In Foz do Iguaçu, there was a concession to Sanepar – a mixed capital company in Paraná concerning the water supply and sanitary sewage

service. According to technicians from the company itself, the city is supplied with surface water (approximately 70% of the supply water is collected from the Itaipu Biological Refuge, while 30% comes from the Tamanduá River). Sanepar does not extract groundwater in Foz do Iguaçu. On the other hand, 100% of the wastewater produced is returned to the rivers with treatment (GIRÓN; BRZEZINSKI, 2018). Following Art. 47 of Law no. 11,445/2007 (BRAZIL, 2007), the municipality of Foz has created the Municipal Council for Social Control of Sanitation (by Municipal Law No. 4,499/2017), a collegiate body of an advisory nature for social control of sanitation services, composed of representatives of the service holders, government agencies, providers, users, and technical entities, civil society organizations and consumer protection organizations related to the basic sanitation sector.

As for the solid waste produced within the municipality of Foz do Iguaçu, its integrated management is also provided for in Complementary Law No. 198/2012 – in compliance with Law no. 12.305/2010 (BRAZIL, 2010). The management and integrated management of solid waste are provided for in Arts. 7 to 16 of Complementary Law No. 198/2012 (FOZ DO IGUAÇU, 2012a). Foz do Iguaçu's Solid Waste Management Plan is part of the 2012 Basic Sanitation Plan. The document lets us know that the maintenance of the structures of the Sanitary Landfill of Foz is continuous and systematic, with leachate drainage and effluent treatment. The landfill uses the total leachate recirculation technique, whereby there is no discharge of effluents into streams and rivers in the region (FOZ DO IGUAÇU, 2012b).

It is observed that the municipality of Foz produced very advanced legislation in environmental matters. The effective implementation of these integrated – environmental, land use, solid waste, and sanitation – management policies can positively contribute to the preservation of groundwater and, specifically, the Guarani Aquifer.

## **FINDINGS**

There are more than 200 transboundary aquifers in the world, but only 4 of them are subject to any international regulation. The Agreement on the Guarani Aquifer, signed in 2010 by the four Mercosur States, is the only one after the UN General Assembly Resolution (UN/GA Resolution No. 63/124, 2008) which recommends a set of principles and rules for

transboundary aquifers.

Although the Guarani Aquifer is a topic of political, social, environmental, economic, and strategic importance, its treaty showcases excessive concern with the proclamation of state sovereignty and a certain detachment regarding environmental parameters. Most of the treaty's provisions are dedicated to procedures for exchanging information between States, concerned with projects, works, and undertakings that may be authorized in neighboring territory. Concerning the preservation of the quality and quantity of the Guarani waters, the states abstain from binding obligations, providing only a 'sovereign right to promote the management, monitoring, and sustainable use' of groundwater. In other words, the text ignores the phenomena of pollution, contamination, and overexploitation of groundwater, as well as the need for conservation and preservation of ecosystems dependent on the aquifer.

The absence of precise and binding obligations of the Agreement on the Guarani Aquifer does not prevent State-Parties from adopting provisions in their domestic legal systems to transform the 'right to promote the management, monitoring and sustainable use of water resources' into concrete measures. In this work, the federal, state, and municipal laws in force in the Triple Border were analyzed to verify if they exist and what are the public policies that can promote the conservation and preservation of groundwater.

Established by Law no. 9,433/1997, the National Water Resources Policy mirrors principles and instruments of recommendations from international bodies on the good management of water resources; that is, water is a public good with economic value, of multiple uses, whose right to use must be charged, according to parameters established in planning authored by basin committees, promoting integrated management of water resources and articulation with several other policies. The priority must be human consumption and animal watering, and management must rely on the participation of communities, without there being mechanisms to guarantee these humanistic loopholes. On the contrary, the users of water become the economic and productive sectors, not the citizens, according to the National Policy Law. The federal legislator submitted groundwater to the grant instrument. And that is it.

Groundwater belongs to the states – according to Art. 26, I, of the Constitution of the Republic of 1988 – despite admitting, even today, the existence of a special legal regime for mineral waters, which fragments the

management of water resources and is blatantly unconstitutional. Within the scope of the state of Paraná, Law No. 12,726/1999 echoes the same objectives, principles, and instruments of the legislation. On the subject of groundwater, it provides for specific provisions – Arts. 26 to 29 – which in itself represents an advance if compared to the national policy. Still, it contains the – unconstitutional – particularity of relieving the agricultural sector from paying for the right to use water resources (Art. 53) (PARANÁ, 1999).

Several norms were enacted within the scope of the municipality of Foz do Iguaçu whose implementation could contribute to the preservation and conservation of groundwater quality and quantity. Foz do Iguaçu has an Environmental Code, a Master Plan, and a municipal sanitation policy, including the issue of solid waste. However, neither at the municipal level nor at the state or federal level, did legislators mention the need to prevent and mitigate the impacts of climate change, such as desertification and rising sea levels.

If, on the one hand, the Brazilian legal system is based on advanced principles for water and environmental management; on the other, it does not always provide the necessary mechanisms to translate the principles of the law into public policies. Groundwater approaches an epiphenomenon of water resources management, unrelated to the planning of basin committees and subject only to the granting of the Public Authority to be exploited.

There is also a lack of real articulation between the three governmental authorities – federal, state, and municipal – so that the various policies concerning water resources are integrated. Above all, the inseparability of the hydrological cycle is a factual reality still little known by national legislators.

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Article received on: 05/19/2021.

Article accepted on: 07/26/2022.

**How to cite this article (ABNT):**

BRZEZINSKI, M. L. N.; GIRÓN, M. Y. R. The Guarani Aquifer and public policies at the triple border. *Veredas do Direito*, Belo Horizonte, v. 19, n. 44, p. 35-66, May/Aug., 2022. Available from: <http://www.domhelder.edu.br/revista/index.php/veredas/article/view/2155>. Access on: month. day. year.

