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WATER LAW ACCORDING TO GOVERNANCE



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**NATIONAL WATER AND SANITATION AGENCY
MINISTRY OF REGIONAL DEVELOPMENT**

WATER LAW ACCORDING TO GOVERNANCE

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LIST OF ABBREVIATIONS

AEB – Brazilian Space Agency

ANA – National Water and Sanitation Agency

ANEEL – National Electricity Sector Regulatory Agency

ANM – National Mining Agency

ANVISA – Brazilian Health Regulatory Agency

APP – Permanent Preservation Area

CAR – Rural Environmental Register

CEREGAS – Regional Centre for Groundwater

CNRH – National Water Resources Council

CONAMA – National Environment Council

CPRM – Geological Survey of Brazil

DNPM – National Department for Mineral Production

EIA/RIMA – Environmental Impact Study /
Environmental Impact Report

GEF – Global Environmental Facility

IBAMA – Brazilian Institute for the Environment and
Renewable Natural Resources

ICMBIO – Chico Mendes Institute for the Conservation
of Biodiversity

INPE – National Institute for Space Research

MERCOSUL – Southern Common Market

MMA – Ministry of the Environment

OAS – Organization of American States

PNMC – National Policy on Climate Change

SINGREH – National System for Water Resources
Management

SISNAMA – National Environmental System

SNIS – National System for Information about
Sanitation

SNUC – National System of Conservation Areas



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PRESENTATION

Right after its creation in July 2000, the National Water and Sanitation Agency (ANA) felt the need for training its own technical staff concerning the new water legislation, as well as instructing all those at the federal and state levels, who would begin to implement the Water Law, promulgated in 1997. These persons included members of the National Council and State Councils of Water Resources, state managing bodies, the Secretariat of Water Resources of the then Ministry of the Environment who would be agents to form river basin committees in rivers of the Union's domain, among other activities.

Starting in 2001, through the then Superintendency of Technology and Training (STC), ANA hired some of the most prominent jurists in this area to give short-term, on-site courses. Among these jurists was one of the authors of this book, Professor Maria Luiza Machado Granziera, a pioneer in the study of water law and author of the first work on the subject, *Water Law and Environment*, which was published in 1993.

The present publication originated in 2018 from the preparation of didactic material for one of ANA's courses. The idea of the Training Coordination of the National Water Resources Management System (Singreh) was to provide a distance learning course to offer to Singreh's agents and ANA's international partners, particularly to the countries of Latin America, the Caribbean, and the Community of Portuguese-speaking countries.

Our goal was to provide an up-to-date panorama of water legislation and its role in water governance.

This overview consisted of presenting key legal issues in a scenario of governance, aiming to build integrated management of water resources by participation of the multiple stakeholders.

The didactic material was developed by Professor Pilar Carolina Villar of the Federal University of São Paulo, in partnership with Granziera. She is another pioneer in the study of water legislation, especially groundwater and author of the book *Transboundary Aquifers: Water Governance and the Guarani Aquifer*, published in 2015.

In 2019, based on the didactic material prepared, it was decided to offer a classroom course on the subject in partnership with the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Brazilian Cooperation Agency (ABC), linked to the Ministry of Foreign Affairs. The written material distributed was translated into Spanish and English and the authors themselves gave the course at ANA's headquarters from June 4-6, 2019. The demand for participation was huge and the course a great success.

Given the technical quality of the material prepared and the current relevance of the topics covered, we decided to edit it in digital book format. The publication coincides with the 20 years of ANA's creation.

Good reading to all.

ANA Collegiate Board of Directors.



THE LAW IN THE DEVELOPMENT OF FRESH WATER GOVERNANCE





1. THE LAW IN THE DEVELOPMENT OF FRESH WATER GOVERNANCE

The Water Law is gradually being recognized as an autonomous branch of Legal Science, as it complies with the scientific, normative and didactic requirements (Commetti, Vendramini and Guerra, 2008; D'Isep, 2010; Dalla-Corte and Portanova, 2013). The scientific requirement refers to the existence of principles and institutes that are distinct to the Water Law; the normative requirement is based on the development of the Brazilian norms, demonstrating a paradigm shift in the relationship between the law and water; and the didactic requirement is related to the existence of subjects on Water Law in universities and specialized technical literature (Commetti, Vendramini and Guerra, 2008).

The Federal Constitution, the National Policy on Water Resources (Law No. 9.433/1997) and its regulations are the primary bases of this law, and were evaluated by Granziera (2003) and Pompeu (2006) as follows:

Water Law: "a set of principles and legal standards that govern the domain, use, jurisdictions and management of water intended to plan for the uses and the preservation, as well as the defense of their harmful effects, whether or not they are caused by human activity" (Granziera, 2003, p. 34).

Water Law: "a set of principles and legal standards that govern the domain, use, benefit, conservation and preservation of water, as well as protection from its harmful effects" (Pompeu, 2006, p. 39).

This law has a set of principles and independent institutes that make it distinct from other areas of the law. Efforts made to consolidate its guiding principles include the approval, by judges and prosecutors from Brazil and abroad, of the Brasilia Declaration of Judges on Water Justice, during the 8th World Water Forum held in 2018, in Brasília (DF). This document consolidates the commitment

made by those enforcing the Water Law, to guide their work through the following principles:

Principle 1 – Water as a public asset

Principle 2 – Water Justice, Land Use, and the Environmental Functions of Property

Principle 3 – Water Justice and Indigenous, Tribal, and Mountain Peoples, and other peoples in river basins

Principle 4 – Water Justice and Prevention

Principle 5 – Water Justice and Precaution

Principle 6 – *In Dubio Pro Aqua*

Principle 7 – Polluter-payer, user-payer and the internalization of environmental costs.

Principle 8 – Water Justice and Good Water Governance

Principle 9 – Water Justice and Environmental Integration

Principle 10 – Procedural Justice on Water

Mandatory Reading:

Brasilia Declaration by Judges on Water Justice.

This new branch of law has its set of guidelines, institutions, and instruments. Its guidelines point out the need for integrated and participatory management, while the National Water Resources Management System (SINGREH) was equipped with agencies and entities composed of several actors (State, civil society and users) to build a negotiated management of water. The instruments for the water policy – Water Resources Plans, categorization of water bodies into classes, granting rights of use of water resources, charging for water use, and Information System on Water Resources – also attempt to promote this integrated, participatory and decentralized water management.

The current Brazilian Water Law has established a system of water governance because its formulation and application transcend the technical view of legal

experts, engineers, and technocrats. The Brazilian legal system has assembled a management system that establishes and legitimizes a political process characterized by strategies, debates, conflicts, and coalitions between the various actors that utilize water in some form (Sehring 2009). As such, the Law is not only an instrument linked to governability but water governance as well.

The idea of governance emerged as an alternative to the governance crisis that was reflected in the Public Authority's difficulty in resolving contemporary issues (Merrien, 1998). In Law, this phenomenon is reflected by the establishment of regulations that are not effective in practice because they either lack social adhesion, an institutional capacity to promote them, regulation or oversight. Diniz (1999, p. 196) distinguished the concepts of governability and governance, as follows:

Governability refers to the more general systemic conditions under which the exercise of power takes place in a given society, such as characteristics of the political regime (whether democratic or authoritarian), the form of government (whether parliamentary or presidential), the relations between the powers (greater or lesser asymmetry, for example); the party systems (whether multiparty or bipartisan), among others.

Governance, on the other hand, concerns governing ability in the broad sense, involving the capacity for state action in implementing policies and achieving collective goals. It touches on the set of mechanisms and a procedure to deal with the participatory and plural dimension of society, which entails expanding and improving the means of communication and managing interests. [...] they presuppose a State that has greater flexibility, capable of decentralizing functions, transferring responsibilities and widening, rather than narrowing, the universe of participating actors without giving up any instruments of control and supervision.

Hence, governability refers to the "state scope in the exercise of power" (Gonçalves, 2005, p.3) and focuses on the attributes of the government's exercise of power; on the other and, governance is broader because it includes other actors and new institutional arrangements. Governability is a part

of the governance process and is directly influenced by it. Viewed as an instrument of governance, the Law allows other actors, in addition to the Public Authority, to participate in this process in which decisions are made, and public policies are implemented (Villar, 2015).

The governance of water is made up of a range of political, social, economic and administrative systems that directly or indirectly affect its use, benefit, management and providing water services at different levels of society. Governance systems determine who receives what type of water, when and how, making decisions on who has the right to water, its services and related benefits (UNESCO, 2006).

The law is a fundamental part of governance, since it is responsible for defining the political-administrative systems, outlining the responsibilities of institutions, establishing the rules for the use, utilization and provision of water services, as well as being responsible for guaranteeing the quality parameters of water and supply services, ecosystem protection standards, restrictions on the use and utilization of resources, and defining mechanisms to promote social and environmental justice.

This task becomes hard due to three specific attributes of water: its mobility, its variability and its multiplicity (Sehring, 2009). The rivers cut through the land with no regard to borders or administrative limits, and the same occurs with the aquifers that spread invisibly through this territory. The waters are neither static nor are they subject to municipal, state or federal limits, consequently requiring the cooperation of multiple scales and actors. The law faces the challenge of structuring this cooperation, whether through international agreements, paradiplomatic initiatives, institutional coordination mechanisms, norms, conventions, or others. To get a better understanding of the complexity of the water, we suggest the documentary *The Waters' Path*, which deals with various problems related to water and water security. The documentary takes a closer look at the relationship between

water and energy, sanitation, agriculture and the ramifications of this new water context marked by climatic uncertainties. The presence of water allows energy and agricultural development, generating well-being for local communities.

Watch:**Video 1: *The Waters' Path***

The amount of water available in an area varies by time and space, and depending on weather conditions, for this reason, a region can withstand droughts and floods according to the cycle of precipitation. As such, the law must establish guidelines for water allocation as well as adaptation and mitigation mechanisms to deal with climatic variability, which tends to worsen against the phenomenon of climate change.

Finally, water is used for a wide range of applications, such as economic, technical, cultural and social usage, taking on completely different material and symbolic dimensions by the group that appropriates this substance. This characteristic requires the law to define spaces for negotiation and conflict resolution between the multiple perspectives and uses of water, as well as determine parameters to reduce the risk of disputes. Further, there is a demand to create spaces to bring actors and institutions together that are not necessarily directly linked to water but play an essential role in its availability or quality.

The law and water relationship goes way beyond protecting and controlling the use of this vital resource for humans and ecosystems. It is so because it requires the creation of coordination mechanisms with other fields of policies linked to multiple applications of water (irrigation, hydroelectric power generation, sanitation, and water supply, industrial needs for water, fishing, shipping and transportation, recreation and tourism, among others.)

To this end, the following sessions and units will attempt to reasonably demonstrate how this Law has dealt with regulating the use, benefit, management and protection of water to guarantee reasonable and equitable access to water and to construct connections with other policies to promote good water governance.

1.1 The Waters Act and the centralized management model

The Waters Act went into effect through Decree No. 24.643/1934. This legal instrument incorporates a preamble and 205 articles organized in three books: Book I – Waters in general and their properties; Book II – Use of Water; and Book III – Water Forces – Hydroelectric Industry Legislation. This Legal Act was the first to regulate the industrial use of water and, as stated in the preamble, its purpose was to modernize water resources legislation and to allow the Public Authority to control and encourage the industrial utilization of water and its energy potential. The first two books address water in a general way, while the third book specifically covers water used for power generation (Milaré, 2015).

Waters were classified into three categories: public, common and private. Public waters were divided into common and proprietary use. Public waters for common use are listed in Article 2 and correspond to a) the territorial seas; (b) navigable currents, canals, lakes and lagoons; c) the currents from which these waters are made; d) public streams and reservoirs; e) springs; and f) the sea arms of any public current, provided that they influence the navigability. This article was amended by art. 3 of Decree-Law No. 852/1938. These waters may belong to the Union, the States or the Municipalities, according to the criteria specified in Article 29. Dominical public waters were classified by an exclusion criterion, being defined as “all waters located on land that is also classified as such, when they are not in the public domain of common use, or when they are not common” (art. 6). Common

waters have been classified as “currents that are not navigable or buoyant and that are not made” (Art. 7). Private water corresponds “to the springs and all waters on land that are also private when they are not classified among the common waters for everyone, public waters or common waters” (art. 8).

This categorization of waters became incompatible with the Federal Constitution of 1988 and the enactment of Law No. 9.433/1997, which consolidated the understanding that all waters are in the public domain shared between the States and the Union. Given this interpretation, the municipal and private waters were dissolved. This issue will be detailed in the next chapter “The new environmental constitutional order and water protection,”

The Waters Act had an innovative approach for the time (Pompey, 2006), but its application left something to be desired. Although it was intended to regulate the different types of water utilization, its focus turned towards energy uses. The applicability of the Waters Act depended on the regulation of several articles. Book III was regulated by several laws and other provisions, but unfortunately, we can not say the same regarding the contents of Books I and II (Pompeu, 2006).

At the time of the Act's approval, there was not any environmental or water resources management system. The entire administration was centered in the federal or state agencies, according to the waters' classification. Under the federal realm, the management was initially carried out by the Water Service of the National Department of Mineral Production of the Ministry of Agriculture. In this respect, Law 9.433/1997 not only transformed the management concept but also created an institutional apparatus focused on water.

The environmental bias of water management was not a priority. On the contrary, its focus was “essentially privatizing and protecting the economic activity, with little or no preservationist or humanist concern” (Milaré, 2015, p.917). The administrative control of the uses was quite precarious. Management

was restricted to the quantitative aspect. Everyone had the right to use public waters, as long as they obeyed the administrative regulations (arts. 36 and 43 to 52). Only in cases of derivation was the concession or administrative authorization required (Milaré, 2015).

The concern with quality was primarily addressed in articles 109 to 116 and focused on the duty not to cause harm to third parties. Pollution was tolerated given the relevant interest for agriculture and industry as long as administrative authorization was requested. Another point that incompatible with the new water regime was the treatment of wetlands that, if declared unhealthy, should be desiccated by the owners or the administration (art. 113).

In general, the majority of the provisions in the Waters Act have been repealed. However, some of its provisions are still valid; this is the case of articles 102 to 108 that deals with the utilization of rainwaters, which were not addressed by Law No. 9.433/1997. But the articles that are still enforced should be interpreted in light of the current water regime.

This legal act presented distinct measures of ownership and categorization of waters. Its focus was a developmental and economic perspective of water resources, with no concerns over resource scarcity or environmental issues. Management was concentrated in the Public Authority, highlighted by the use of hydraulic energy potential (Commetti, Vendramini and Guerra, 2008). The Federal Constitution of 1988 and the National Water Resources Policy completely shifted this management, as will be revealed in the upcoming sessions.

1.2 The new environmental constitutional order and the protection of waters

The Federal Constitution is the supreme law of a State and encompasses the set of norms and principles relating to the form of government, organization of the public authorities, the distribution of responsibilities, rights, and duties of the State and citizens. The 1988 Constitution laid

the main foundations for water and environmental management.

The *Magna Carta* innovated by dedicating a specific chapter to the environment, as per article 225 of the Constitution. This article enshrines the principle of an ecologically balanced environment, which is incumbent on all, State and community, the duty to care for the environmental heritage and the right to a healthy environment. This principle arises as a result of the right to life and human dignity. Additionally, this article assigned to the Government several obligations that are directly related to water management, which are:

- preserve and restore essential ecological processes and provide for the management of the ecosystem (section I);
- define protected territorial spaces (item II);
- require prior environmental impact studies for the implementation of works or activities which could potentially cause significant degradation of the environment, to which publicity will be given (item IV);
- control the production, marketing and use of techniques, methods, and substances that pose a risk to life, the quality of life and the environment (section V);
- promote environmental education (item VI);
- protect flora and fauna (item VII);
- duty of the mining industry to recover any degraded environment (§ 2);
- hold those responsible for violating environmental standards or causing damage (§ 3); and
- condition the use of the Brazilian Amazon Forest, the Atlantic Forest, the Serra do Mar, the Mato Grosso Pantanal and the Coastal Zone to preserve the environment (§ 4).

Article 225 influences the interpretation of all constitutional articles related to water and other environmental resources defined in article 3, item V,

of Law 6.938/1981. The Federal Constitution of 1988 maintained the idea of the division of waters between the Union and States, which was first provided for in the Federal Constitution of 1946. If the Union's domain has remained virtually unchanged, the same cannot be said of the States. The state water domain was broadened considerably because it incorporated the surface waters and groundwaters terminology.

In this respect, Articles 34, I and 35 of the Federal Constitution of 1946, whose wording was maintained by the 1967 Constitution (Arts. 4, item II, and 5) divided the waters as follows.

Article 34 – the Union's assets include:

I – lakes and any watercourses on lands under its dominion or that bathe more than one State, serve as a limit with other countries or extend to foreign territory, as well as the fluvial and lacustrine islands in the bordering zones with other countries;

Art 35 – this includes assets of the State, the lakes and rivers in lands of its domain, and the ones that have spring and mouth in the state territory.

The Federal Constitution of 1988 brought minor changes to this wording concerning waters under federal control, through the inclusion of the noun “rivers”, the expression “or originates from it”, and the creation of a specific clause for the fluvial and lake islands. Thus, the federal water domain was established in article 20, item III as follows:

Art. 20. The following are the property of the Union:

III – lakes, rivers and any watercourses on land under their domain, or bathing more than one State, serving as boundaries with other countries, or extending to or from foreign territory, as well as marginal land and river beaches;

As it can be seen, the changes are not very significant, because the expression rivers was already included in the idea of any water streams, and the words “or that come from it” just gave clarity to discussing cross-border rivers. On the other hand, in the case of state domain, the

transformations were representative, as seen in the wording of article 26, item I:

Art. 26. The states' assets include:

I – surface or underground waters, flowing, emerging or in deposit, with the exception, in this case, of those resulting from work carried out by the Union, as provided by law.”

As can be seen, the expression “lakes and rivers in lands under its domain” or the criterion of the source and mouth in the state territory has been removed. At the same time, the terms “surface water” were included, which is much more comprehensive than the concept of rivers and lakes, and innovation was introduced by subjecting “groundwaters” to state supervision, as well as adopting a much broader criterion than that of spring and mouth in the state territory, by inserting the term “flowing, emerging and in deposit”. The wording of article 26, item I, indicates that excluding federal waters, provided for in article 20, III, or resulting from works of the Union, all other waters become state waters, since this entity will be responsible for surface and groundwaters, flowing, emerging, and in deposit. Hence, the state domain seized for themselves all the waters that were not a federal domain. Thus, the possibility of municipal and private waters provided for in the Water Code was tacitly revoked. Possible doubts about the constitutional non-reception of private waters were eliminated with the enactment of Law No. 9.433/1997, which declared the waters as public assets.

The Federal Constitution also provided a new focus to the nature of water by classifying the environment and, as a result, its integrating elements, as a common use property of the people. In this way, the domain does not mean that the Public Authority possesses its assets, but rather has the duty to manage them. Finally, this law regulated the administrative and legislative water and environmental responsibilities and management rights of federal entities. Given the complexity of

these issues, they will be addressed individually in forthcoming chapters, namely: Legal nature of fresh waters: environmental asset, social asset, and economic asset; Constitutional Domain of fresh waters and Constitutional Jurisdiction in matters of fresh waters, which is subdivided into Administrative and Legislative Jurisdiction in Matters of Waters.

1.3 Legal nature of fresh water: environmental asset, social asset, and economic asset

Articles 20, III, and 26, I, of the Constitution, in conjunction with art. 1, I, of Law No. 9.433/1997 determined that water is a public domain asset. However, the interpretation of public domain should be broadened in light of Article 225 of the Magna Carta, which established the following:

Art. 225 – Everyone has the right to an ecologically balanced environment, which is an asset of common use and essential to a healthy quality of life, and both the Government and the community shall have the duty to defend and preserve it for present and future generations.

In this way, the environment and the components that integrate it, as is the case with water, were classified as assets of common use for the people. This concept does not remove but broadens the perception of a public asset, as it creates a new asset category that goes beyond the classical division of public or private asset, provided for in article 98 of the Civil Code. Therefore, a reading of article 99 of the Civil Code, that classifies public assets should be broadened according to article 225 of the Federal Constitution and the Consumer Defense Code, which clearly defined the legal nature of common assets. Below are the legal provisions related to this issue:

Civil Code

Art. 99. Public assets are:

I – those of common use for the people, such as rivers, seas, roads, streets, and squares;

II – those of special use, such as buildings or land for service or federal government, state, territorial and municipal establishments, including their federal parastatal agencies;

III – those of dominium nature, which constitute the assets of legal entities under public law, as the object of personal or real right of each of these entities.

Consumer Protection Code

Art. 81. The defense of the interests and rights of consumers and victims may be exercised in court individually or collectively.

Single paragraph. The collective defense will be exercised when it comes to:

I - diffuse interests or rights, thus understood, for this code, the trans-individual rights, of indivisible nature, which are held by indeterminate persons and linked by factual circumstances;

II – collective interests or rights, thus understood, for this code, the trans-individual rights of an indivisible nature, in which an involved party is a group, category or class of people connected amongst each other or with the defending party through a judicial relationship;

III – similar individual interests or rights, thus understood, those resulting from a common origin.

Environmental assets, which include water, are diffuse assets of common use by the people. They do not integrate public assets like traditional public assets (dominium or special-use assets). However, they are under the administration of public entities, who become their managers (Yoshida, 2007). This relation will be discussed in more detail in the Fresh Waters Constitutional Domain section.

Water, assumed as an environmental asset, has a legal nature of diffuse interest, understood as those rights that are trans-individual (that is, they transcend the individual and exceed the limit of the sphere of rights and obligations of an individual nature) and indivisible (it is not possible to identify its holders. Therefore the satisfaction of a subject implies the satisfaction of all). Water belongs to everyone, but at the same time, it does not belong to anyone specifically, given its trans-individuality.

Given these characteristics, the Public Authority assumes the role of the manager in the interests of the community.

As Viegas (2005) clearly explains, when analyzed within an environmental perspective, water falls under the category of a diffuse asset and constitutes a fundamental third-generation right, incorporated into the idea of the right to an ecologically balanced environment outlined in article 225 of the Federal Constitution. However, access to water is also a first-generation individual right because this substance is vital for meeting basic human needs that are presupposed for the right to life, human dignity, and freedom. It is also configured as a social right in the sense that without water there is no health, economic development, work or social assistance.

It is, therefore, necessary to distinguish between water and water resource. Granziera (2006) and Pompey (2006) clarify that the term water refers to the natural element, without connection to any use or specific utilization. It is a global vision of water, within the environmental perspective, understood as a macro asset.

In turn, the water resource is conceived as the portion of water that is subject to the specific allocation for use or utilization by an individual or legal entity. Law No. 9.433/1997, art. 1, II, recognizes that “water is a limited natural resource with economic value.” As such, the water resource constitutes the economic and utilitarian dimension of water (Pompeu, 2006). An economic asset is defined considering its scarcity or of its ability to contribute to the creation of value (Neutzling, 2004). Thus, in the water resource perspective, water becomes an economic asset because it is a scarce resource and functions as a basic raw material for productive processes, whose utilization must be paid for by the user.

The water resource use presumes a private appropriation of the water for a certain purpose (Caubet, 2004), however, this does not imply the property transfer, but the granting of a certain

amount for a specific period, provided that the public interest is served.

Therefore, the water resource use does not imply ownership over water, but the granting of a temporary right of use, which can be suspended. Conversely, the recognition of the economic value of the water resource allows the attribution of a price for the individual use of a collective good (Caubet, 2004). Despite some criticisms over this economic component of water (Caubet, 2004; Viegas, 2008), this consideration for the use of a water resource contributes to better management.

Law No. 9.433/1997, in art. 1, items III and IV, acknowledge the social component of water and its appropriation because it establishes that human consumption and watering of animals are priority uses in case of scarcity, as well as determining that the management of water resources must offer multiple uses of water. The idea of the social dimension in water is valued to the extent that the law requires a participatory and decentralized management of water.

Given this legal nature, it is concluded that:

- Water is an asset of common use with a legal characteristic of diffuse interest.
- Water is not the property of the Public Authority, which has the role of manager.
- A single person (individual or entity) can not benefit from the distribution of water in a way that deprives other users of the right to have access to water.
- The social component of waters requires that they serve multiple uses.
- The water resources correspond to the economic and utilitarian components of water. However, it maintains its character as common use, while allowing temporary private appropriation that is conditioned by Law 9.433/1997.
- Private appropriation of water through a grant may subject the beneficiary to the payment of economic value as a consideration for the use of an asset that belongs to the community.

- Except for human and animal watering in the event of scarceness, there is no priority established by law among the various uses.

1.4 Constitutional Domain of Fresh Waters

Articles 20, III and 26 (1) have divided the domain of waters between the Union and States as follows:

Art. 20. The following are the property of the Union:

III – lakes, rivers and any watercourses on land under their domain, or bathing more than one State, serving as boundaries with other countries, or extending to or from foreign territory, as well as marginal land and river beaches;

Art. 26. The states' assets include:

I – surface waters or underground, flowing, emerging or in-deposit waters, with the exception, in this case, of those resulting from works carried out by the Union, as provided by law."

In parallel, article 225 of the Federal Constitution classified the environment as an asset of common use to the people. Water as an integral element of the environment eventually assumed this characteristic, becoming a public asset.

As defined in art. 98 of the Civil Code, public assets are those belonging to the legal entities Public Right or are related to the provision of public service (Camargo and Ribeiro, 2009). As already seen in the previous item, the Civil Code, in article 99, divides public goods into three categories: those of common use by the people, those of special use and those of property concession. Given this new nature of water, it would no longer be possible to defend the existence of private waters in the Brazilian legal system. However, this issue was only resolved with art. 1, item I, of Law No. 9.433/1997, which declares the public status of waters (Granziera, 2003).

Article 225 of the Federal Constitution, together with the enactment of the Consumer Defense Code, defined the legal nature of assets for the common use of the people, to understand

them as a diffuse, trans-individual, indivisible right, to which the entire community is entitled. When the Federal Constitution classified the waters as the property of the Union or the States, it did not establish a state property right itself (because the environment belongs to everyone), but rather, the responsibility of these entities to manage the resource.

Thus, the classic definition of public domain understood as “set of movable and immovable assets held by the administration, affected to its own use, either to the direct or indirect use of the community, subject to public law regime” (Cretella JR, 1984, p.29) gains a new clothing to incorporate the power relationship that the State exercises over the environmental assets under its jurisdiction (Camargo and Ribeiro, 2009). This type of authority, known as imminent domain, is defined as the “political power by which the State submits to its will all the things that are found in its

territory. Its limits are established by law” (Fiuza, 2003, p. 643).

Therefore, the domination of the waters divided between the Union and the States is therefore not linked to the notion of ownership, but the manifestation of internal sovereignty. In this way, the Union and the States will be the managers of the waters that are under their guardianship, and their actions should be guided by constitutional principles, of which the idea of participation and citizenship stands out.

Surface waters are subject to two systems: the federal and the state; while underground waters are always subject to the states. Controversies over the domain of underground waters will be discussed in the 3rd module. However, it is already clear that, regardless of their boundaries, underground waters are considered as state assets by managers. Figure 1 illustrates the shared domain between the Union and States for state and federal rivers.

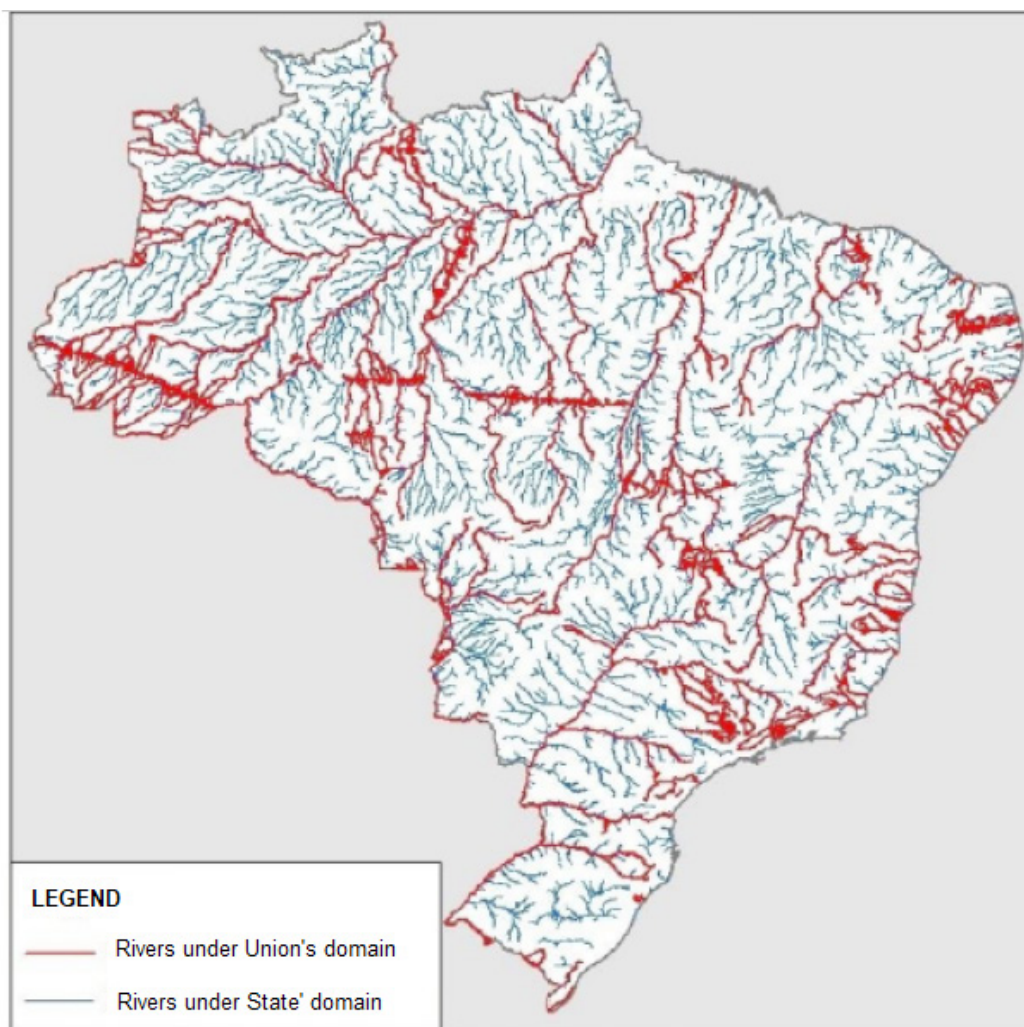


Figure 1: Surface Water Resources Domain

Source: ANA, s/d, p. 4.

***See ANA's interactive map of
federal and state domain rivers that are shown in Figure 1.***

[ONLINE](#)

The National Water Agency (ANA) shall be responsible for managing the rivers under the Union's domain, while this task will be done for state rivers and underground waters by the state agencies responsible for water resources.

***Click here for the full list
of Brazilian managing agencies:***

ONLINE

1.5 Constitutional Jurisdiction in Water Issues

The 1988 Federal Constitution adopted the Federal State, which is based on the idea of the principle of autonomy and political participation. The Brazilian Federation is composed by the Federal Union, the States, the Municipalities and Federal District (article 18, CF). This composition is divided into three scales of power – national, state and local – and each of them has own responsibilities. The Brazilian Constitution instituted a system based on a division of powers (administrative, legislative, tax and jurisdictional), through which it stipulated political power and guaranteed the autonomy of each of the states (Moraes, 2004).

Jurisdiction: “jurisdiction legally assigned to an entity, body, agent from the Public Authority to issue decisions [...] they are the various forms of power that serve the state agencies or entities to perform their roles (Silva, 1996, p.455)

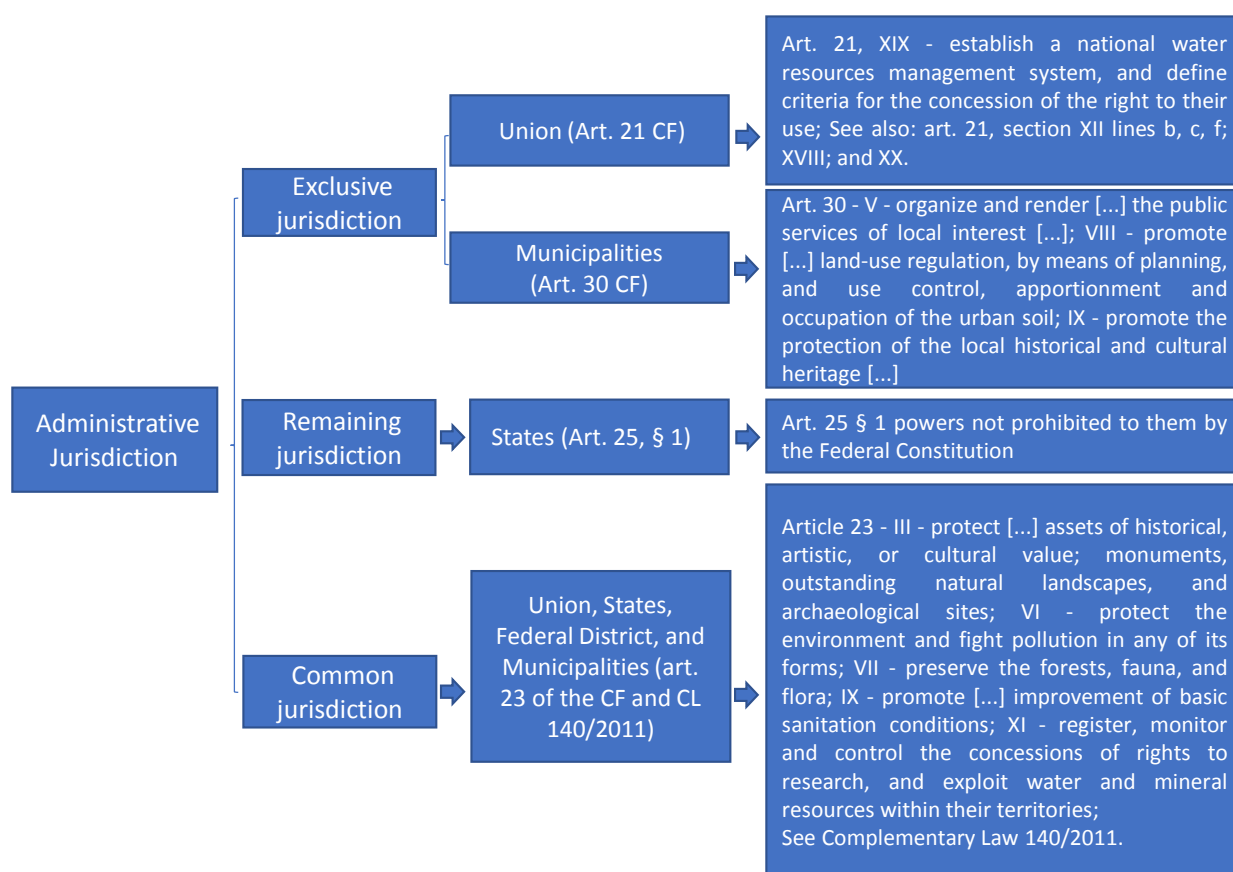
The Federal Constitution distributes to the federative entities their jurisdictions, recognizing their powers and responsibilities. Thus, multiple centers of political decision-making have been established, in which each entity has specific autonomy, attributions, and specific powers to act on certain issues (Moraes, 2004). This system of division of powers directly influences environmental and water resources management, since the law will define, through administrative and legislative powers, the role of each of these entities in water management.

1.6 Administrative Jurisdiction in Water Matters

The administrative or material responsibility refers to the performance of administrative actions inherent to the public administration's varied entities. The Public Administration's power and duty are to take responsibility for the roles assigned to it.

These responsibilities give specific powers to each of the federative entities and are divided into three categories: exclusive, remaining and common. Table 1 summarizes these roles concerning federal entities and their impact on water resources.

Table 1 – Summary of administrative jurisdictions for the federal entities and their impact on water resources



Source: Federal Constitution
Prepared by Villar, 2018.

1.6.1 Exclusive Material Jurisdiction of the Union

The Federal Constitution, in article 21, attributed exclusive jurisdiction to the Union to practice the following acts directly related to water: to institute the national water resources management system; and to define the criteria for granting rights of its use.

In addition to these specific obligations, Article 21 brought in attributions that have a connection with water management or its uses, such as: establishing relations with foreign states (transboundary dimension of waters); organize land use planning; explore the services of electrical energy installation and energy use of waterways; water transportation; river and lake ports; propose programs to combat drought and floods; guidelines for urban development and sanitation, and determine the conditions for the

exercise of mining in associative form. Article 21 of the Federal Constitution and its primary obligations directly or indirectly related to waters is presented below:

Art. 21. It is the responsibility of the Union:

I – maintain relations with foreign States and participate in international organizations;

IX – prepare and implement national and regional plans for territorial planning and economic and social development;

XII – to operate, directly or by permission, concession or permission:

b) the services and installations of electric energy and the energetic use of watercourses, in articulation with the states where the hydro-energetic potential is located;

d) rail and waterway transport services between Brazilian ports and national borders, or that cross the limits of the State or Territory;

f) sea, river and lake ports;

XVIII - plan and promote permanent defense against public disasters, especially droughts and floods;

XIX - establish a national water resources management system and define criteria for granting rights of use;

XX - establish directives for urban development, including housing, basic sanitation, and urban transportation;

XXV - to establish the areas and conditions for the exercise of the mining activity, in associative form.

The role of the Union in the management of transboundary water resources stands out, as it will be responsible for organizing international cooperation initiatives with countries bordering on or in the aquifer. In the case of the operation of electrical energy services and installations and the energy utilization of watercourses, a restrictive measure is imposed on the exercise of that competence, which is the negotiation with the States at the place where the energy installation or use is implemented. Also, the Federal Constitution guarantees participation to the states, the Federal District and municipalities in the revenues from harvesting water resources to generate electric energy in their territory or financial compensation for this type of exploitation (article 20, § 1). The Union also plays a strategic role in preventing droughts and floods, as well as in regional planning and economic, and social development.

Law No. 9.433/1997 defined the National Water Resources Management System (SINGREH) and management tools, in which the granting of use rights was included. The National Council on Water Resources, a collegiate and deliberative body of SINGREH, is responsible for establishing the general criteria for granting the right of use of water resources.

1.6.2 *Exclusive Material Jurisdiction of Municipalities*

Article 30 of the Federal Constitution, defines the exclusive material jurisdictions of municipalities in sections III to IX. In the specific case of waters, items V and VIII, which attributed to this entity the responsibility for services of local interest (V), in which the sanitation service is included (art. 8-A of Law nº 11.445/2007), and the responsibility for territorial planning, which when determining the configuration of land use and occupation impacts directly on the vulnerability of water resources. For example, the lack of control of territorial planning allowed the occupation of spring areas, generating their degradation. Also, it will be the municipalities' responsibility to include the recommendations of land use and occupation in their territorial planning that are established in the water basin plans.

Among the municipal jurisdictions was the protection of the local cultural heritage, which can be related to waters, since the existence of rivers was one of the fundamental aspects for the choice of human settlement sites. Traditionally, sites that feature cultural value are found close to rivers, and this substance is linked to various cultural traditions. Article 30 and items V, VIII, and IX, which have a closer relationship with water issues, are presented below.

Art. 30. The municipalities have the power to:

V – organize and provide, directly or by concession or permission regime, public services of local interest, including public transportation, which is of essential nature;

VIII – promote, wherever pertinent, adequate territorial ordaining, using planning and control of use, apportionment, and occupation of the urban soil;

IX – promote the protection of the local historical and cultural heritage, in compliance with federal and state legislation and supervision.

1.6.3 Remaining Material Jurisdiction of States

The remaining material jurisdiction of the States is provided for in article 25, § 1 of the Federal Constitution and determines that it is the State's responsibility to have all material jurisdictions that do not fall under the Union (Art. 21) or municipalities (Art. 30). Consequently, if not expressly assigned to these two entities, the State will be the responsible agent.

1.6.4 Common Material Jurisdiction

Finally, the common material jurisdiction provided for in article 23 of the Federal Constitution assigns joint duties to all entities in the federation. Common jurisdiction is directly related to environmental protection, either in the creation of environmental policies or in the supervision exercised by environmental agencies. This article was regulated by Complementary Law 140/2011, which defined the guidelines for this simultaneous action. The following are Article 23 of the Federal Constitution and the main items related to waters and their uses or environmental dimension:

Art. 23. It is a common jurisdiction of the Union, the States, the Federal District, and the Municipalities:

III – to protect the documents, works and other assets of historical, artistic or cultural value, as well as monuments, remarkable landscapes, and archaeological sites;

V – to provide the means of access to culture, education, science, technology, research, and innovation;

VI – to protect the environment and combat pollution in any of its forms;

VII – to preserve the forests, fauna, and flora;

VIII – to promote agricultural production and organize food supply;

IX – to promote housing construction programs and the improvement of housing conditions and basic sanitation;

X – combat the causes of poverty and marginalization factors, promoting the social integration of disadvantaged sectors;

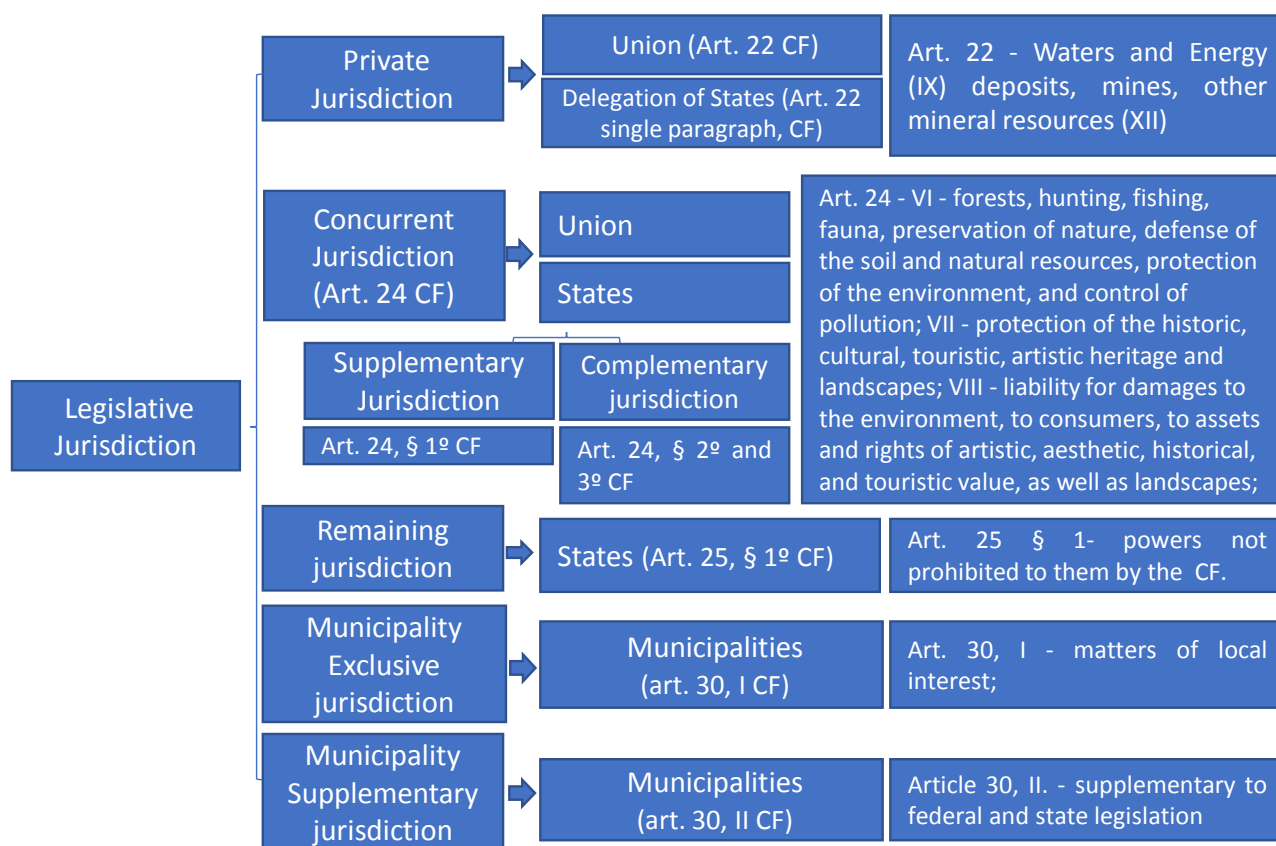
XI – to register, monitor and supervise the granting of research rights and the exploitation of water and mineral resources in their territories;

The common jurisdiction ensures that the Union, States, Municipalities and Federal District can establish programs for environmental protection and conservation, as well as permitting environmental agencies from the three spheres to oversee compliance with legislation on environmental and water resources. But, the collective exercise of common jurisdiction may lead to conflicts to determine which administrative rule is most appropriate for a given issue. Complementary Law No. 140/2011 brought several contributions to harmonize the cooperative performance of federal entities, with specific criteria for determining the relevant authority for environmental licensing and for determining the direct responsibility for supervision. The definition of a direct responsible for supervisory guardianship does not prevent the action of other entities; it only resolves the conflict if conduct generates the same assessment by more than one environmental agency.

1.7 Legislative Jurisdiction on Fresh Water Issues

Legislative jurisdiction allows “to establish legal standards, edit rules and establish dominant principles, governing political and administrative activities” (Ferreira, 1990, p.1). Table 2 presents a summary of the main legislative jurisdictions related to waters.

Table 2 – Summary of water-related legislative powers for the federal entities



Source: Federal Constitution
Prepared by Villar, 2018.

1.7.1 Union's Reserved Power

Article 22 of the Federal Constitution regulates the reserved power of the Union to legislate. Contrary to exclusive material jurisdiction, which does not permit delegation to the States, reserved power gives the Union the ability to authorize States to legislate on the matters provided for in article 22 employing a complementary law. The following are the items of article 22 that have a direct and indirect relationship with water and environmental protection:

Art. 22. The Union has the private jurisdiction to legislate on:

I – civil, commercial, criminal, procedural, electoral, agrarian, maritime, aeronautical, space, and labor law;

IV – water, energy, IT, telecommunications and broadcasting;

X - a regime of ports, lake, river, maritime, air, and aerospace navigation;

XII – beds of ore, mines, other mineral resources, and metallurgy;

A reading of item IV could convey the false idea that only the Union can legislate on matters related to waters and, therefore, the States could not establish any type of legal norm on the watercourses under their dominion. This understanding is not correct, so much so that the Brazilian states have established their water resources policies based on the remaining, concurrent, and common jurisdictions. This particular issue will be explained in detail in item 1.7.5 – “If the jurisdiction to legislate on waters is exclusive to the Union, why do the states have state laws on the subject?”

By establishing the Union's reserved power for civil and criminal law, Article 22 restricted the definition of environmental civil and criminal liability to rules issued by the Union. Similarly, mineral waters belonging to the category of mineral deposits are subject to federal laws, but this does not deprive the States of their power to regulate groundwaters. Mineral waters are a category of underground water, which has its special legal treatment. This topic will be addressed in more detail in Unit 3. Finally, issues related to energy use, and navigation will also be regulated by federal laws.

1.7.2 Concurrent Jurisdiction

Article 24 establishes the rules of concurrent jurisdiction among the federal government, states, municipalities, and the Federal District. The focus of this type of jurisdiction is to promote a vertical division in legislative activity (Moraes, 2007). As such, the Union's jurisdiction is restricted to the establishment of general provisions, whereas the States and the Federal District specify them through laws according to their local characteristics.

The concurrent jurisdiction guarantees the States the complementary jurisdiction, that is, to detail a federal law that already exists (art. 24, § 1). The Union is restricted to the issuance of general laws, and may not provide any details, which will be the prerogative of each state and the Federal District. Besides, the Union's inertia in enacting general rules gives rise to the supplementary jurisdiction of the States (art. 24, §2 and §3), which will have, temporarily (until the general federal law is enacted), full jurisdiction to enact general and specific rules. Moraes (2007) summarizes the main features of concurrent jurisdiction:

- The Union's jurisdiction is solely restricted to the general rules;
- The jurisdiction of the States and the Federal District is designed to complement the general provisions to make them more specific or detailed;

- There is no possibility to delegate jurisdiction on matters provided for in article 24 of the Federal Constitution;
- The states can broadly legislate if the Union has not regulated the matters provided for in art. 24 of the Federal Constitution. The supervening general federal law suspends the effectiveness of the state law, insofar as it is contrary to it.

Article 24 and the items relating to water management are set out below:

Art. 24. The Union, the states and the Federal District have the power to legislate concurrently on:

I – tax, financial, prison, economic, and urban law;

V – production, and consumption;

VI – forests, hunting, fishing, fauna, nature preservation, soil and natural resources defense, environment protection, and pollution control;

VII – protection of the historical, cultural, artistic, tourist and landscape heritage;

VIII – liability for damage to the environment, consumer, goods, and rights of artistic, aesthetic, historical, tourist and landscape value;

XII – social security, health protection defense;

§1. Within the context of opposing the legislation, the Union's jurisdiction shall be limited to establishing general rules.

§2. The Union's jurisdiction to legislate on general rules does not exclude the States' supplementary authority.

§ 3 If there is no federal law on general rules, the states shall exercise full legislative jurisdiction to provide for their peculiarities.

§ 4 The supervenience of federal law over general rules suspends the effectiveness of state law, to the extent to which they are contrary.

Concurrent jurisdiction deals with various water-related issues, such as urban law (the production of urban space significantly modifies the characteristics of river basins); production and consumption (encouraging water reuse and rationing water use); nature conservation, soil and natural resource protection, environmental protection and pollution

control; protection of cultural and landscape heritage; responsibility for environmental damage and health protection.

The list of matters in Article 24 is rather broad, allowing States to legislate on various water-related aspects and mitigating the idea of the Union's reserved power to legislate on water issues. Concurrent jurisdiction enables States to legislate comprehensively on the environmental dimension of water.

1.7.3 *Remaining Legislative Jurisdiction of States*

Article 25, § 1, protects not only the remaining material jurisdiction but also legislative authority. States may legislate on all matters that are not prohibited by the Federal Constitution (see arts. 22 and 30 of the Federal Constitution, which define the jurisdictions: private for the Union and exclusive for the Municipalities). It should be pointed out that a complementary federal law may authorize states to legislate on the matters listed in art. 22, which includes waters (art. 22, single paragraph).

1.7.4 *Exclusive and Supplementary Legislative Jurisdiction of the Municipality*

The exclusive legislative jurisdiction of municipalities is found in Article 30, I and the supplementary in Article 30, II of the Federal Constitution.

Art. 30. The municipalities have the power to:

- I – legislate upon matters of local interest;
- II – supplement federal and state law where pertinent;

The exclusive jurisdiction is characterized by the predominance of local interest, which can be understood as those interests directly related to the demands of the municipality, even if they can generate repercussions at the regional or general level (Moraes, 2004). The judiciary was called on in several cases to judge the constitutionality of municipal laws given the need to verify whether the municipal rule meets the local interest in environmental matters or extrapolated it. The Municipality is competent to legislate on the

environment, at the limit of its local interest and provided that its regulation is aligned with state and federal norms (Mendes; Branco, 2011). Based on local interest and the jurisdiction to establish land use planning, the municipality is responsible for enacting the master plan and the soil use and occupation laws, which are fundamental for water protection.

The municipalities also have supplementary jurisdiction, i.e., in the absence of national and state norms, can fill these gaps, as long as it is necessary to meet the local interest (Mendes; Branco, 2011).

1.7.5 *If the jurisdiction to legislate on waters is private to the Union, why do the States have state laws on the subject?*

Article 22, IV of the Federal Constitution attributes the Union's reserved power to legislate on water. But, keep in mind that the Constitution still provides for concurrent jurisdiction and common jurisdiction, as well as placing part of the water resources under the control of States.

In this sense, this reserved power refers to the creation of water rights that may relate to:

Control of river beds, silt, avulsion, abandoned river bed, water returning to the river bed, change of course, riparian rights, guaranteed free use, right to access to water, inalienability of waters, mandatory conditions of the lower buildings receiving waters flowing from above, diverted currents, course of springs, hierarchy of use for public waters and fines and penalties for infringements to many of these provisions (Pompeu, 2006, p. 47).

If the analysis focus is the ability to legislate on waters on the environmental side or the power to issue administrative rules for assets that are under the control of a particular entity, Article 22, IV is not used as a reference, but rather the idea (Article 20 and 26) which gives the holder the obligation to manage their assets, as well as articles 23 and 24 of the Federal Constitution that detail the common and concurrent jurisdiction, respectively.

The Federal Constitution, when it gave states control of surface water and groundwater following

Article 26(I), gave them the right to issue administrative rules to manage these resources. Because the Union did not possess these resources, it could not issue specific provisions to manage them. The concurrent jurisdiction of States arises out of this situation.

Article 24, VI, prescribes that the Federal Government, the States, and the Federal District must concurrently elaborate laws on forests, hunting, fishing, fauna, nature conservation, soil and natural resources protection, environmental protection and pollution control, which includes the safeguarding of waters from the perspective of environmental quality. In this manner, based on the general rules issued by the Federal Government (emphasized by Federal Law 9.433/1997), the States are authorized by concurrent jurisdiction to establish specific provisions for the water resources that are under their control.

Also, Article 23, sections VI and XI of the Federal Constitution confers common jurisdiction to the Union, States, Federal District and Municipality “to protect the environment and to fight pollution in any of its form” and “to register, monitor and control the concessions of rights to research and exploit water and mineral resources within their territories.” To carry out this power-duty about water resources, States and Municipalities must enact provisions that will support their free operation, especially in the case of States related to waters under their control.

The reading of article 22, IV of the Federal Constitution should be taken collectively with the other types of jurisdictions and about article 225. In environmental matters, the legislator opted for the multiplicity and overlapping of spheres of action, which is demonstrated not only in the regime of jurisdictions but also in the reading of article 225 that imposes on the Public Authority and the entire community the duty to defend and preserve the ecologically balanced environment.

As a result, the States can lay down administrative rules on the management of water under their control, by the criteria laid down in the general rules

issued by the Union, and they can also establish environmental standards to protect waters. But they can not establish water rights provisions.

Municipalities can only issue environmental provisions for water resources, provided they are backed by the idea of local interest. There are no waters under local control so they cannot issue administrative provisions for their management.

1.8 Federal Law No. 9.433/1997: a new paradigm in the management of fresh waters

Federal Law No. 9.433/1997, which establishes the National Policy on Water Resources, was created to regulate Article 21, XIX, of the Federal Constitution. This rule established the new legal regime for water resources in Brazil. Altogether, there are 57 articles divided into four titles: Title I – National Policy on Water Resources; Title II – National Water Resources Management System; Title III – Violations and Penalties; and Title IV - General and Transitional Provisions.

This law is substantiated in a legal document of a political nature, since it determines the standards of water management, establishes the instruments for its use and the institutional jurisdictions of the entities and bodies that are part of this management system, organizes how the relationship with society will be and establishes violations and penalties for non-compliance with the prescribed conducts (Caubet, 2004). The National Water Resources Management System and the Management Instruments from this law will be addressed in Unit 2. The focus here will be to introduce the innovative management parameters brought by this law in its foundations, objectives, and guidelines for actions.

Watch:

Video 2: Brazil's Water Law.

Production: ANA.

1.8.1 *Key Assumptions of the New Water Resources Policy*

Article 1 reflects the fundamentals of the National Water Resources Policy, which are as follows:

- I -- water is a public domain asset;
- II – water is a limited natural resource with economic value;
- III – humans, and animals have the priority of consumption in case of scarcity;
- IV – the management of water resources should always provide for multiple uses of water;
- V – the river basin is the territorial unit for implementing the National Water Resources Policy and activities by the National Water Resources Management System;
- VI – water resources management must be decentralized and rely on the participation of the Public Authority, users and communities.

Each of these fundamentals will be broken down into topics.

1.8.1.1 *Public Character of Water*

Article I, item I, reaffirmed the public character of water, which was defined in Articles 20, III, and 26, I, of the Constitution. Thus, the understanding of the full disclosure of water ownership was crystallized (Viegas, 2005, Granziera, 2006, Pompeu, 2006). There are no more doubts about the end of private waters.

Article 1.230 of the Civil Code states that “Land ownership does not encompass deposits, mines and other mineral resources, water power potentials, archaeological monuments, and other property referred to by special laws.” Although there was no specific mention of waters, they fell into the category of “other assets referred to by special laws,” so the water resources on a property do not belong to the owner, and if he wants to use them, he must comply with the necessary administrative procedures to legitimize their use.

1.8.1.2 *A scarce asset with economic value*

Article 1, item II, classifies water as a scarce asset. The quantity of water is limited on the planet, but the demand for its use increases, while there is the progressive deterioration of reserves through human

activities. This reality demands a rational use of water, and one of the ways to encourage this behavior is to attribute an economic value to this resource.

This assumption is based on the idea that the misuse of water is linked to its free availability. Thus, by having a zero cost, users would not worry about setting limits and would abuse consumption. The attribution of economic value would contribute to generating the perception of scarcity and, consequently, more rational use of the resource that would meet the principles of the user-payer and the polluter-payer (Barros and Amin, 2007).

Payment for the use of water is a way of offering consideration to society for the use of a resource that belongs to everyone. This rationale is the basis for applying a billing mechanism, which has proven to be a key source of resources for improving management and environmental conditions of the river basin.

On the other hand, this provision stirred controversy because the recognition of an economic value did not take place at the same time as the recognition of its essential nature for life. Several authors argue the need to allow access to free water if it is provided to meet the basic needs of life, as well as to create instruments that ensure this right (Caubet, 2004). Moreover, turning water into an economic asset would not necessarily transform management, as those who have the financial means could continue to use the resource excessively.

Watch:

Video 3: Rational Use of Water

Production: ANA.

1.8.1.3 *Priority of human consumption and watering of animals*

Article I, section III, assures the priority of human and animal consumption when the use of water is scarce. This assumption was intensely debated during the rationing imposed on the population due to the droughts that took place in 2014 and 2015. Except in cases of scarcity, water management is guided by

the multiple uses. In this exceptional situation, it is possible to suspend or modify the concessions of grants, provided that the focus is on meeting the basic needs of the population and animals. However, this foundation faces two legal difficulties: the first refers to the lack of legal parameters to define what is a scenario of scarcity, depending on the discretionary action of the Public Authority, and the second refers to the amount of water that should be distributed to the population in this type of situation (Caubet, 2004).

1.8.1.4 Multiple Uses of Water

Article I, item IV, establishes the multiple uses of water so that no user sector should have privileges about other sectors (Milaré, 2015). The law did not establish an order of priorities among users. This choice will be negotiated through decentralized management conducted by the Water Basin Committees, which assess the circumstance and determine the best way to optimize water use to benefit the highest number of users.

Watch:

Video 4: Multiple Uses

Production: ANA

1.8.1.5 The River Basin as a Management Unit

Article I, item V, adopted the river basin as a territorial unit of water management. This regional scale had already been adopted by the Agricultural Policy (Law no. 8171/1991), which consolidated it in article 20 as the basic planning unit for the use, conservation, and recovery of natural resources. The river basin may be defined as a natural collection area of precipitation water from that converges the flows to a single exit point, its outlet (estuary or outflow) (Tucci, 1997). Figure 2 demonstrates how a river basin is formed, pointing out its major elements.

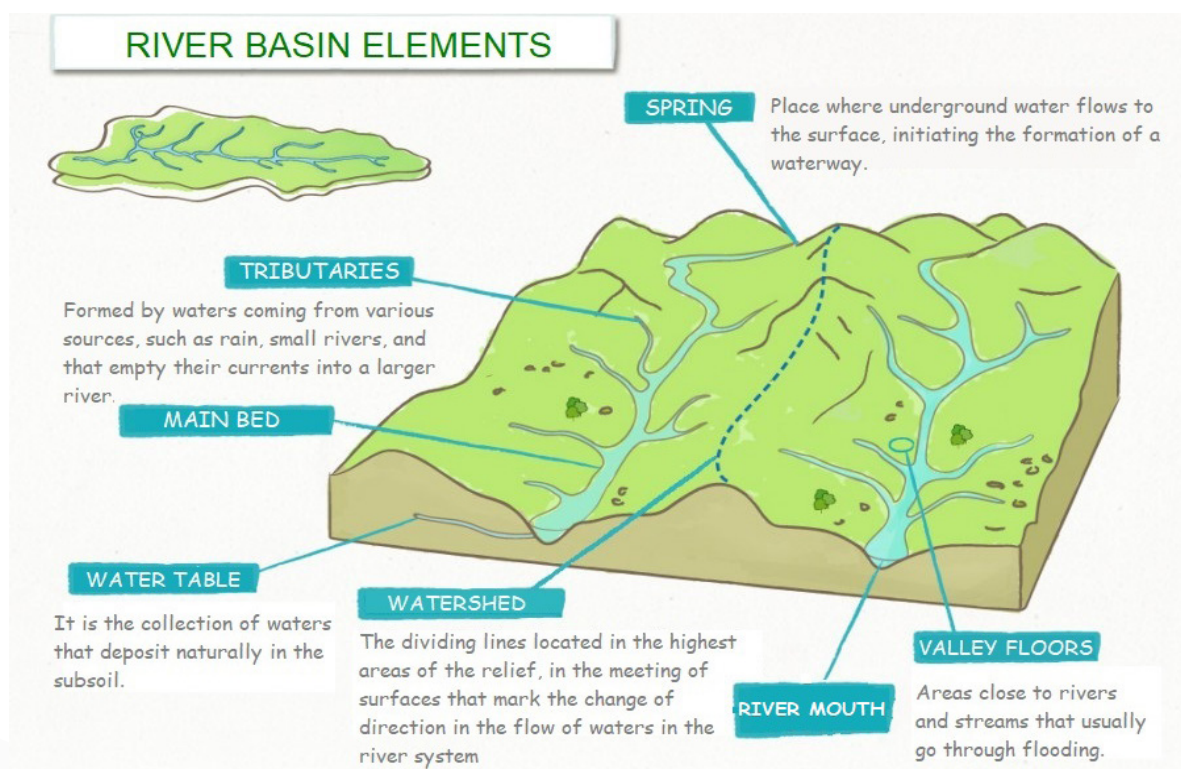


Figure 2: The river basin and its elements.

Produced by: Fernanda Bornancin Santos and Maristela Mitsuko Ono

Source: <http://www.cuidadosrios.eco.br/bacia-hidrografica/>

By observing Figure 2 we notice that the basin is composed of a set of sloping surfaces (inclined surfaces that allow the water to flow), of watersheds and inclinations in the ground, and a drainage network formed by the hierarchically interconnected waterways that flow up to the point that it becomes a single berth at the outflow. Thus, it can be said that the “river basin is the bio-geo-physiographic unit that drains into the river, lake, dam or ocean” (TUNDISI et al., 2008, p. 1). From a legal point of view, MMA Normative Instruction No. 4/2000 defined the river basin as

the “drainage area of a watercourse or lake” (article 2, section IV).

Resolution CNRH No. 32/2003 instituted the National Hydrographic Division, which is made up of 12 hydrographic regions and defined as: “the Brazilian territorial space comprised of a basin, group of contiguous river basins or sub-basins with homogeneous natural or social, and economic characteristics or similar features, designed to guide the planning and management of water resources” (article 1, sole paragraph). Figure 3 shows the national hydrological division.

Brazilian Hydrographic Regions



Figure 3 - Brazilian Hydrographic Regions

Source: ANA, 2012, p. 23.

These river basins can be spread out in smaller management units, which will be provided with management structures (river basin committees and agencies). The States must also define their management units based on river basins. This managerial cut-out does not need to correspond exactly to the boundaries of the entire basin and may comprise part of it or specific sub-basins.

The river basin area corresponds to a physical unit that can span multiple spatial, local, regional, national or transboundary scales (TUNDISI, 2003). Often, due to its extension or socioeconomic characteristics, it is recommended that it be subdivided into sub-basins, as a way of reducing the scale of operations and optimizing management. CNRH Resolution No. 30/2002 defines the methodology to develop a coding system for river basins throughout the country.

The adoption of the hydrographic basin as a management unit was a major advance because it enabled a systemic view of water resources to be adopted, incorporating environmental, social, and economic aspects, as well as encouraging the decentralization of management, allowing the involvement of social actors that use water resources in a specific territory.

1.8.1.6 The River Basin and the challenge of integrating surface, underground, and coastal waters

The river basin faces the challenge of promoting integrated management of fresh surface waters, underground, and coastal waters. These three dimensions of water are directly interrelated, but each of them has geographical bases that do not necessarily converge with the limits of the basin. Underground water is linked to the hydrogeological basin, which does not always converge with the river basin, a topic that will be fully covered in Unit 3. Coastal waters are linked to Coastal Management and to the definition of the Coastal Zone, which are governed by Law

7.661/1988 and Decree No. 5.300/2004. This space is also influenced by Decree-Law No. 9,760/1946 since part of these areas is located on marine land (Calasans and Silva, 2014).

As for underground waters, they have been classified as water resources and are part of water management, although with some difficulties. In turn, there are controversies over whether or not coastal waters are included within the definition of river basin (Calasans and Silva, 2014).

This controversy includes a geographic definition of the river basin because the jurisdiction of the National Water Resources Management System agencies is restricted to this territory, as well as the effect of water management instruments. Apparently, Law No. 9.433/1997, art. 3, VI, in establishing that the National Water Resources Policy should provide for the “integration of river basin management with that of estuarine and coastal systems” reinforces the understanding by excluding these resources from the notion of river basin, removing them from the jurisdiction of the National Water Resources System (Calasans and Silva, 2014). CNRH Resolution 32/2003, which delimits the Brazilian Hydrographic Regions, does not provide details on the final border of the basin, defining where the water resources end and the sea begins.

There is an interaction between fresh and salt waters, which generates particularly important problems in the case of the grants related to coastal transition environments. In these cases, the activities that use water are subject to grant and who would be responsible, the ANA or the state agencies?

This issue led to the creation of the Technical Chamber for the Integration of River Basin Management and Estuarine Systems for the Coastal Zone - CTCOST under the sphere of the CNRH. Despite these efforts, so far it has not been possible to reach a resolution that establishes guidelines for the water resources plans of regions that contain stretches of the coastal zone or regulates the issue of granting.

CNRH Resolution No. 145/2012, which deals with the general guidelines of the basin plans, does not address the issue. It only mentions that basin plans should consider other existing plans, programs, projects and studies related to coastal management. CNRH Resolution 181/2016, when defining the Priorities, Actions, and Targets of the National Water Resources Plan for 2016-2020, included goal 16, which specifically addresses the integration of coastal zones into the water resources management system. Some of the actions envisaged included:

- Build up the roles of SINGREH's representatives on topics that interface between Coastal Zone Management and Water Resources Management.
- Set specific guidelines for drafting plans about water resources in regions containing stretches of the Coastal Zone and island basins.
- Define the guidelines and attributions of the water resources management area in the management of coastal areas and island basins in an integrated manner with other areas.

It can be seen that the issue of integration between river basin management and coastal management is at an early stage and has much to advance.

1.8.1.7 Decentralized and participative management

Law n° 9.433/1997, in art. 1, items V and VI, designed a new model of decentralized and participatory water management, based on the river basin and the involvement of the actors. This management transition was inspired by the French water policy model. Caubet (2004: 152) explains that decentralization “includes delegating [...] decision-making power to political and administrative issues.” It was assumed that the involvement of actors and the community in the decision-making process contributes to the democratization, transparency and social control of water policies.

The strategy adopted to promote decentralized and participatory management is based on the creation of two public entities at the scale of each basin: the river basin committees and the basin agencies. The committees would be made up of representatives of public authorities, users and civil society and have a deliberative character. In turn, the agencies would assume the role of executive officers of the committee and provide technical and administrative support to the decision-making process (Abers and Jorge, 2005). Unit 2 will address these management structures in more detail.

1.8.2 Objectives

The objectives of the National Water Resources Policy are set out in Article 2 of Law No. 9.433/1997 and are designed to:

- I – ensure the required availability of water to current and future generations, in standards of quality that are suitable to their uses;
- II - the rational and integrated use of water resources, including water transportation, with a view to sustainable development;
- III - prevention and defense against critical hydrological events of natural origin or resulting from the inappropriate use of natural resources.

The objective provided for in item I is intended to ensure that water is available in quantitative and qualitative terms for present and future generations, according to the different types of uses. This section incorporates the constitutional idea of article 225, which guarantees the right to a stable environment. Item II advocates the rational and integrated use of water resources and draws attention to the need to promote waterborne transport. Section III highlights the importance of disaster prevention and control, whether natural or caused by inadequate use of resources (CAUBET, 2004).

1.8.3 General Guidelines for Action

Article 3 establishes the following general action guidelines for implementing a water policy:

I – the systematic management of water resources, without dissociating quantity and quality;

II – adapting water resources management to the physical, biotic, demographic, economic, social, and cultural diversities of the numerous regions of the Country;

III – the integration of water resources management with environmental management;

IV – the joint planning of water resources with that of the user sectors and with regional, state and national planning;

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

VI – the integration of river basin management with that of estuaries and coastal zones.

The guidelines set out in Article 3 seek to guide water management based on the integrated management model of water resources. Thus, water management should be done systemically, including aspects of quality and quantity, which are integral and complementary.

Management should adapt to local or regional circumstances. Brazil is a country of continental proportions with distinct realities. For example, the management in the Amazon region can not use the same strategies that are enacted in the Southeast or Semi-arid Regions. Management should be dynamic and adapt to the needs and characteristics of each basin and region.

And lastly, water management should be coordinated with other closely related themes such as the environment, land use, and coastal management. The quality and quantity of water depend on protecting ecosystems and territorial policies that encourage uses that comply with the vulnerability of the basin. Integration with coastal management is critical because the highest percentage of the pollution that reaches this area comes through rivers. Also, the unregulated extraction of fresh waters in coastal areas can cause salinization of rivers and aquifers and compromise coastal ecosystems.

1.9 Human right to water and sanitation in the Brazilian legal system

The human right to water and sanitation gained momentum at the start of the 21st century, largely motivated by the movements against the privatization of public water and sewage services. Below is a video that presents the opinion of Prof. Doctor Andreia Vieira Costa on the topic.

Video lesson 1:

Privatization of Water Services and the Human Right to Water by Professor Doctor Andreia Costa Vieira.

However, international law and international organizations already affirmed the need to recognize a right of access to water since the mid-twentieth century. Its inspiration emerges in humanitarian law, considering the need to protect certain vulnerable social groups (Dupuy, 2006). The following conventions are some examples:

- the 1949 Geneva Convention
- the Standard Minimum Rules for the Treatment of Prisoners adopted by the First United Nations Congress on the Prevention of Crime and the Treatment of Offenders (Geneva, 1955);
- the Convention on the Elimination of All Forms of Discrimination against Women (1979); and
- the Convention on the Rights of the Child (1989).

The essential nature of water has also been reinforced in several conferences and declarations on water, environment, and health (Ribeiro, 2005; Villar, 2015), such as:

- the United Nations Conference for Human Development (Stockholm, 1972);
- the United Nations Conference on Water, in 1977;

- the International Conference on Water and the Environment (Dublin, 1992);
- the United Nations Conference on Environment and Development (Rio 92);
- the International Conference on Water and Sustainable Development (Paris, 1998);
- the Global Conference on Drinking Water and Sanitation (1990);
- the International Conference on Fresh water (Bonn, 2001).

To expand access to water, the “International Drinking Water Supply and Sanitation Decade” (1980-1990), the Global Assessment of the International Decade of Drinking Water and Sanitation and the Charter of New Delhi were established, which offered recommendations on the provision of drinking water in sufficient quantities, and sanitation for all as a goal for 2000 (Castro, 2007; Villar et al, 2012).

A drop in the number of people who do not have access to drinking water was taken up at the Millennium Declaration, among the goals being to halve the proportion of people who are unable to reach or to afford safe drinking water by 2015. These targets were widened by the World Summit on Sustainable Development in Johannesburg in 2002, adding the goal of halving the number of people without access to basic sanitation. The United Nations declared 2003 as the International Year of Fresh water, and 2008 as the International Year of Sanitation. In 2005, The International Decade for Action, “Water for Life” was established (2005-2015).

In September 2015, UN member states approved the 2030 Agenda for Sustainable Development which sets in place 17 Sustainable Development Objectives to be met by 2030, and access to water and sanitation were included in SDG No. 6.

The affirmation of understanding the right to water and sanitation as a human right at the international level has increasingly gained form and substance thanks to three documents: General

Comment No. 15 of the Committee on Economic, Social and Cultural Rights, Resolution No. 64/292 of 28 of July 2010, of the General Assembly of the United Nations; and Resolution 15/9 adopted by the UN Human Rights Council in 2010. These instruments strengthened the idea of the human right to water and water justice advocated by several social movements.

General Comment No. 15 of the Committee on Economic, Social and Cultural Rights - CESCR (2002), entitled the right to water, considered the human right to water as part of the set of economic, social and cultural rights proclaimed by the 1966 International Covenant on Economic, Social and Cultural Rights (CESCR). Although the CESDP does not make express reference to this right, it can be inferred from other rights such as the right to life, to enjoy a proper standard of living for human health and well-being, dignity for the human being, protection against diseases, access to adequate food and human development (Villar, 2013).

This document defined this particular human right as providing sufficient, safe, acceptable, physically accessible and reasonably priced water for personal and domestic uses (CESCR, 2002). This concept gave rise to two controversies: how to determine the sufficient amount of water per person since the literature differs on what those quantities would be. The other was the fact that it linked the exercise of a fundamental right inherent to the human person to the payment of a price.

In 2010, the United Nations General Assembly (UNGA) approved Resolution No. 64/292, which was known as the human right to water and sanitation and contributed to reinforcing the view of this right as an offshoot of the rights provided for in the Charter of Human Rights. In addition to recognizing this right, this instrument called upon States and International Organizations to come up with ways to guarantee universal access to the population. Resolution No. 15/9 of the United Nations Human Rights Council confirmed that this right results from the right to an

adequate standard of living and is directly associated with the right to health, life, and human dignity.

Brazil voted in favor of UNGA Resolution 64/292 (2010). However, unlike other Latin American countries (such as Uruguay, Bolivia, Ecuador, Costa Rica, etc.), its domestic law does not expressly recognize this right. Faced with the essential nature of water for life, some authors sustain that access to safe drinking water and sanitation are included in the eternity clause of human dignity, enshrined in article 1, section III, of the 1988 Federal Constitution (Mirandola and Saito, 2006, Fachin and Silva, 2011, Flores, 2011; Moares and Marques Júnior, Melo, 2013).

Although the Constitution opens up the inclusion of this right as a fundamental right, the Brazilian legal system has failed to establish the required means to guarantee it efficiently. Federal Law No. 11.445/2007 (Brazilian Basic Sanitation Policy) and Federal Decree No. 7.217/2010 draw attention to the need to universalize the service and the application of subsidies as a way to guarantee this access for the most neediest classes. One of the major challenges of this right is the creation of projects to amplify the coverage of these services in places that are not considered economically profitable, either due to the socioeconomic conditions of the population, the lack of resources or the high cost of setting up a water supply and sanitation network. On the other hand, applying subsidies as a way of guaranteeing access to those who can not pay leaves something to be desired (Villar, 2013).

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GENERAL OVERVIEW OF THE NATIONAL WATER RESOURCES POLICY





2. GENERAL OVERVIEW OF THE NATIONAL WATER RESOURCES POLICY

The National Water Resources Policy was instituted by Federal Law No. 9.433 of January 8, 1997, which also created the National Water Resources Management System (SINGREH). The primary function of this provision was to regulate Art. 21, item XIX, of the 1988 Constitution, which provides:

Art. 21. The Union is responsible for:

XIX – establishing a national water resources management system, and define criteria for granting rights of use of said resources.

This Module will detail the structure of the organs and entities of the National Water Resources Management System and will present the main water resources management instruments in Brazil.

2.1 The National Water Resources Management System

The National Water Resources Management System (SINGREH) is the set of bodies and entities that work on managing water resources in Brazil (Machado, 2018, p. 589).

Under Law no. 9.433/97 (art. 32), SINGREH has the following objectives:

- coordinate the integrated management of waters;
- provide administrative arbitration on conflicts related to water resources;
- implement the National Water Resources Policy;
- plan, regulate and control the use, preservation, and recovery of water resources;
- apply charges for the use of water resources.

Coordinating integrated water management consists of promoting institutional articulation between competent bodies and entities in river basins composed of water resources with different domains. This is the case, for example, of the Rio Doce Basin,

which involves agencies and entities from two states: Minas Gerais and Espírito Santo, besides the Union.

The jurisdiction to arbitrate administratively on water-related disputes is not yet fully established, as no specific rule has been issued regulating the procedures necessary for the initiation of administrative proceedings to settle conflicts.

The function of planning, regulating and controlling the use, preservation and recovery of water resources refers to the application of the management instruments established by law, including the Water Resources Plans, the grouping of water bodies into classes, according to their predominant uses, the granting of rights to use water resources, and the collection of charges for water resources use, always based on the Water Resources Information System (Granziera, 2015, p. 125).

To comply with these objectives, Public Administration agencies and entities were created with specific hierarchies and responsibilities within SINGREH (Art. 33). These agencies are subdivided into three categories, according to their nature and performance (Granziera, 2015, p. 125):

- Collegiate bodies: National Water Resources Council; Water Resources Councils of the States and Federal District, and River Basin Committees;
- Management and control agencies and entities: National Water Agency, Water Agencies, agencies and entities of the federal, state, Federal District, and municipal and public authorities, whose jurisdictions relate to water resources management and control;
- Civil Water Resources Organizations: (a) consortia and river basins' inter-municipal associations; (b) regional, local or sectorial associations of water resources users; (c) technical, and teaching-research organizations with interest in the water resources sector; (d) non-governmental organizations with objectives of defense of diffuse and collective interests of

society; (e) other organizations recognized by the National Council or by the Water Resources Statal Councils.

It is important to emphasize that the domain of waters, established in the Federal Constitution, is divided between the Union (art. 20, III) and the States (art. 26, I) and, by analogy, the Federal District, according to the location of water bodies. This implies that, for each political entity to which the domain of a water body corresponds, there will be a competent agency or entity to exercise

the attributions of SINGREH (Granziera, 2015, p. 122).

Figure 4 shows the organization chart and the attributions of the agencies and entities that are a part of the National Water Resources Management System, given the scope – federal and statal –, the jurisdictions to devise and/or implement the instruments from the National Water Resources Policy, and the type of agency. The composition, legal nature, and specific roles of each agency or entity will be detailed in the upcoming items.

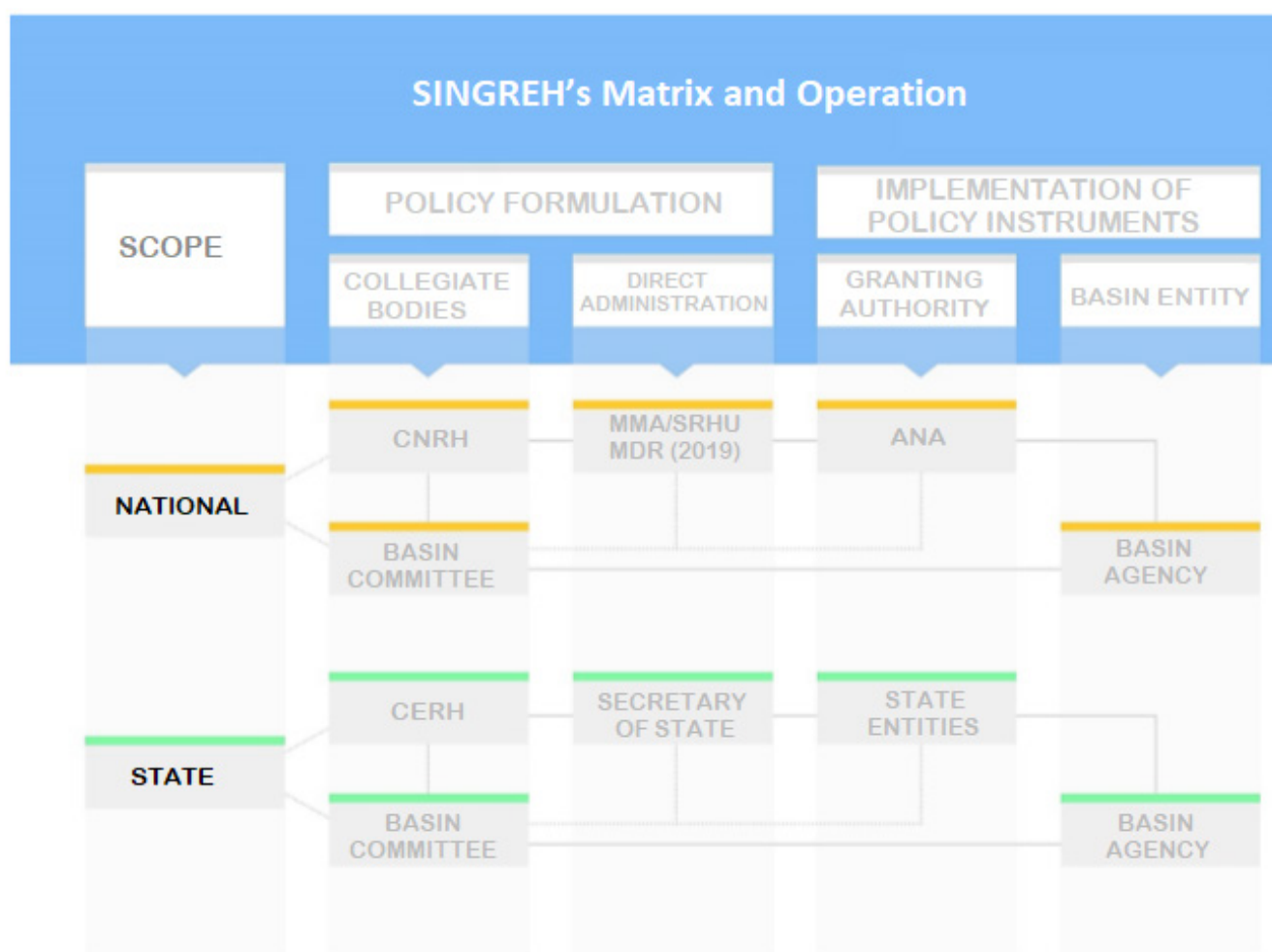


Figure 4: SINGREH's Matrix and Operation

Source: ANA. Available at: <<http://www3.ana.gov.br/porta/ANA/gestao-da-agua/sistema-de-gerenciamento-de-recursos-hidricos/o-que-e-o-singreh>>. Accessed on October 24th, 2018.

The Water Law established, as the foundation of the National Water Resources Policy, that the *management of water resources should be decentralized and have the participation of public authorities, users and communities* (art. 1º, VI). The objective of decentralization is to facilitate local communication, privileging the decisions made in the river basin itself. However, this should not imply any antagonism or lack of coordination (Machado, 2018, p.591).

Decentralization, as interpreted in Law 9.433/97, can be understood in two ways. First, under the prism of the participation of civil society, as one of the characteristics of contemporary Public Administration in decision making. The modern trend in public administration involves the participation of society in decisions previously exclusive to the Public Authority (Granziera, 2014, p. 153).

The second form of decentralization, of a geographical nature, occurs in the management that is based on the river basin. In the framework of the Committees, decisions are taken, which will bind administrative acts under the jurisdiction of the public authorities (Granziera, 2014, p. 154). As an example, the granting of the right to use water is mentioned, whose priorities for the basin should be included in the respective Plan, approved by the Committee, linking the granting of the right to use water resources (art. 13).

Thus, the functioning of the National Water Resources Management System depends on the cooperation between federal and state agencies and public administration entities, as well as civil society - via civil organizations. Coordinated and effective action will require an on-going effort by all members of SINGREH, as it faces inequalities in regional development, and with overlaps water domain (Machado, 2018, p.590).

2.1.1 National Water Agency (ANA)

Created by Law No. 9.984 of July 17, 2000, the National Water Agency is part of the National Water Resources Management System and is the federal entity that formulates the National Water Resources Policy. This is a special regime federal agency, with administrative and financial autonomy. The ANA was previously associated with the Ministry of the Environment, but it was incorporated into the Ministry of Regional Development - MDR (Decree No. 9.666/2019) as of 2019, and its role is to enforce the objectives and guidelines of the Water Law.

Watch:

Video 5: National Water Agency:

Production: ANA

ANA is led by a collegiate board composed of five members appointed by the Brazilian President. The existence of a term of office for its directors provides this autonomous agency with broader self-sufficiency (Machado, 2018, p.596).

The coordination of national water planning is the responsibility of the National Water Resources Council, of which the ANA is an executive branch. The agency's duties relate to the National Water Resources Policy and Union waters.

Accordingly, the ANA is responsible for supervising, controlling, and evaluating the actions and activities resulting from compliance with the federal legislation on water resources (Law No. 9.984/00, art. 4). Regarding the exercise of police power, the ANA is responsible for disciplining the implementation, operation, control, and evaluation of the instruments of the National Water Resources Policy; granting, by authorization, the right to use water resources in water bodies under the jurisdiction of the Union,

supervising these uses; defining and supervising the conditions of operation of reservoirs, with a view to ensuring multiple use, as established in the water resources plans of the river basins.

Watch:

Video 6: *Joint Report on Water Resources 2017*

Production: ANA.

As the agency responsible for the management of water resources under the Union's domain, and for the implementation of the National Water Resources Policy, the following provision actions are the object of ANA's jurisdiction (Law No. 9.984/00, art. 4):

- promoting and supporting initiatives to create River Basin Committees;
- preventing and minimizing the effects of droughts and floods, in coordination with the Civil Defense, to support States and Municipalities;
- studies to subsidize the application of financial resources of the Union in works and services for the regularization of watercourses, allocation, and distribution of water and control of water pollution, in accordance with what is established in the plans for water resources;
- coordination of the activities developed in the national hydro-meteorological network, in articulation with public or private agencies and entities that integrate it, or that are users of it;
- managing the National Water Resources Management System (SNIRH);
- researching and training human resources to manage water resources;
- supporting States in creating management agencies for water resources;
- drafting proposals to the National Water Resources Council, pertaining to incentives,

including financial, qualitative and quantitative, for conserving water resources.

Regarding the jurisdiction for charging for the use of water resources within the Union's domain, ANA is responsible for preparing the technical studies that will support the definition, by the CNRH, of the respective values, based on the mechanisms and quantitative suggested by the Committees (Law No. 9.984/00, art. 4, VI, and Law n° 9.433/97, art. 38, VI); implement the collection, in articulation with the Committees (Law n° 9.984/00, art. 4, VIII); and collect, distribute and apply the collected revenues (Law n° 9.984/00, art. 4, IX, and Law n° 9.433/97, art. 22).

In view of the Conversion of Provisional Measure No. 462 of 2009, Law No. 12.058 of October 13, 2009 assigned the authority to ANA, *when water bodies under the domain of the Union are involved, to regulate and supervise the provision of public irrigation services, if in a concession plan, and untreated water supply. They are also responsible for the provision of these services in a regulatory manner, as well as instituting efficiency standards and setting fees, when applicable, along with managing and auditing all aspects of the respective concession contracts, when applicable* (Law 9.984/00, Art. 4, XIX).

Under the terms of §8 of Art. 4, modified by Law No. 12.058 of October 13, 2009, ANA will ensure that the appropriate service is provided to fully serve its users, observing the principles of regularity, continuity, efficiency, security, timeliness, generality, courtesy, moderate tariffs, and rational use of water resources.

In accordance with Law No. 12.334 of September 20, 2010, the following attributions were added to ANA's responsibilities: organize, implement and manage the National Dam Safety Information System – SNISB (art. 4, XX); foster links between the inspection agencies for dams (art. 4, XXI); coor-

dinate the drafting of a Dams Safety Report, and submit it to the National Water Resources Council (CNRH) on an annual basis (art. 4, XXII).

In 2018, Provisional Measure No. 844/2018 was enacted, which amended Law No. 9,984/2000, increasing ANA's attributions. However, this Provisional Measure was not approved by the National Congress on time and was terminated. Later, a new Provisional Measure – No. 868 of December 27, 2018 – was published. This regulation amended a number of provisions in Law No. 9984/00, including ANA's jurisdiction to enact national guidelines for sanitation services. However, approval is still pending from the National Congress.

The National Water Agency may delegate or assign to water agencies the activities within its jurisdiction (Law 9.984/2000, art. 4, § 4).

ANA's revenues (Art. 20) are: funds transferred to it as a result of allocations included in the Union's Total Budget, special appropriations, additional allowances and transfers, and on loans granted to it; funding resulting from fees collected for water from water bodies under the Union's control, respecting the forms and limits of the application provided for in art. 22 of Law 9.433/97; funds derived from conventions, agreements or contracts entered into with national or international entities, agencies or companies; the donations, legacies, subsidies and other funds earmarked for it; proceeds from the sale of publications, technical material, data and information, including for public bidding purposes, administrative fees and registration fees; compensation for services of any nature rendered to third parties; the product resulting from the collection of fines imposed as a result of inspection activities treated in arts. 49 and 50 of Law No. 9.433/97; the amounts calculated with the sale or lease of movable and immovable property that it owns; the proceeds from the sale of assets, objects and instruments used for committing violations, as well as the offenders

property seized as a result of the exercise of police authority and incorporated into the assets of the autonomous agency, under the terms of a judicial decision; and the proceeds from the collection of administrative fees.

2.1.2 The National Water Resources Council (CNRH)

The National Water Resources Council (CNRH) was established by Law No. 9.433/97, and regulated by Decree No. 4613, of March 11, 2003.

The CNRH is a collegiate body composed of representatives of the Ministries and Secretariats of the Presidency of the Republic, who act in the management or use of water resources; representatives appointed by the States Water Resources Councils; representatives of water resources users; and representatives of the water resources civil organizations (Law No. 9.433/97, Art. 34).

Although it is attended by representatives not linked to the Public Administration, it is a State body, of the direct Public Administration, established within the scope of the Federal Public Administration, with the participation of representatives of civil society, as a manifestation of the already mentioned tendency to allow the participation of society in certain decisions of the Administration, especially in planning and public policies (Granziera, 2014, p. 156).

Within the CNRH, the number of representatives from the Federal Government may not exceed half plus one of the total number of members (Law No. 9.433/97, Art. 34, sole paragraph). In 2018, the National Water Resources Council comprised 58 members, which included (Decree No. 4.613/03, Art. 2):

- 29 representatives from Ministries and Special Presidential Bureaus;
- 11 representatives from the State Water Resources Councils. According to the National

Water Resources Council website, there are currently 11 advisors representing the State Water Resources Councils (<<http://www.cnrh.gov.br/conselheiros#governo>>). In November 2018, the full representatives were composed of the following States: Espírito Santo, the Federal District, Rondônia, Rio Grande do Sul, Paraíba, São Paulo, Tocantins, Ceará, Rio Grande do Norte, Goiás, and Mato Grosso;

- 12 representatives from water resources users. In November 2018, according to the National Water Resources Council website (<<http://www.cnrh.gov.br/conselheiros#governo>>), full advisors representing users of water resources are from the following institutions: Brazilian Confederation of Agriculture and Livestock - CNA; Rio Grande Rice Institute - IRGA; Brazilian Association of State Sanitation Companies - AESBE; Santa Catarina Water and Sanitation Company - CASA; Brazilian Association of Electric Power Generating Companies - ABRAGE; Brazilian Association of Clean Energy Generation - ABRAGEL; State of São Paulo Union of River Navigation Shipowners - SINDASP; Delima Commerce and Navigation LTDA; Brazilian Institute of Mining - IBRAM; State of São Paulo Federation of Industries - FIESP; National Confederation of Industry - CNI; Association of Mining Companies of the Thermal Waters of Goiás;
- 6 representatives from civil water resources organizations. In November 2018, according to the National Water Resources Council website (<<http://www.cnrh.gov.br/conselheiros#governo>>), full advisors representing civil water resources organizations are: Comitê Gravataí; Intermunicipal Consortium of the Piracicaba, Capivari and Jundiaí River Basins; Brazilian Association

of Sanitary and Environmental Engineering - ABES; Universidade Estadual Paulista Júlio de Mesquita Filho - UNESP; National Forum of Civil Society in the Committees of River Basins - FONASC.CBH; Instituto Socioassistencial Educando.

For more information on advisors who hold positions on the National Water Resources Council

ONLINE

From the numbers on the CNRH's composition, it can be concluded that (Ax, 2018, 592 p.):

- The Federal Government holds the majority of votes in the CNRH, unlike in other councils that include the National Environmental Council (CONAMA), the State Water Resources Councils, and the River Basin Committees;
- By the number of seats, not all the States have representation in the CNRH;
- There is no explicit provision of River Basin Committee representatives - who can apply for positions for civil water resources organizations - and the National Water Agency.

The National Water Resources Council is managed by the Minister of Regional Development and the Executive Secretary, who will be the holder of the office integrated into the structure of the Ministry of Regional Development, who is responsible for water resources management (Law No. 9.433/1997, Art. 36, as amended by Provisional Measure No. 870/2019).

Under Decree No. 4.613/03, the CNRH is a consulting and deliberating agency (Art. 1, *caput*). However, its attributions have technical, consultative, normative, deliberative, and political articulation character (Granziera, 2014, p. 156).

Article 35 of the Water Law, defined the following responsibilities for the CNRH:

- promote the coordination of water resources planning with national, regional, state and user sector planning;
- arbitrate, as a last administrative recourse, the existing conflicts between State Water Resources Councils;
- deliberate on projects involving the use of water resources whose impact go beyond the scope of the States where they will be deployed;
- resolve issues that have been submitted to it by the State Water Resources Councils or by the River Basin Committees;
- analyze proposals for changes in legislation related to water resources and the National Water Resources Policy;
- establish additional guidelines for setting up the National Water Resources Policy, the application of its instruments and activities by the National Water Resources Management System;
- approve proposals for instituting the River Basin Committees and to establish general criteria for drafting its internal rules;
- monitor the execution and approve the National Water Resources Plan, and determine the necessary measures to meet its goals; (Drafting given by Law No. 9,984 of 2000)
- establish general conditions for the use of rights granted to water resources, and for the charge of fees for their use.
- ensure that the National Dam Safety Policy (PNSB) is implemented; (Introduced through Law No. 12.334 of 2010)
- establish guidelines for implementation of the PNSB, application of its instruments and performance of the National Information System on Dam Safety (SNISB); (Included by Law No. 12.334, 2010)

- assess the Dams Safety Report, offering recommendations whenever needed for improving the safety of the projects, as well as submitting them to the National Congress. (Introduced through Law № 12.334 of 2009)

Decree n° 4.613/03, art. 1, also establishes jurisdiction in the scope of the CNRH, among which the following stand out: to deliberate on the administrative appeals that may be submitted to it; to approve the classification of water bodies into classes, in accordance with CONAMA's guidelines and in accordance with the classification established in environmental legislation; to manifest itself on proposals forwarded by the National Water Agency (ANA), relative to the establishment of incentives, including financial, for the qualitative and quantitative conservation of water resources; and to authorize the creation of Water Agencies.

The National Water Resources Council meets regularly every six months in the Federal District and, extraordinarily, whenever convened by the President, by its own initiative or at the request of a third of its members (Decree No. 4.613/03, Art. 5).

The CNRH meeting sessions are public, with attendance by an absolute majority of its members, who decide through a simple majority of the votes. In the event of a tie in decisions, the President of the National Water Resources Council shall have the casting vote.

The CNRH manifests itself through (Executive Order of the Environmental Ministry No. 437 of November 8, 2013, Art. 9):

- Resolution: when it is a deliberation linked to its specific jurisdiction and the institution or extinction of specialized chambers, commissions and work groups;
- Motion: when it is a manifestation directed to any public or private organs and entities, in alert, recommendation or request of interest of the National Water Resources Policy and SINGREH;

- Communication: when it is an act of expediency within the jurisdiction of the National Water Resources Council.

By means of resolutions, the CNRH may establish Technical Chambers (CT) on a permanent or temporary basis, in charge of examining and reporting to the Plenary matters of its competence. On average, each Technical Chamber (CT) holds a monthly meeting to discuss matters related to its duties, in order to support the advisors on the decisions in plenary. CT meetings are open to the public, and the attendees have the right to speak.

The CNRH relies on the following Technical Chambers: Legal and Institutional Affairs TC; National Plan on Water Resources TC; Subterranean Waters TC; Project Analysis TC; Science and Technology TC; Transboundary Water Resources Management TC; Integration of Procedures, Granting Actions and Regulatory Actions TC; TC on Charging for the Use of Water Resources; TC of Education, Training, Social Mobilization and Information on Water Resources; TC for the Integration of Managing River Basins and Estuarine and Coastal Zone Systems.

Lastly, it is significant to emphasize the importance of the National Water Resources Council in articulating the planning of water resources with national, regional, state and user sectors. Although other SINGREH agencies and entities are involved in planning for water resources - State Councils, River Basin Committees, Water Agencies etc. - the CNRH plays a key role in the efficiency of this system, which, although decentralized, must be coordinated.

2.1.3 State Water Resources Councils

The Water Resources Councils for States and the Federal District are part of the National Water Resources Management System (Law No. 9.433/97, Art. 33, II). All Brazilian states have their own water resources council or an entity that is equivalent to it.

Like the National Water Resources Council, the State Councils are also collegiate bodies, most

of which consist of representatives from the public authorities, water users, and the civil society.

Most of the provisions used to structure the jurisdiction of the State Water Resources Councils are not included in the Water Law. Each State has the power to legislate on water resources within its territory and supplement national legislation, without altering the authorities of other agencies SINGREH (Machado, 2018, p. 606).

Even so, it is possible to identify, within the Water Law, some of the attributions provided to state agencies. The State Councils have jurisdiction to deliberate on accumulations, derivations, abstractions, and discharges of minor importance, for exemption from the obligation to grant rights of use of water resources of their domain (art. 38, V).

They are also a first recourse for the decisions by the River Basin Committees on state-owned rivers (Art. 38, sole paragraph) and have the function of authorizing the creation of Water Agencies in these river basins (Art. 42, sole paragraph).

Also under Law 9.433/97, Water Agencies must propose to the respective River Basin Committees, the classification of water bodies into the existing usage categories. If the river is under state control, the Committees must submit a proposal to the State Council of Water Resources for assessment and subsequent submission to state environmental agencies.

Within the National Water Management Covenant Consolidation Program (PROGESTÃO), regulated by ANA Resolution No. 379/2013, the State Councils sign as intervening parties in the contracts and are responsible for the certification of the management goals at the state level. This ANA program consists of financial incentives to state systems for exclusive application in actions of institutional strengthening and management of water resources, through the achievement of goals defined based on the complexity of management chosen by the federation unit.

2.1.4 River Basin Committees: Federal and State Domain

The River Basin Committees integrate the National Water Resources Management System (Law No. 9.433/97, Art. 33, III) with consultative and deliberative functions, linked to the Public Authority and subordinated to the respective Water Resources Councils.

Watch

Video 7: River Basin Committee.

Production: ANA.

It is a groundbreaking feature in Brazilian legislation, as its work does not correspond to the country's political-administrative organization – Union, States, Federal District, and Municipalities –, although it has decision-making power (Granziera, 2015, p. 127). Its area of activity consists of one of the three hypotheses provided for in the Water Law (art. 37):

- the entirety of a river basin;
- the river sub-basin of any tributary to the main watercourse of the basin, or any tributary of that tributary; or
- a group of contiguous river basins or sub-basins.

The flexibility between the political-administrative organization of the country and the areas of action of the River Basin Committees is a result of the legislator's concern in enabling the accommodation of various forms of river basins and the possible political articulation in different regions of the country, given the existence of very extensive rivers that have very diverse scenarios and realities throughout their course (Granziera, 2014, p. 158).

The River Basin Committees are collegiate bodies and are the most important authority for local participation and integration of water planning and management, under the focus of river basins, to the extent that it is an adequate nucleus for the

exercise of governance over local issues related to water resources.

For this reason, the regulations of the collegiate bodies should provide for the representation of all existing interests in the basin, since the effectiveness of the system and the success of governance depend on this representativeness. There is the only legitimacy in the decisions by the Committee if there is active participation by representatives from all areas of society with interest in water resources (Granziera, 2015, p. 127).

Considering this need to represent different interests, the Water Law establishes that the Committees be composed of representatives from the Union; the States and the Federal District, whose territories are located, in whole or in part, in their respective areas of activity; from Municipalities situated, in whole or in part, in its area of activity; from users of the waters within its area of operation; from civil entities of water resources with proven activity within the basin (Art. 39).

However, it is worth noting that this general guideline proposed by the Water Law regarding the composition of the Committees does not specify the number of representatives from each sector. On the contrary, according to Law No. 9.433/97, the number of representatives from each sector and the conditions for appointing them will be established within the rules of the committees, limited only to representation from the executive powers of the Union, States, Federal District, and Municipalities to half the total number of members (Art. 39, §1).

CNRH Resolution No. 5/2000 establishes the guidelines for the creation and operation of the committees in its Art. 8, as amended by CNRH Resolution 24/2002. In addition, CNRH Resolution 109/2010 establishes complementary procedures for the creation and monitoring of basin committees. Thus, the criteria established for the composition of the committees are:

- Public Authority: number of votes by representatives from the executive powers of the Union, the States, the Federal District, and the Municipalities, observing a limit of forty percent of the total votes;
- Civil society: number of representatives from civil entities, proportional to the population residing in the territory of each State and the Federal District, whose territories are, even partially, in the areas where they operate, with at least twenty percent of the total votes, guaranteed the participation of at least one representative per State and the Federal District;
- Users: number of representatives of water resource users, complying with forty percent of the total votes.

The composition of the Committees may also be established according to the political-administrative sphere. The Union is required to participate in the River Basin Committees for rivers that are found in the Union's area. However, in the committees of rivers exclusively under state control, the participation of the Union and its form will be established in the respective bylaws (Art. 39, § 4).

In the River Basin Committees, where the territories cover indigenous lands, representatives from the National Indian Foundation (FUNAI) should be included as part of the representatives from the Union and of the indigenous communities residing there or with interests in the basin (Art. 39, § 3).

Legal Nature of Committees

River basin committees are collegiate bodies of the water resources management systems. As agencies, they do not have a legal identity. But there is no doubt about their nature as members of the Public Administration, linking themselves to the federal, state or district Public Authorities, pertaining to the administrative nature of the relationship (Granziera, 2014, p.161).

Although they are collegiate bodies and centralize the discussions on the use of water resources,

their operation complies with the principles of the formal procedure and the administrative process, and their work and operation come out of the law. The formulation of the regulations and statutes must meet the need to include, in the committee, the representation of all existing interests in the watershed where this collegiate body is intended to be implemented, under penalty of deviation from its purposes (Granziera, 2014, p. 161).

The river basin committees are linked to the Public Authority and contingent to the respective Water Resources Councils. They are the same type of agencies but at a higher hierarchical level, either at the national or at the State level, in relation to decisions surrounding planning for water resources (Granziera, 2014, p.161).

As for their jurisdictions, the Water Law defines that the River Basin Committees, within their area of activity, are responsible for (article 38):

- to promote discussion on issues related to water resources and to coordinate the activities of those entities involved;
- mediating, in the first administrative instance, disputes related to water resources;
- approving the Water Resources Plan for the basin;
- tracking how the Water Resources Plan for the basin is being executed, and suggest the measures required to achieve its goals;
- proposing to the National Council and to the State Water Resources Councils which accumulations, diversions, catchments, and releases are relatively small to effect an exemption from the obligation of granting rights for using water resources, according to their domains;
- setting mechanisms in place for charging fees to use water resources and to suggest the amounts to be charged;
- establishing criteria and promote the distribution of cost for projects involving multiple use, common or collective interest.

Therefore, it is the responsibility of the Committees, within the scope of their area of operation, and subject to the deliberations of the CNRH or the State Councils, to arbitrate in the first administrative instance the conflicts related to water resources, including those related to the Basin Committees of tributary watercourses; approve the Water Resources Plan of the Basin, respecting the guidelines of the other bodies of the SINGREH; approve the proposals of the Water Agency that are submitted to it; submit, mandatorily, the Water Resources Plans of the Basin to the public hearing; and develop and support initiatives in environmental education, among others (Pompeu, 2010, p. 346).

It is also important to analyze the differences of the River Basin Committees according to the domain of their rivers: Federal and State domains.

As for the Federal Hydrographic Basin Committees, that is, those that are installed in river basins, whose main river is the domain of the Union, their institution will be formalized by an act of the President of the Republic (decree). The National Water Resources Council Resolution No. 5/2000 establishes that the proposal for instituting a River Basin Committee, whose main river is under the Union's domain, may be submitted to the CNRH if it is endorsed by at least three of the following categories (Art. 9th):

- Secretaries of State that are responsible for the management of water resources of at least two-thirds of the States contained in the respective river basin, taking the Federal District into account, when applicable;
- Municipal Mayors whose cities have at least

forty percent of their territory in the river basin;

- Entities representing users, legally constituted, of at least three of the indicated uses, with at least five entities; (Under the terms of Resolution CNRH No. 5/2000, art. 14, the uses subject to the granting shall be classified by the National Water Resources Council, in accordance with the purpose of the river basin, among the following user sectors: a) urban supply, including dilution of urban effluents; b) industry, abstractions, and dilution of industrial effluents; c) irrigation and agricultural use; d) hydroelectricity; e) hydro-way; f) fishing, tourism, leisure, and other non-consumptive uses);
- Civil entities of water resources, with proven performance in the river basin, which may be qualified as Civil Society Organizations of Public Interest, legally constituted, with at least ten entities, and this number may be reduced, at the discretion of the Council, depending on the local characteristics and justifications prepared by at least three civil entities.

A proposal for instituting the Committee will be submitted to the National Water Resources Council and, if approved, will be effected through a Presidential decree. After the Committee is instituted, the Executive Secretary of the National Water Resources Council will appoint the respective Interim President and Secretary within 30 days, with a term of up to six months, and hold exclusive responsibility for coordinating the organization and installation of the Committee (Article 11).

Figure 5 shows the Interstate River Basin Committees instituted through Federal Decree:

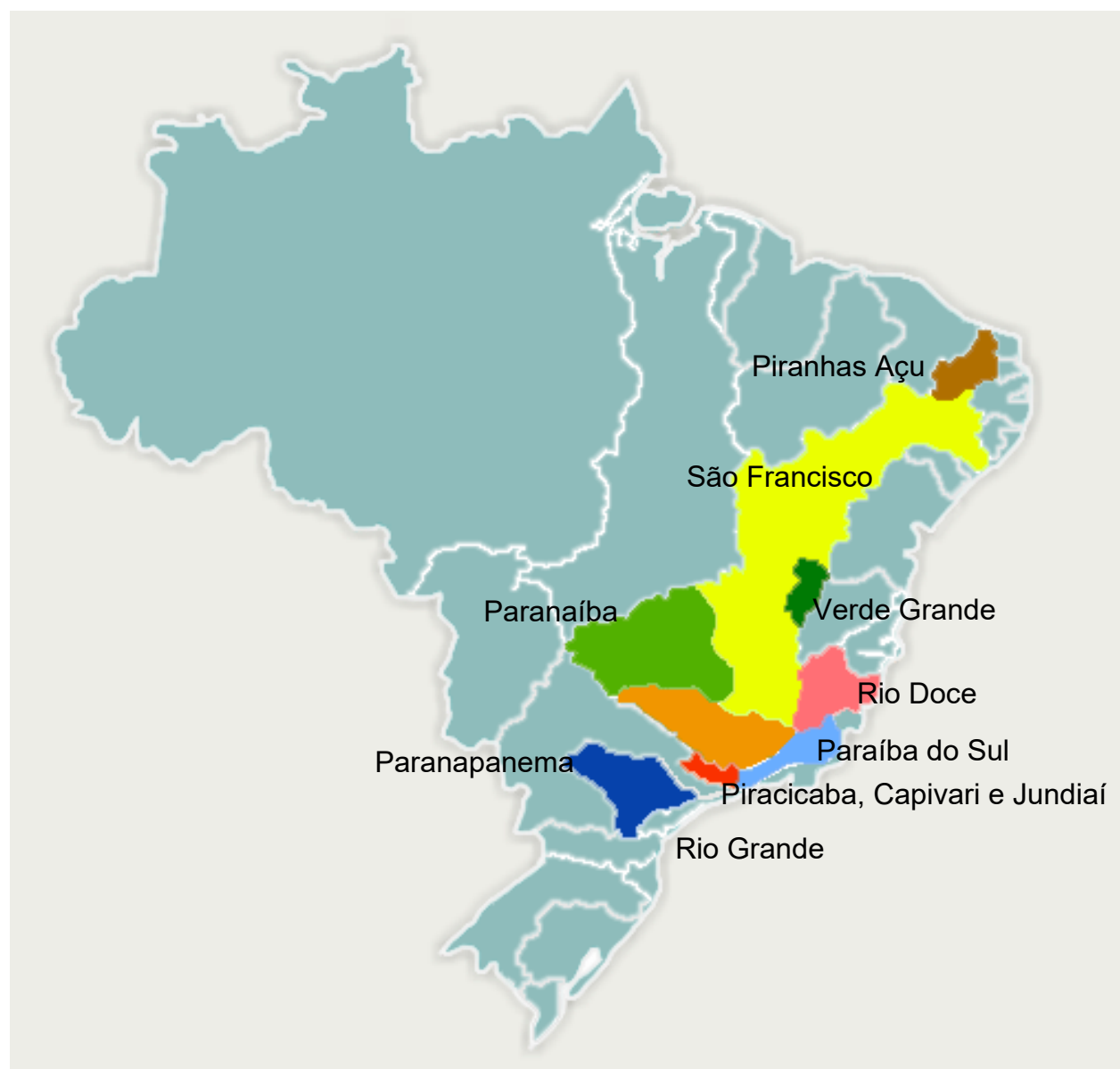


Figure 5: Interstate Committees.

Source: ANA. Available at: <http://www.cbh.gov.br/#not-interestaduais>. Accessed on: Oct. 30th, 2018.

Each of the above mentioned Interstate Committees has as its main river a water body under Union's domain. However, its river basin consists of other rivers, which in most cases are under state dominion. In turn, the river basins of these state rivers correspond to a state basin committee, instituted under state legislation.

Thus, it occurs that an interstate committee covers the territory corresponding to the jurisdiction

of several state committees. An example consists of the Federal Committee of the River Basins of the Piracicaba, Capivari and Jundiaí rivers (PCJ FEDERAL), whose activities correspond, in part of the territory of São Paulo, to the Piracicaba Capivari and Jundiaí River Basin Committee, CBH-PCJ and, in part of the territory of Minas Gerais, to the Committee of the Piracicaba and Jaguari River Basin – CBH-PJ1.

The Piracicaba Capivari and Jundiaí Rivers Basins Committee (CBH-PCJ) was established through São Paulo State Law No. 7.663/1991. The second committee (PCJ Federal) installed in the basin was instituted by the Federal Decree of May 20, 2002, as a measure of implementation of the National Water Resources Policy - Law No. 9,433/1997, aiming at its integration with the State Policy.

The institution of the Federal PCJ Committee was based on confirming the practice of integrated, decentralized and participatory management in the region, with the integration between the States of São Paulo and Minas Gerais and the Federal Government, through the National Water Agency - ANA. The implementation of this new committee, in a region where there are water bodies under the control of the Union and the States, is based on permanent integration and negotiation, including the challenge of having different compositions in each committee. More recently, the River Basin Committee for the Piracicaba and Jaguari Rivers - CBH-PJ1 was established in Minas Gerais, through Minas Gerais State Decree 44.433/2007.

2.1.5 Water Agencies

The Water Agencies are part of the National Water Resources Management System (Law No. 9.433/97, Art. 33, V) and, in accordance with the provisions of Art. 44, possess the following jurisdictions in their operational area:

1. Technical aspects (management):

- maintain an updated balance on the availability of water resources, and a record of water resources users;
- generate the Water Resources Information System;
- promote the studies required to manage the resource;
- draft the Water Resources Plan for evaluation by the Committee;

- propose the following to the respective River Basin Committee(s): 1. a classification of water bodies, by usage categories, for submittal to the respective National Council or State Water Resources Councils, according to their domain; 2. the fees to be charged for the use of water resources; 3. the plan for applying the funds raised through the fees charged for the use of the water resources, and 4. the cost apportioning for projects of multiple use, with common or collective interest.

2. Billing of usage fees:

- apply, through an appointed party, the charges of fees for the use of water resources;
- analyze and issue opinions on the projects and works to be financed with resources generated by the charge for the use of water resources and forward them to the financial institution responsible for the administration of these resources;
- monitor the financial management of the funds raised through the fees collected for the use of water resources.

3. Administrative:

- enter into agreements and contracts for financing and services for the execution of its jurisdictions;
- prepare its budget proposal, to be submitted to the respective river basin committee(s) for consideration.

The River Basin Committee and the Water Agency should act together in a complementary manner. The first discussing and approving decisions and the second executing. As defined by Paulo Affonso Leme Machado (2018, p. 622), the Agency should have a minimum of people, and operational homogeneity and the Committee should be broader, in the plurality and diversity of its composition.

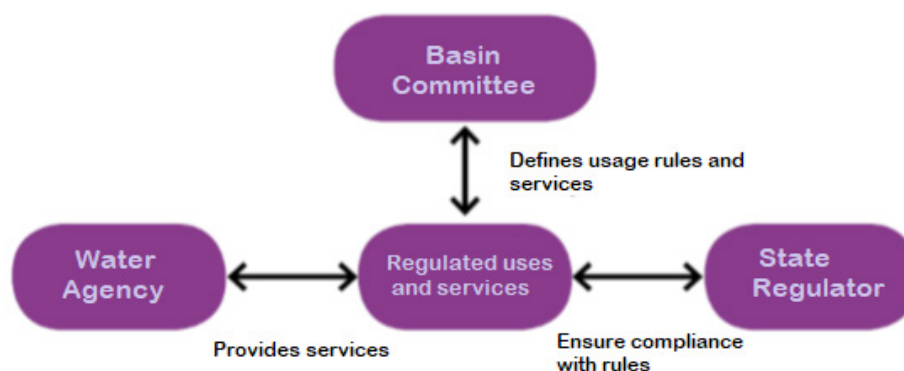


Figure 6: Basic system of management in river basins.

Source: National Water Agency, 2014, p. 13.

Article 42 of the Water Law, in its single paragraph, states that its creation shall be authorized by the National Water Resources Council or by the State Water Resources Committees, upon request of one or more River Basin Committees, subject to compliance with the following requirements: prior existence of the respective River Basin Committee(s) and financial viability ensured by charging the use of water resources in its area of operation (Article 43).

In the exercise of its function as executive secretariat of the River Basin Committee, the Water Agency is responsible for administrative support for the functioning of the collegiate. To this end, it shall organize the meetings, make prior disclosure of studies ancillary to decision making, communicate them to the company, and keep up-to-date and available information on the implementation of these resolutions.

Law 9.433/97 did not establish a specific legal model for the Water Agency. In view of the authority to charge for the use of water resources, it is understood that it cannot constitute a private law entity, to the extent that the resources resulting from the collection are of a public nature and, therefore, only a public entity is competent to collect them. With regard to the other attributions, there is no restriction on the exercise of these powers by legal entities governed by private law.

The categories that may constitute a Water Agency, as provided for in Law No. 9,433/1997, are the autarchy, the foundation of public law, the public company or mixed economy company, and the public consortium of public law. As these are figures that make up the Public Administration, the principle of legality applies to them, in the form of Article 37 of the Federal Constitution.

The Water Agencies are created by specific laws, which will bring, in their content, the legal regime of the entity. Because it does not violate the Federal and State Constitutions, the law creating a Water Agency entity substantiates its operation.

a. Autarchy (an autonomous federal agency)

Autarchies shall be legal entities governed by public law with functions granted in the law of their creation. Under the terms of Decree-Law no. 200/1967, Art. 5, they are defined as “an autonomous service, created by law, with a legal nature, assets and proprietary income, to carry out typical public administration activities that require, for better operation, decentralized administrative and financial management.”

The autonomous agency, in the law of its establishment, must define the organizational structure and the legal regime, being bound to a single federative entity: to the Union or to the States, through

a public agency-Ministry, or State Department. The leaders of the autonomous agencies are freely appointed and dismissed by the head of the Executive Power, and the public employees, in general, have a working regime linked to the Consolidation of Labor Laws (CLT).

Some autonomous agencies have been created differently, and are known as autonomous agencies under a special regime. For them, greater administrative and financial autonomy was provided for, even when linked to a public body. Their operation is subject to a management agreement, as established in Decree No. 3.692/2000, which created the ANA, and must fulfill the goals negotiated with the supervisory ministry (ANA, 2014, p.35).

b. Foundation

The foundation is a nonprofit entity created by the legislative authority to carry out state activities that do not require enforcement by agencies or public-law entities. A foundation must have administrative autonomy, its own assets managed by the respective management groups, and its operating costs financed through public resources. It must be created by a specific law, which is submitted to the public administration control. The directors are appointed by the Chief Executive, and must follow the general law for tendering contracts with public funds (ANA, 2014, p. 35).

For a foundation created by the Union or by a certain State to become a River Basin Water Agency, each of the other states, in addition to the one that has established it, enacts a law recognizing its jurisdiction and authorizing the Public Authority to enter into an agreement with it.

c. Public enterprise or mixed-economy enterprise

Public enterprises and mixed-economy enterprises, regulated by Law No. 13.303/16, are endowed with the legal personality of a private company and created by law to carry out economic activities. The main difference between them is their capital, purely

governmental in the case of public companies and operating as a business corporation in the second case.

In both instances, the government either controls it completely, as in the first case or through holding the majority of shares, with voting rights, as in the second case. The directors are appointed by governments and employees are hired through a public service exam process, and are subject to the Consolidated Labor Laws (CLT). Purchases and contracts must follow the precepts of Law No. 8.666/1993. All these bodies are inspected by internal control entities of the Executive Branch, the Legislative Branch and the Courts of Auditors, in addition to being subject to the actions of the Public Prosecution Service (ANA, 2014, p. 35).

d. Public Consortium under Public Law

Unlike a traditional autonomous agency and public foundation, a public consortium, with a self-sufficient legal character under public law is, by law, an indirect administration entity of all consortium members. This legal figure that is regulated in Law nº 11.107/2005 consists in a public association formed by federated entities - Union, States, Federal District, and Municipalities.

It is formed from an initial agreement - called a protocol of intentions - which establishes the relations of cooperation for the achievement of objectives of common interest. In order to put the consortium into effect, this protocol must be ratified through laws that are approved by the entities that signed it. At that time, it is converted into a consortium agreement. This then becomes the instrument that will govern the new institution's operations linked to the indirect administration of each of the signatory entities that have approved ratifying laws (ANA, 2014, p. 36).

The public consortia law itself also provides for the possibility of gradual adherence to the entity over time by the various entities from the Federation. This allows the agreements already established to be

formalized and the ongoing negotiations to develop their process, without hindering the solutions already found. Through the apportionment contract, which is the consortium's financial management instrument, the entity can receive resources from the consortium members, in an orderly and rigid manner, to effectively carry out the management in the river basin.

As a public law entity, the public consortium may be delegated by the law of the Union and the States

to carry out all tasks related to the management of water resources, including the exercise of police power, provided that this is defined in the consortium contract, and ratified in the specific legislation of each entity.

Table 3 shows the description of the characteristics that make up the legal nature of the local authority, the foundation, the public company and the mixed-economy enterprise and the public consortium.

Table 3: Differences between public arrangements in water agency functions.

	Autonomous Agency	Foundation	Public enterprise or mixed-economy enterprise	Public consortium
Predominant activity	Administrative.	Social/ educational.	Business.	Administrative.
Establishment method	Specific law.	Specific law.	Specific law.	Protocol of intents ratified by specific laws of consortium entities.
Administrative binding	Union, state, or municipality.	Union, state, or municipality.	Union, state or municipality.	More than one consortium federative entity When integrated by the Union and municipalities, the participation of the states where the municipalities are located is mandatory.
Organizational structure	Generally includes a president and directors, with the ability to have Board of Directors, according to its law of establishment.	Generally includes a Board of Trustees, Supervisory Board, and Executive Board.	Generally includes a president and directors, with the ability to have a Board of Directors, according to its law of establishment.	General Meeting - exclusively for the chief consortium executives - and directors, with the ability to have a Board of Directors, according to its law of establishment.
Recruitment of staff	Public tender with CLT or statutory bond. Selection processes for temporary contracts may be provided for.	Public tender with CLT or statutory bond. Selection processes may be envisaged for temporary contracts.	Public tender with CLT or statutory bond. Selection processes may be envisaged for temporary contracts.	Public tender and CLT bond.
Legal regime for hiring process	Law No. 8.666/93	Law No. 8.666/93	Law No. 8.666/93	Law No. 8,666 / 93, with hiring limits, multiplied depending on the number of consortium members
Legislative control	Court of Auditors of the federal entity that created it.	Court of Auditors of the federal entity that created it.	Court of Auditors of the federal entity that created it.	Court of Auditors with authority to examine the accounts of the chief executive, president of the consortium.

Source: National Water Agency, 2014, p. 38. Adapted by Granziera, 2018.

Figure 7 shows the institutional articulation system within the Water Agency and its relations with the other actors that comprise the National Water Resources Management System and other entities that work in partnership.

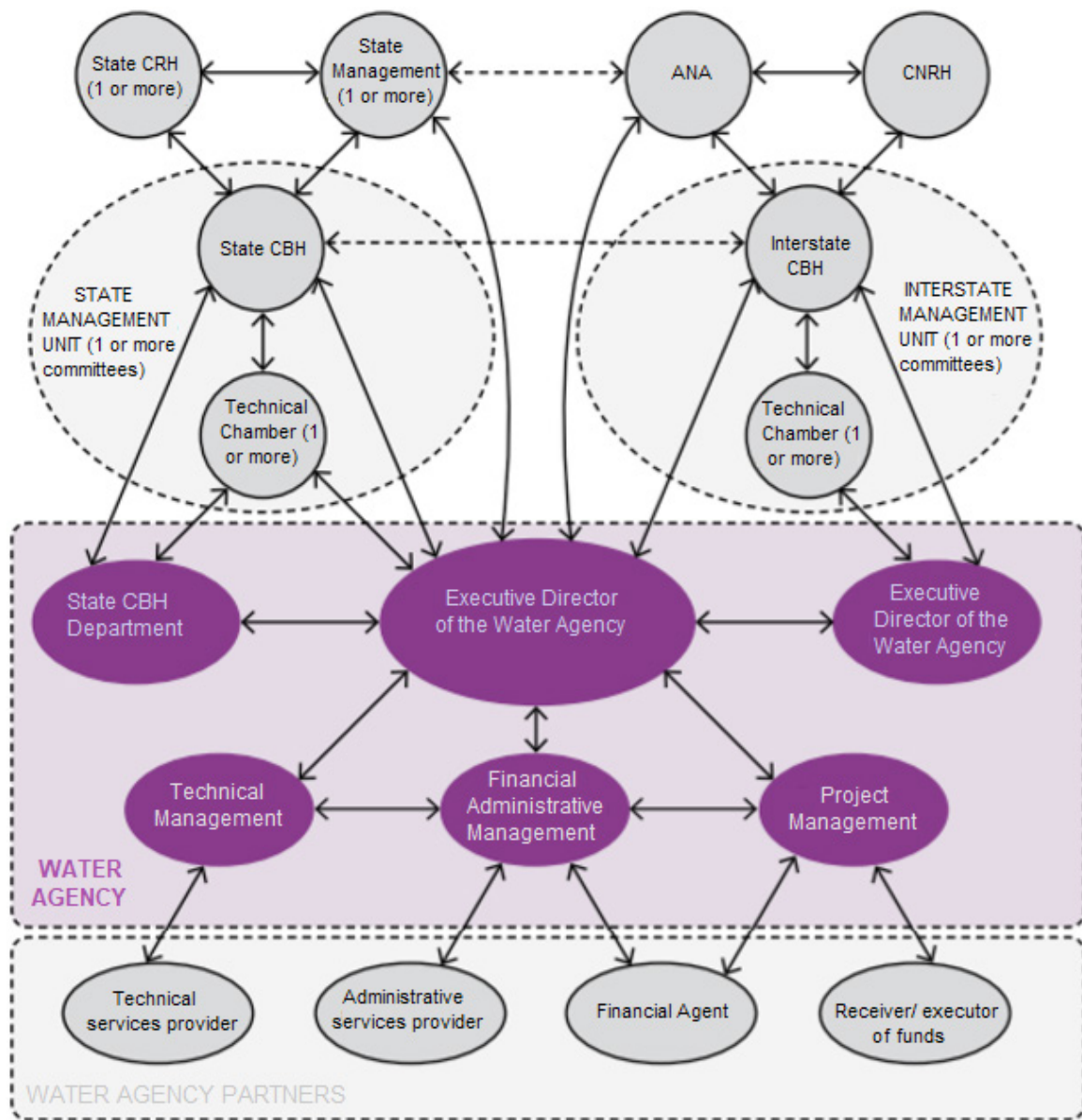


Figure 7: Relations between the water agency, SINGREH agencies, and other partners.

Source: National Water Agency, 2014, p. 25.

Table 4 displays a comparative description of the jurisdictions for the Basin Committees and Water Agencies.

Table 4: Relationship between the jurisdictions of the Water Agency and the CBH.

River Basin Committee	Water Agency
Administrative matters	
Hold general meetings and meetings of technical chambers to: DEBATE over internal procedural and organizational issues, including elections of members and directors; ARBITRATE disputes between uses and users; COORDINATE and integrate management within the basin.	SUPPORT committee meetings, which includes: providing infrastructure and logistics for the meetings; register, formalize, and disclose the minutes of meetings, resolutions, motions, etc. SIGN contracts and agreements. SUPPORT the arbitration processes for disputes between uses or users. MANAGE staff, procure goods and hire services.
Technical matters	
DEBATE issues related to water resources. CHOOSE mechanisms and amounts for collection and forward them to the Water Resources Council. APPROVE the plan for applying financial resources.	KEEP the water balance current. Maintain user records. CREATE an Information System PROMOTE the studies required to manage the water resources; ANALYZE and PUBLISH technical advice on investments. STUDY and PROPOSE alternatives to collection fees for the use of water resources. PROPOSE the plan for financial resources application.
Regulatory matters	
APPROVE the Water Resources Plan, including: SET usage priorities; PROPOSE the areas subject to restricted usage; SET targets regarding the water resources (rationalization, quality, and quantity); ESTABLISH the multiple uses for setting the operating conditions of reservoirs. CHOOSE the grouping classification alternative and submit it to the Water Resources Council. CHOOSE an alternative for non-grantable uses and submit it to the Water Resources Council.	DRAFT a Water Resources Plan. PROPOSE alternatives for classifying water bodies. PROPOSE alternatives for non-granted uses.
Supervisory, implementation and monitoring attributions	
MONITOR the implementation of the Water Resources Plan and propose adjustments. EVALUATE the proposed management agreement between the delegatee 1 entity and the collecting agency. MONITOR compliance of the management contract. ASSESS the water agency's performance.	IMPLEMENT the Water Resources Plan. PREPARE a progress report and assess its compliance with the goals for the Water Resources Plan. SIGN and FULFILL the management contract with the agency responsible for collection. PREPARE the implementation report and the financial statements of management contracts.

Source: National Water Agency. 2014, p. 23.

As provided for in Law No. 9,433/97, art. 51, the exercise of functions of Water Agencies, while these bodies are not constituted, may be delegated to non-profit organizations, by the National Council of Water Resources or by the State Councils, for a determined period (Pompeu, 2010, p. 350). These organizations are called “Delegatee Entities” and will be discussed in more detail below.

2.1.6 *Delegatee Entities*

Law No. 10.881/04 amended the wording of Art. 51 in the Water Law, establishing a new legal relationship between the National Water Agency (ANA) and civil water resources organizations, listed in Art. 47 of Law No. 9.433/97, which had been meant to act as a Water Agency but did not find the required legal basis for this action in the legal regime existing at that time.

Under the terms of Article 51:

The National Water Resources Council and the State Water Resources Councils may delegate, for a fixed term, duties under the jurisdiction of the Water Agencies to the non-profit organizations listed in Art. 47 of this Law, as long as these organizations are not constituted.

The law establishes the political-administrative procedure so that a civil water resources organization receives delegation, through a resolution, from the National Water Resources Council (CNRH) or the State Water Resources Councils to carry out the responsibilities inherent to the Water Agencies, provided for in Law No. 9,433/97, except for charging for the use of water resources (Granziera, 2015, p. 135). (Granziera, 2015, p. 135). This institutional alternative has been incorporated into the laws of a few Brazilian states, as is the case for Bahia, Minas Gerais (known as “assimilated entities”), Piauí, Rio de Janeiro, and Rondônia.

This model, however, does not exclude the Water Agencies. Law 10.881/2004 establishes that, once a Water Agency is formed, it will assume the responsibilities established by Arts. 41 and 44 of Law No.

9.433/97, and consequently ending the management contract related to its operational area. In this case, the delegatee entity loses this status in the National Water Resources Council, although it may continue to act as a civil water resources organization in the same way that it did before receiving the CNRH delegation.

There must be three characteristics present for an entity to receive a delegation of powers from the National or the State Water Resources Council: 1. be a civil water resources organization; 2. be a non-profit organization; 3. be legally established (Machado, 2018, p. 624).

Law No. 9.433/97, in its Art. 47, set the following entities as civil water resource organizations:

- inter-municipal consortia and associations of river basins;
- regional, local or sectoral associations of water resource users;
- technical, and educational-research organizations with interest in the field of water resources;
- non-governmental organizations for the purpose of advocating the diffuse and collective interests of society;
- other organizations recognized by the National Council or by the State Water Resources Councils.

The categories for civil water resources organizations set forth in the Water Law are generally quite broad and include state specificities, facilitating the coordination between the Union and the states, when required to share these entities for the management of resources under federal and state domain (ANA, 2014, p. 32). Included in this list are private organizations if they are non-profit, who may be constituted as civil associations or foundations under private law.

The Private Law Foundation acquires legal personality with the registration of the public deed of its constitution in the Civil Registry of Legal Entities.

It is an independent organization that is not linked to the public administration and is governed by its bylaws. In general, its organizational structure includes a Board of Directors and a Fiscal Council, in addition to the executive body – the executive board – responsible for carrying out its actions. One example of this model is the River Basin Foundation of the Piracicaba, Capivari and Jundiaí Rivers (PCJ) as the entity delegatee to carry out these functions in the PCJ Basins along with the National Water Agency.

The Non-profit Civil Association, in turn, is a model with a flexible structure. For it to be established, the minutes from the meeting for its

institution and the bylaws need to be registered in the Civil Registry Office. For the organizational structure, the Association must have a General Meeting and, usually, also have a Supervisory Board and an executive board. The “Peixe Vivo” Agency is an example of a civil association that is legally empowered to exercise the functions of the Basin Agency for two state committees in Minas Gerais, CBH Velhas (SF5) and CBH Pará (SF2), as well as the Interstate Committee of the São Francisco, CBHSE, and CBH of the Rio Verde Grande. In Table 5 below, the set of distinctions are pointed out between the Private Law Foundation and the Civil Association.

Table 5: Differences between private law foundations and civil associations in water agency duties.

	Private Law Foundation	Civil association
Purpose	Religious, moral, cultural or support purposes.	Any non-profit activity.
Creation	Deed or testament registered with the Civil Registry Office.	Registration of the statute and the minutes of the meeting for its institution, at the Civil Registry Office.
Organizational structure	Generally includes a Board of Directors, Supervisory Board and Executive Board.	The General Assembly is required, usually includes a Supervisory Board, and an executive board.

Source: National Water Agency, 2014, p. 33.

The delegation of powers to the delegatee entity, regardless of the legal regime, presupposes compliance with the Public Administration's principles, set forth in Article 37 of the Federal Constitution, and in Law No. 9784/99, which regulates the administrative process within the Public Administration. Civil water resources organizations that meet the above requirements may apply for the Water Agency selection procedure, and the Council of Water Resources will establish selection criteria that follow the principles of impersonality, morality, equality, publicity, efficiency, administrative probity, cost-effectiveness, sustainable national development, connection to the convening instrument, competitiveness and objective judgment (Art. 37).

Except for implementing usage fees and actions that require police power, all other attributions may be exercised by the Delegatee Entities. In this case, once all the legal formalities established in articles 42 and 43 of Law 9433/97 have been complied with, the proposed instrument to define the relationship between the public revenue collector (ANA) and the delegatee entity is the fixed-term management contract.

The management contracts will establish the duties, rights, responsibilities, and obligations of the signatory parties (Law No. 10.881/04, Art. 2). While it is an administrative contract, its legal regime differs from the classic model, where the Public Administration supervises every step of the process, taking measurements at each stage or at

each period. Supervision occurs through assessing the compliance with contractually set goals, and not for each activity performed by the delegatee entity (Granziera, 2015, p.135).

The management contract should detail the proposed work program, the goals to be achieved, and the respective deadlines for implementation, as well as the objective evaluation criteria to be used, using performance indicators. The delegatee entity should submit a report to ANA and the respective River Basin Committee(s) at the end of each year on the contract performance, containing a specific comparison of the proposed goals with those that have been met, accompanied by an account of actual expenses and revenues (Granziera, 2015, p.135).

With respect to the control of the management contract, ANA, as the Public Authority responsible for monitoring compliance with the obligations assumed, shall establish an evaluation committee that shall periodically analyze the results achieved with the execution of the management contract, and shall submit a conclusive report on the evaluation carried out, containing a specific comparison of the proposed goals with the results achieved, accompanied by the rendering of accounts corresponding to the financial year, to the entity of the Regional Development Ministry designated to perform the control of the management contracts, and to the respective River Basin Committee(s).

The National Water Agency is also responsible for submitting a copy of the delegatee entity report to the CNRH, with explanations and pertinent conclusions, within a maximum period of 30 days after its receipt. If the ANA becomes aware of any irregularity or illegality in the use of resources or assets of public origin by the delegatee entity, it shall inform the Federal Court of Auditors, under penalty of joint liability of its directors.

Once the breach of the provisions of the management contract is verified, ANA shall promote its rescission, duly preceded by an administrative proceeding, ensuring the right of ample defense, and

the directors of the entity shall be liable, individually and jointly, for damages or losses resulting from its action or omission.

2.1.7 Water Resources State Agencies and Entities

The Brazilian states and the Federal District have the autonomy to establish their own Water Laws and their specific agencies and entities for water management, observing Federal Law No. 9.433/97. These bodies are part of the structure of the National Water Resources Management System (SINGREH) and act in an integrated and articulated manner with the other entities of the System.

They can be structured in a number of different ways, such as autonomous entities (ex. autonomous agency or local authority) and, for the most part, as direct administrations of States (ex. specific departments or agencies from these offices).

Management is accomplished through the issuance of authorization for the use of water resources under the control of the States, as well as through the supervision of water uses. In addition, the management bodies are responsible for planning and promoting actions aimed at preserving the quantity and quality of water.

2.1.8 Civil Water Resources Organizations

The Water Law defines that the legally established Civil Water Resources Organizations are part of the National Water Resources Management System (Art. 48). The following are listed as civil organizations: 1. inter-municipal consortia and associations of river basins; 2. regional, local or sectorial associations of water resources users; 3. technical and teaching-research organizations, with interest in the area of water resources; 4. non-governmental organizations with objectives of defense of diffuse and collective interests of society; 5. other organizations recognized by the National Council or the State Water Resources Councils (art. 47).

As seen, civil water resources organizations can be Delegatee Entities of a River Basin Committee,

performing typical activities of a Water Agency. In order to function as an executive office for River Basin Committees, they must sign a fixed-term management contract with the public collection agency, at the federal level, in the case of ANA.

However, civil water resources organizations perform other functions within SINGREH. The National Water Resources Council is composed, among others, of civil water resources organizations (art. 34, IV), which currently have 6 representatives among the 58 councilors. This representativeness within the CNRH allows diffuse and collective interests to no longer be managed only by public officials and elected party representatives (Machado, 2018, p. 625).

2.2 Water Resources Management Instruments

The contemporary Brazilian state follows a welfare state model. The implementation of its objectives and purposes, in the social, economic and environmental spheres, implies the institution of public policies that should “aim at the achievement of defined objectives, expressing the selection of priorities, the reservation of the necessary means for their achievement and the time interval in which the results are expected to be achieved” (BUCCI, 2006 p. 39).

In the theme of water resources, from the 1990s on, specific norms were instituted, aimed at solving both the demands of the development process and seeking ways to conserve and protect water (Granziera, 2014, p. 113). These provisions, reflected in water resources policies, and seeking to fulfill the established purposes, provided management instruments.

Managing a given river basin involves specific objectives, guidelines, and the application of instruments that are aligned with water policies. The water resources management instruments consist of the means available to the bodies and entities of the National Water Resources Management System

to implement the objectives and guidelines of water policies, in compliance with the fundamentals and principles.

The set of these instruments, duly implemented, marks the differential that must exist between the previous period and the creation of water policies. The effectiveness of applying the instruments, however, depends on the institutional apparatus established in the agencies and entities to meet the demands. Since each instrument specifically addresses a distinct but complementary issue, the protection of water quality and quantity depends essentially on this political-technical-administrative effort.

Political, because the decision to structure the relevant agencies and entities financially and under the aspect of training often stems from the political will. Technical, because those responsible for setting the management instruments in place need to be able to face the challenges posed by the diversity of the Brazilian territory, and have the understanding both of environmental issues and the need for the development of the country. Administrative, because there is a path within the bureaucracy to follow in relation to the various administrative processes related to water resources management.

2.2.1 River Basin Plans

Planning would be the way to reconcile scarce resources with abundant needs, wielding a technical function that demands an effort to forecast, standardize, and program, in addition to implementing actions. That’s what we might call management. Before any plan can be developed, there must be a common agreement on the goals: what uses will be protected, what quality indexes will be used, what commitments must be made between conflicting uses.

Once the goals are known and have been agreed upon, there needs to be a way to achieve them. Hence the need to draw guidelines for the implementation of the plan, seeking feasible strategies agreed between the actors involved, ensuring the

participation of civil society so that the instruments and other proposed actions can be implemented.

The importance of planning actions in the short, medium, or long term is unquestionable. To plan is to prevent, to avoid damage in repairing what went wrong. In environmental matters, and specifically in the case of water, it costs less to prevent than to remedy.

Water resources plans are technical instruments that comprise a specific area. The area it affects can be the national territory, a state or the river basin (whose boundary must be specified in the act of creating the respective committee). In the National Water Resources Policy, it was established, as a legal norm, that the Water Resources Plan is the instrument that comes first, because of its importance (POMPEU, 2006, p. 234).

Watch:

Video 8: Water Resources Plans and the Categorization of Water Bodies

Three issues stand out regarding the plan:

- The Plan is a technical instrument. Much of the Water Resources Plan content has a technical aspect. Technical issues need to be studied, such as water balance, availability versus demands, or water quality. The innovation of water resources policies consists in considering this management instrument not only as a technical document but also as a work that addresses the legal and institutional apparatus, which represent the support for the implementation of the Plan, through the application of strategies proposed and approved by the River Basin Committee.
- The Plan is essentially democratic. Democracy, in the design of the plan, can be translated into discussions about the final product and its approval by the River Basin Committee, in which representatives of various segments interested in water resources participate. Hence the need to mention the principle of participation, according to which administrative decisions are passed from the hands of a single

employee or body of employees to councils, in which the so-called organized civil society or even non-governmental organizations (NGOs) have voice and vote (MACHADO, 2017, P. 131).

- The Plan must be fulfilled. Implementing the plan is a way to guarantee the effectiveness of the entire water resources policy. In this step, the question arises about how to make the plan be complied with, or the legal mechanisms that require compliance with the plans. Pursuant to Law 9.433/1997, Art. 6, the plans are designed to provide a base and guidance on deploying the policy and the management of the water resources. It follows that the plan does not only consist of suggestions for measures but also and above all, must contain the implementation strategies at the institutional level.

Law nº 9.433/1997 does not define the Water Resources Plans of River Basins, providing only that they are “prepared with a view to the long term, with a planning horizon compatible with the period of implementation of their programs and projects,” as provided in art. 7.

CNRH Resolution No. 145/2012, which establishes guidelines for preparing River Basin Water Resources Plans, established a specific concept, providing that it refers to:

“Long-term water resources management instruments provided for in Law No. 9.433 / 1997, with planning horizon compatible with the implementation period of their programs and projects, which aim to inform and guide the implementation of National, State and District Policies of Water Resources, and the management of water resources within the respective river basins”(Article 2).

The provision does not establish a duration period for the plan but establishes a “planning horizon that must be compatible with the amount of time needed to implement the proposed programs and projects” proposed, involving a designation (amounts and sources) of financial resources needed for this implementation.

According to the referred CNRH Resolution, the purpose of the Plans is to provide foundation and

guidance for the implementation of National, State and District Water Resources Policies. Note that the provision regulates river basin plans. When citing that these plans base and guide the water policies, the understanding is that the States, the Federal District, and the Union should take each Water Resources Basin Plan into account when preparing State, District, and National Plans.

In addition, now focusing on the river basin object of the plan, CNRH Resolution no. 145/2012 states that in addition to the water policies, these instruments should also be the basis and guide to the management of water resources. Planning is thus not just limited to a list of actions that are to be taken but contain strategies for these measures, which places this instrument at the heart of issues related to river basin planning and implementation.

The law establishes a minimum content for the plan, which is outlined in more detail in CNRH Resolution No. 145/2012 in Art. 10. According to these regulations:

“River Basin Water Resources Plans should consist of the diagnostic, prognostic, and action-plan stages, including the surface and underground water resources, and establishing short, medium, and long term goals and actions to fulfill them, in accordance with art. 7 of Law No. 9.433/1997.”

The obligation to consider surface and underground water resources in the Plan is not provided for in Law No. 9.433/1997 but is included in its regulation. This understanding expands the content of the Plan, which begins to treat the surface and groundwater in a concatenated manner.

In this line, Resolution CNRH n° 22/2002 states that “the Water Resources Plans must consider the multiple uses of groundwater, the peculiarities of the aquifer’s function, and the aspects of quality and quantity for the promotion of social and environmentally sustainable development.” (CNRH Resolution No. 22/2002, Art. 1).

In addition, the mentioned norm determines that the Water Resources Plans should promote the

characterization of aquifers and define the interrelationships of each of them with the other surface and underground water bodies and with the environment, aiming at the systemic, integrated and participatory management of water (art. 2).

The resolution also imposes, in art. 3, that the Plan must contain “hydrogeological information and data on groundwater necessary for the integrated management of water resources” and, in art. 4, “contemplate the monitoring of the quantity and quality of aquifer resources, with the results duly presented in a map.”

In addition, “potentially impacting actions on groundwater, as well as the protection and mitigation actions to be undertaken, must be diagnosed and foreseen in the Water Resources Plans, including emergency measures to be adopted in cases of contamination and accidental pollution” (art. 5). “The Water Resources Plans should also make explicit the measures for the prevention, protection, conservation, and recovery of aquifers with a view to ensuring the multiple uses and maintenance of their environmental functions” (art. 6).

With regard to the diagnosis of the current water resources situation, mentioned in art. 7, I, of Law n° 9.433/1997, Resolution CNRH n° 145/2012 provides for the development of the following theme (art. 11):

- characterization of the river basin considering physical, biotic, socioeconomic, political and cultural aspects;
- characterization of water infrastructure;
- evaluation of environmental sanitation;
- a quantitative and qualitative evaluation of surface and underground waters;
- evaluation of the current scenarios of water use and associated water demands;
- the balance between the assessed availability and demand for water;
- characterization and evaluation of the qualitative and quantitative monitoring network of water resources;

- identification of areas subject to use restrictions in order to protect water resources;

Law No. 9,433/1997 mentions “proposals for the creation of areas subject to use restriction, with the aim of protecting water resources”. In CNRH Resolution no. 145/2012, this theme is now included as “identification” of these areas in the diagnosis. As will be seen below, it is understood that the proposals for areas subject to use restrictions would be contained in “recommendations for the user sectors, government, and civil society.” The other provisions of Resolution CNRH No. 145/2012, on the Diagnosis stage, will be indicated below.

- Evaluation of the institutional and legal framework of water resources management, the implementation stage of the water resources policy, especially the management instruments;

The evaluation of the institutional and legal framework related to management implies not only a survey of the norms, in order to verify what is in force, but also the stage of implementation of management instruments. Only based on this information can the implementation and improvement of management instruments be planned, in addition to the strategies to be applied to ensure the effectiveness of the proposed actions.

- Identification of policies, plans, programs and sectoral projects that interfere with water resources;

Along these lines, it is important to be aware of all policies, plans, programs and projects. But they should be addressed in the Water Resources Plan only where they have an effective impact on water management.

- characterization of relevant actors for water resources management and identified conflicts;

The characterization of the actors involved in the management of water resources, public or private, gives rise to the knowledge of all those who, in some

way, have a leading role within the river basin, identifying the interests and conflicts involved and the political coordination established (or not).

The purpose of this whole apparatus is to provide a basis for the exercise of governance in the Water Resources Plan, considering the need to discuss the issues that will be included in this technical document with political connotation.

In relation to the prognosis, Resolution BNRC 145/2012 establishes that at this stage of the Plan, future scenarios should be proposed that are compatible with the planning horizon. They should cover at least the following aspects (art. 12)::

- the analysis of patterns of demographic and economic growth and of policies, plans, programs and sectoral projects related to water resources;

Law No. 9.433/1997 mentions, in item II of its article 7, “the analysis of alternatives for demographic growth, the evolution of productive activities and changes in land use patterns,” which implies that, in the preparation of the Plan, the content of both provisions - law and regulation - must be considered.

- The proposal of a biased scenario, with the premise of the permanence of the prevailing demographic, economic and political conditions, and of alternative scenarios;
- evaluation of the water demands and availability of the formulated scenarios;
- the balance between water availability and demand with identification of potential conflicts in the scenarios;

Law nº 9.433/1997 establishes, in item III of art. 7, the “balance between availability and future demands of water resources, in quantity and quality, with identification of potential conflicts”. In other words, the demands should include qualitative and quantitative aspects, in addition to what is mentioned in Resolution CNRH no. 145/2012.

- evaluation of water quality conditions in the formulated scenarios, detecting potential conflicts;

- the needs and alternatives for prevention or mitigation of the critical situations identified;
- definition of the reference scenario for which the Water Resources Plan will guide its actions;

The third stage of the River Basin Water Resources Plan consists of the Action Plan (art. 13), which aims to mitigate, minimize, and anticipate problems related to surface and groundwater resources, in order to promote multiple uses and integrated management. At a minimum, it should contain the following:

- definition of plan's goals;

The Law n° 9.433/1997, in item IV of its art. 7 specifies the goals that should be included in the Plan such as: rationalization of use, increase of quantity and improvement of the quality of the available water resources. In this case, the regulation of the law cannot extrapolate its content, which means that there is a specific definition of which goals should be included in the plan. In addition, the CNRH Resolution states that the following elements should be included in the Action Plan:

- actions or interventions required, organized into components, programs and subprograms, with justification, objectives, executor, investments, possible sources of resources, implementation deadline;
- Priorities and investment schedule;
- Guidelines for management tools;
- an institutional arrangement or institutional recommendations for improving water resources management and for implementing the required actions;

With regard to the institutional arrangement, it is important to remember that the management instruments are implemented within public administrations, through administrative processes. This is the case, for example, with the granting of the right to use water resources and the charging for the use of water resources. The implementation of these instruments and others depends on organized institutions with trained technicians.

The Water Resources Plan is a technical document capable of explaining, in a systematic way, the institutional difficulties and what is necessary for the agencies and entities to fulfill their legal attributions, including those related to implementing the management instruments.

- operational recommendations for the implementation of the plan;

The recommendations indicated in item VI above deal with the technical issues of the Plan that are necessary for its implementation. Law no. 9.433/1997, in item V of art. 7, mentions “measures to be taken, programs to be developed and projects to be implemented, to meet the goals set, which corresponds to the recommendations set out in the regulation.

- Indicators that allow evaluating the level of implementation of the proposed actions;
- recommendations for the user sectors, government, and civil society.

The expression “recommendations for the user sectors, government, and civil society” represents a wide range of possibilities. Specific themes cited in art. 7 of Law n° 9.433/1997, as: 1. priorities for granting rights of use of water resources; 2. guidelines and criteria for charging for the use of water resources; and 3. proposals for the creation of areas subject to use restriction, with a view to protecting water resources, would be contained in this provision.

Under the terms of art. 4, XVIII of Law no. 9.984/2000, the National Water Agency is responsible for participating in the preparation of the National Water Resources Plan and supervising its implementation. Under the terms of Law No. 9.433/1997, art. 35, IX, it is the responsibility of the National Water Resources Council to monitor the implementation and approve the National Water Resources Plan and determine the necessary measures to meet its goals. The first National Water Resources Plan was approved by way of CNRH Resolution No. 58/2006.

The State Water Resources Plans should be prepared in accordance with state standards and approved by the respective Water Resources Councils.

The River Basin Plans are the responsibility of the Water Agencies or Delegatee Entities, and in their absence, the competent governmental bodies and entities to proceed with the management of water resources. The River Basin Committees, under the terms of Law No. 9,433/1997, art. 38, are responsible for “approving the Basin Water Resources Plan” (item III) and “monitoring its implementation, suggesting the necessary measures to meet its goals” (item IV).

The implementation of the Plan, however, is not limited to these bodies and entities, to the extent that the proposed actions may be within the scope of the competencies of other sectors, such as health, housing, planning, the environment, basic sanitation, and others. Thus, the implementation of the proposed actions requires an intersectoral articulation based on governance.

The Water Resources Plan, especially that of the River Basin, is the basic axis for the management and implementation of the other instruments. Its preparation depends on the information already gathered in the implementation processes of the other instruments, such as the Information System and the granting of the right of use of water resources. In the preparation of the plan and its revisions, these data are validated, corrected and, when problems or lack of implementation of other instruments are detected, the plan should guide the actions to be developed with the objective of seeking, in fixed planning horizons, the implementation of all the instruments provided for in water policies.

On the other hand, the Plan plays a guiding role for other instruments. Regarding the classification of water bodies, CNRH Resolution no. 91/2008 expressly provides, in article 3, that “the proposal for the classification should be developed in accordance with the Water Resources Plan of the river basin, preferably during its preparation”.

2.2.2 Granting of Right of Use of Water Resources

Rivers and other water bodies are public goods of common use (Civil Code, Law n° 10.406/2002, art. 99, I), which means, from the point of view of the domain, that they belong to legal entities of public law - Union (CF/88, art. 20, I) and States (CF/88, art. 26, I) and to the Federal District, which is equivalent to the States. In this sense, any person can make use of the water, provided that they observe the administrative rules in force. For private use, for the benefit of someone, who subtracts the possibility of using the resource by other people, the administrative rules in force require an authorization from the Public Power - granting of the right of use of water resources. Through this instrument, the Government, based on current norms and technical studies, grants the interested party the right of using the water, setting the appropriate conditions and the respective limits.

Watch:

Video 9: *Granting of Right of Use of Water Resources.*

The granting of the right of use of water resources, an instrument of the Water Resources Policies, constitutes the administrative act that expresses the terms and conditions by which the Public Authority allows the use of water resources for a determined period, and it is the responsibility of the National Water Agency (ANA) to authorize the use in water bodies controlled by the Union and the agencies and entities of States, in water bodies under state control.

It is worth mentioning that the priorities for granting the right of use of water resources are part of the minimum content of the River Basin Plans (art. 7, VIII), to be approved by the River Basin Committees.

The granting of the right of use of water resources, introduced in Brazilian law by the Water Code (Decree no. 24.643/34, art. 43), is required for uses that alter the quality, quantity or regime of water. In terms of the Law n° 9.433/1997, art. 12, the following

rights of use of water resources are subject to the granting by the Public Authority:

- derivation or catchment of a portion of the existing water in a water body for final consumption, including public supply, or input to the production process;
- extraction of water from underground aquifers for final consumption or production process input;
- discharge of sewage and other liquid or gaseous waste into the water body, treated or not, for dilution, transportation or final disposal;
- usage of hydroelectric potential;
- other uses that alter the regime, quantity, or quality of existing water in a water body;

Initially, the primary objective of the grants was the need to control the quantities derived from and discharged to rivers and lakes, which, together with the natural flows, characterizes the calculation of the water balance. It was necessary to know and control the river flows in order to calculate the hydraulic potential of each fall, in order to obtain greater guarantees in the exploitation of hydraulic potentials. (GRANZIERA, 2014). The granting, thus, was an instrument of control of the quantity of water, even because the generation of electric power does not demand quality. Over time, with the enactment of the National Water Resources Policy and the state policies that are appropriate to environmental standards, the nature of the grants has changed.

In this sense, the grant is considered an instrument of *quantitative and qualitative control of water uses* (Law no. 9.433/1997, Art. 11). *Quantitative* because it controls the volume drawn and released into a water body. *Qualitative* because the authorities grant the discharge concession only when the quality of the effluents to be discharged is compatible with the classification of the receiving body in the given stretch. This new rule is in line with the general guidelines for action for the implementation of the National Water Resources Policy, highlighting the

integration of water resources management with environmental management (art. 3, III).

In fact, as a way to integrate environmental policies in Brazil, Law No. 9,433/1997 extended the function of grants, in addition to controlling quantities, to qualitative control. In this line, the discharge of effluents for dilution will be conditioned not only to the carrying capacity of the receiving body, defined by CONAMA Resolution 430/2011 as the *maximum value of a certain pollutant that the water body can receive, without compromising the quality of the water and its uses determined by the group of classification (art. 4, I)*. (Art. 4, I). It is also necessary to verify the class in which the water body is grouped.

This rule is associated with the environmental licensing process, in which the licensing body or entity will only grant a license if the discharges are in accordance with the class of the water body.

Under the terms of CONAMA Resolution 430/2011, *the effluents may not provide the receiving body with quality characteristics not in accordance with the progressive, intermediate, and final mandatory goals of its classification, and the mandatory goals for receiving bodies will be established by specific parameters*. In case the parameters are not included in the mandatory targets and in the absence of progressive intermediate targets, the quality standards to be obeyed in the receiving body are those that appear in the class in which the receiving body is classified (art. 5). This rule reinforces the binding criterion of the categorization for the granting of effluent discharge permits.

The grant is linked to the following objectives of the National Water Resources Policy:

1. ensure that current and future generations have the necessary availability of water in quality standards appropriate to their respective uses;
2. promote the rational and integrated use of water resources, with a view to sustainable development;
3. prevent and defend against critical hydrological events of natural origin or due to the inappropriate use of natural resources.

The objectives listed above are perfectly in line with the basis of the grants, considering that this is the basic instrument to control the use of water resources, precisely with the objective of ensuring availability to future generations in quality and quantity and avoiding critical hydrological events, especially the scarcity caused by excessive use.

On the other hand, rational use is much more a means than an objective. It is up to the entity responsible for granting the right of use of water, for demanding from the user the rational and integrated use of water resources, ensuring sustainability.

In the administrative decision on the grants, water use priorities should also be considered as a reference when established in the River Basin Plan, duly approved by the respective Committee.

2.2.2.1 Flow Reference Rate

With regard to catchments, the *reference flow*, defined in CONAMA Resolution no. 357/2005, art. 4, XXXVI, as “the flow of the water body used as a basis for the management process, taking into account the multiple uses of water and the necessary articulation of the instances of the National Environmental System (SISNAMA) and the National Water Resources Management System (SINGREH)” should be observed.

The expression “multiple uses” can be understood as a balanced use of water among the various types of uses: sanitation, industry, navigation, electric power generation, irrigation, fishing and aquaculture, recreation and tourism, and flood control. The idea is to ensure that various uses are considered instead of a priority use, thus avoiding conflict within the river basins. Based on the principle of equitable use of natural resources, and the principles of Law No. 9.433/1997 provided in Article 1, IV, multiple use is one of the foundations of the National Water Resources Policy.

It is important to verify the meaning of the expression “*necessary articulation of the instances of the National System of Environment - SISNAMA and*

the National Water Resources Management System (SINGREH)”, the object of CONAMA Resolution n° 357/05. According to Law n° 6.938/1981, art. 6, the organs and entities of the various spheres of the Public Authority responsible for the protection and improvement of environmental quality constitute the National Environment System (SISNAMA). In terms of water, we are talking about the improvement, maintenance, and recovery of the quality of this resource.

The Law n° 9.433/1997 created the National Water Resources Management System, with emphasis on the following objectives (art. 32):

- coordinate the integrated management of waters;
- implement the National Water Resources Policy;
- plan, regulate and control the use, preservation, and recovery of water.

The Water Law deals mainly with the legal basis for the organization of water uses, in order to guarantee the access of users to the resource, in a balanced way and with minimum conflicts, which refers to the quantity. Although the granting of the right of use of water resources is an instrument of quantitative and qualitative control of water, this second function refers to environmental legislation, which is CONAMA Resolution 357/05.

There are, therefore, two rules affecting the waters: the first with a focus on quality (CONAMA Resolution No. 357/2005) and the second with focus on quantity (Law No. 9.433/1997). The two are necessarily complementary, which means that when guaranteeing multiple uses (quantity) the quality of water bodies must also be guaranteed, not only for the uses granted but for the essential ecological processes that develop in the aquatic environment or that depend on it.

The reference values are set to make the environmental dimension compatible with the management of water use. By setting these values, a technical

parameter is established to guarantee the flow, such as Q7, 10" (Minimum average of 7 consecutive days and 10 years of return period) or Q95 (Permanence flow for 95% of the time), or Q90 (Permanence flow for 90% of the time).

These values are the technical basis for:

- the granting of the right of use of water resources;
- guarantee multiple uses;
- protecting water bodies, preventing the volumes granted from compromising the conditions necessary for the maintenance of terrestrial and aquatic ecosystems (GRANZIERA, 2013).

Although the focus of the reference flows is the water balance, the quality of the receiving body must be considered. This issue is neuralgic since it is the responsibility of the water resources management body to ensure the quantitative and qualitative control of water uses, as mentioned above.

For more information on the grant and reference flows, watch:

Video lesson 2:

Granting of water resources and the flow reference rates by Prof. Marco Antônio Palermo.

Errata: In the box "Criteria for granting the QP% (which is presented at 21'11)": where it reads "ANA - 70% of Q95, read ANA 100% of Q95. The same correction applies to the narrator's speech at 21'14".

2.2.2.2 Insignificant uses

The term "insignificant derivations" was used in the 1934 Water Code, at a time when water flows in the country were more than sufficient to meet the needs of the population.

Although the law establishes that private uses of water may be granted, there is an exemption from this obligation, which extends to charging for the use of water, for the following uses (Law No. 9.433/1997, art. 12, §1):

I - the use of water resources to satisfy the needs of small population nuclei distributed in rural areas;

II - the derivations, abstractions, and discharges considered irrelevant;

III - the accumulations of water volumes considered insignificant.

The single paragraph of article 5 of CNRH Resolution no. 16/2001 establishes that the specific criteria of water flows or accumulations considered insignificant will be established in the water resources plans, duly approved by the corresponding River Basin Committees or, in their absence, by the granting authority.

The theme is detailed in CNRH Resolution no. 184/2016, which establishes guidelines and general criteria for the definition of the derivations and abstractions of surface and underground water resources, and discharge of effluents into water bodies, and accumulations of small volumes of water, considered insignificant.

It is important to point out that, although there is the possibility of exemption of the grants and, consequently, also of charging for the use of water (Resolution CNRH No. 184/2016, art. 12), this exemption does not dispense with either the control or the need to register the uses.

Thus, the granting authority must consider in the water balance the sum of the uses granted and the uses that are independent of the granting, in order to control the percentage of the commitment of the water body. The derivations, abstractions, discharge of effluents or accumulations of water volumes, of little expression, considered insignificant, shall be registered with the granting authority, for purposes of regularization of the use of water resources.

In addition, the set of data and information of the registered uses shall compose the database of users of water resources of the respective granting authority. The rules related to the inspection of the use of water resources apply to the derivations,

abstractions, discharges of effluents or accumulations of small volumes of water, considered insignificant.

The CNRH Resolution no. 184/2016 establishes, in its article 2, that:

the specific criteria for derivations, abstractions, discharge of effluents or accumulations of small volumes of water, considered insignificant, will be established in the respective water resources plan, proposed by the River Basin Committees and approved by the State Councils or National Water Resources Council, respecting the domains.

The Brazilian geographic, economic, and population diversity should be considered in this definition and, therefore, art. 3 of the resolution states that:

For the establishment of specific criteria for derivations, abstractions, discharge of effluents or accumulations of volumes of water of minor importance, considered insignificant, the hydrological characteristics of the basins or hydrographic regions, the hydrogeological characteristics of the aquifers contemplated, and the characteristics of the existing demands should be observed.

The decision on the establishment of specific criteria for derivations, abstractions, effluent discharges or accumulations of small volumes of water, considered insignificant, is of a discretionary nature, and the granting authority may adopt the following criteria (art. 4):

- I - percentage of the volumetric reference of a certain portion of aquifer as individual limit of capture;
- II - percentage of the reference flow of a given surface water body as an individual limit of abstraction or derivation;
- III - percentage of volume or of the reference flow as individual limit for dilution of pollutant load launched into the surface water body;
- IV - individual limit for the accumulation of water volumes;
- V - percentage limit of quantitative collective commitment of aquifer portions;
- VI - percentage limit of quantitative and qualitative collective impairment of surface water body.

This list is not exhaustive. The standard admits that, in hydrographic basins, surface or underground water bodies, stretches or portions of them considered critical regarding water demand or availability, in their quantitative and qualitative aspects, new specific criteria can be defined for derivations, abstractions, effluents discharges or accumulations of small volumes of water, considered insignificant.

Although the manager may opt for the criteria mentioned above, the standard imposes a restriction related to the establishment of the percentage limit of quantitative collective commitment of portions of aquifers or surface water bodies. In these cases, the cumulative effect, in the same water body, of all the derivations, abstractions, launchings or accumulations of volumes of water of little expression, considered insignificant, should be considered, and the granting authority may, upon confirming an eventual commitment, review or inform the River Basin Committee about the need to review the specific criteria (article 4, §§ 1 and 2).

Another restriction imposed by the standard is the prohibition of the characterization as insignificant of flows or volumes intended for the dilution of loads of phosphorus or nitrogen contained in effluents discharged into a reservoir, lake, or stretch of a watercourse that are in the process of eutrophication or became eutrophic (Art. 5).

With regard to the jurisdictions involved in relation to insignificant uses, Law No. 9,433/1997 establishes in its article 38, V, that the River Basin Committees, within their area of operation, are responsible for proposing to the National Council and the State Water Resources Councils the accumulations, derivations, abstractions, and discharges of minor relevance, for purposes of exemption from mandatory grant of the right of use of water resources, according to their domains.

An adjacent issue, but which is relevant, consists of the following: considering that the existing quantities of water in the country always remain

the same, regardless of population growth and the demands of anthropic activities, and are committed to great pollution, it is no longer possible to accept the terminology “insignificant”. There is no longer any use that is insignificant. Water issues are becoming increasingly important in the face of tragedies that occur due to lack of access to water, and it is necessary to establish concepts that clearly indicate the importance of this resource.

As this expression was used to dispense with the granting of the right of use of water resources, it would be appropriate to review the legislation to adopt, for example, the expression uses dispensed with the granting of the right, ruling out the idea of insignificance.

2.2.3 Charging for the use of water resources

The waters, as public goods of common use, have as one of their attributes, that of inalienability (Law n° 9.433/97, art. 18). No one, by any means whatsoever, may appropriate the waters, since the law only grants the right to use them by means of a concession, the legal instrument of which, under the law in force, is authorization. And the payment for the use of water does not imply the creation of a right to this resource (Granziera, 2014, p. 193).

Watch:

Video 10: *Charging for the Use of Water.*

Production: ANA.

The charge for the use of water resources is one of the instruments of the National Water Resources Policy, foreseen in the Law of the Waters (Law n° 9.422/97, art. 5, IV). The objectives of the collection institution are as follows:

- recognize water as an economic good and give the user an indication of its real value;
- encourage the rationalization of water use; and, also,

- obtain financial resources for the financing of programs and interventions included in water resources plans (art. 19).

Besides the objectives contemplated in the Water Law, the National Water Resources Council (CNRH) issued the Resolution n° 48, of 21-3-2005, that establishes general criteria for the collection for the use of the water resources, adding two more objectives for the collection, related to environmental issues (art. 2):

- stimulate investment in de-pollution, reuse, protection, and conservation, as well as the use of clean technologies that save water resources, in accordance with the classification of water bodies into classes of predominant use; and
- induce and stimulate conservation, integrated management, protection and recovery of water resources, with emphasis on flood zones, and recharge of aquifers, springs and riparian forests, through compensation and incentives to users.

The amounts collected with the charges for the use of water resources have the nature of public revenue, more specifically of public price. This is because the payment is for the exploitation of public goods that consist of private use of water, to the detriment of the others.

Its nature is business and is developed through a system of proposals and approvals, under the Water Resources Management System (Granziera, 2015, p. 295).

Public prices are the revenues charged by the State mainly in view of the interest of private individuals in the activity performed by the government, but also taking into account, although secondarily, the existence of a general and collective public interest in this activity. This is also a matter of the State's performance of typically private activities; however, the existence of a secondary public interest justifies that the State reserves the exclusivity of its exercise, eliminating competition through the legal monopoly. (Sousa, 1982, p. 36-38).

It is important to distinguish the amounts paid to public service providers of basic sanitation from the collection for the use of water resources. Amounts are paid to correspond to the remuneration for the provision of services, which include the collection of water from water bodies, the treatment, supply and distribution of potable water, as well as the collection and disposal of sewage, including the respective treatment and the final disposal of effluents and sludge. The invoice received is for the provision of sanitation services and has nothing to do with charging for water use, an instrument of water resources policy (Granziera, 2014, p. 193). It is worth mentioning that basic sanitation services, as water users, pay values related to the volumes collected from water bodies and the discharge of effluents.

Charging is an economic instrument in two directions: the first, with respect to the understanding of water as an asset of economic value, the use of which should be charged, which should serve to change the behavior before this resource. The second is related to the financing of activities foreseen in the water resources plan. (Granziera, 2014, p. 196). The nature of the collection, in this aspect, is hybrid, since it is not a voluntary act on the part of each user. It is the River Basin Committee that decides, at first, on the application of the collection, values, and mechanisms, and the respective Water Resources Council is responsible for their ratification, in accordance with the current standard – Union or States. Upon approval, charging becomes mandatory.

In addition to economic, charging is also an instrument of control, to the extent that it consists of a public price, imposed on water users, in values proposed by the River Basin Committees and approved by the National Water Resources Council in relation to the Union domain, and it is up to each State, as has already been said, to define the system of charging for water under state domain (Granziera, 2015, p. 295).

There will be charges for the uses of water resources subject to grant (Law No. 9.433, art. 20 and Reso-

lution CNRH No. 48/2005, art. 4). That is, they are subject to the granting and, therefore, to collection:

- derivation or catchment of a portion of the existing water in a water body, for final consumption, including public supply, or input to a production process;
- water extraction from underground aquifers for final consumption or production process input;
- discharge of sewage and other liquid or gaseous residues into the water body, treated or not, with the purpose of their dilution, transport or final disposal; 4. use of hydroelectric potentials;
- other uses that alter the regime, quantity, or quality of existing water in a water body (art. 12).

The cases in which the granting is not required, automatically indicate the non-enforceability of the collection (Law n° 9.433/97, art. 12, § 1). This does not mean that there is an exemption from collection, but rather that the grant is the taxable event for collection and that its unenforceability, suspension or revocation prevent the collection for the use of water resources.

In setting the amounts to be charged for the use of water resources, these items must be observed:

- in the derivations, abstractions, and extractions of water, the volume withdrawn and its regime of variation; and
- in the discharge of sewage and other liquid or gaseous waste, the volume released and its variation regime and the physical-chemical, biological and toxicity characteristics of the affluent (Law No. 9.433/97, art. 21).

The institution of collection for the use of water resources is conditioned to compliance with the following steps (Resolution CNRH No. 48/2005, art. 6):

- the proposal of the accumulations, derivations, captures and discharges considered insignificant by the respective River Basin Committee, and its approval by the respective Water Resources Council;

- The process of regularization of the use of water resources subject to granting in the respective basin, including the registration of users of the river basin;
- the investment program defined in the respective Water Resources Plan duly approved;
- Approval by the competent Water Resources Council of the technically substantiated collection proposal submitted by the respective River Basin Committee;
- the implementation of the respective River Basin Agency or the entity delegating the exercise of its functions.

As for the jurisdictions to institute and carry out collections at the federal level, it is the responsibility of the National Water Agency to implement the collection for the use of water resources under the Union's control, in coordination with the River Basin Committees, as well as to collect, distribute and apply revenues earned through the collection (Law 9,984/00, art. 4, VIII and IX). The Water Agencies, through delegation from the grantor, are responsible for charging for the use of water resources (Law nº 9.433/97, art. 44, III).

The granting power for a Water Agency to perform the collection for the use of water resources consists of the holder of the domain of the resource, that is, the Union or the States, which shall delegate to the Agency, or to the entity that is exercising this function, through the management contract, the administrative capacity to perform the collection, when this entity is public in nature. Where this is not the case, charge collection is made on behalf of the entity responsible for water management. The rules for this delegation of power should be regulated (Granziera, 2014, p. 197).

The amounts related to collection are proposed by the Water Agency to the River Basin Committees (Law No. 9.433/97, art. 44, XI, b), and it is up to them to suggest to the National Water Resources Council the amounts to be collected (art. 38, VI). The Natio-

nal Water Resources Council establishes general criteria for collection by means of a resolution (art. 35, X) and approves the amounts (44, XI, b).

The amounts collected in a given basin or sub-basin will be in the National Treasury Single Account, but "at the disposal of ANA." This means that the ANA is responsible for the handling of these resources, not the Ministry of Regional Development or Economy (Machado, 2018, p. 584).

The amounts collected by charging for the use of water will be applied primarily in the river basin in which they were generated (Law No. 9.433/97, art. 22), reinforcing the idea of adopting the river basin as a planning and management unit. In other words, at least 92.5% of the collection resources should be allocated to studies, programs, projects, and works contained in the Water Resources Plans.

The law mentions, in its article 22, that the resources of the collection will be applied, in priority, in the river basin in which they were generated. The term "priority," however, does not link the necessary transfer of values to the basin concerned, which caused legal uncertainty for paying users, compromising the implementation of the National Water Resources Policy.

Item III of art. 19, when dealing with the financing of programs and interventions contained in the water resources plans, establishes a link between the collection, the financial resources collected and their application to the activities foreseen in the water resources plan. Considering that it is the responsibility of the River Basin Committees to approve the Basin Water Resources Plan and suggest the values to be collected, and that it is the responsibility of the Water Agencies to present the proposal to the respective River Basin Committee(s) of the plan of application of the resources collected with the collection for the use of water resources, it is understood that the application of the collection values should occur in the very basin in which the collection took place.

However, the law does not guarantee this application in the river basin, since it only states that priority will be given to it. To get around this pending issue, it was necessary to ensure that the amounts collected returned to the river basin in which they were collected, creating means to transform the revenue into expenditure (Granziera, 2015, p. 295).

The first question referred to the guarantee that the resources resulting from the collection, even if allocated to the National Treasury, (1) could not be contingent and (2) were preserved, even in financial years after the collection. These doubts were resolved with the enactment of the Tax Liability Law - Supplementary Law No. 101 of May 4, 2000 - which establishes that funds legally linked to a specific purpose shall be used exclusively to meet the object of their connection, even if in a year other than that in which they were entered. However, Complementary Law 101/00 provides that the law must expressly establish the commitment of funds, indicating their destination. Therefore, this stage in the process of granting legal certainty with respect to the collection funds was not yet completed.

Law 9984/00 determined that the revenues from the collection for the use of water resources controlled by the Federal Government will be kept at the disposal of ANA, in the National Single Treasury Account, as long as they are not allocated to the respective programs. However, establishing that the revenues arising from the collection for the use of water resources under the Federal Government's control would remain at the disposal of ANA until their destination in the respective schedules was not a guarantee that these resources would be preserved after the financial year in which they were generated or prevented any contingency.

It was not fully indicated that the resources would be specifically allocated to the projects, programs, or works subject to an application plan, previously approved by the River Basin Committee, along with the water resources plan and the plan for applying the collection amounts. There was no

specific purpose or link indicated in the Law, which meant that in the legislation then in effect, there was no guarantee that the financial resources obtained through the collection would be preserved or in figurative language, stamped.

It was necessary to establish, in a new law, such an obligation. If there was a provision that expressly required the allocation of resources obtained from the collection for the use of water resources to the studies, plans, programs, and works contained in the application plans, the Fiscal Responsibility Law would ensure the automatic transfer, of a binding nature – and not the transfer, which is of a discretionary nature – of financial resources from the National Treasury to the River Basin's Water Agency (GRANZIERA, 2015, p. 298).

After all, the implementation plans are part of the water resources plans, duly approved by the respective river basin committee. In addition, it was necessary to implement an institutional control mechanism for the transfer of resources from the National Treasury to a bank account in the name of the Water Agency.

The Water Agency should sign a management contract or equivalent instrument with the ANA, in which a series of obligations were to be fulfilled. The National Water Agency would monitor and control compliance with the conditions of the management contract and would be responsible for authorizing the transfers.

It is worth recalling that the transfer is automatic. The purpose is guaranteed. But it would depend on an authorization from the controlling entity of this account – the National Water Agency –, based on compliance with the management contract or other commitment that would be signed between the Water Agency and the National Water Agency (ANA), so that the Water Agency could receive the resources. All these issues were raised when the collection was implemented in the Paraíba do Sul river basin, in a pioneering experience, already consolidated.

As Law No. 9.433/97 establishes in its General and Transitory Provisions, the “consortia and inter-municipal river basin associations may receive a delegation, for a specified period, from the National Water Resources Council or the State Water Resources Councils to perform the duties of the Water Agencies, as long as these organizations are not constituted”, an institutional model was formulated that seeks to resolve (1) the problems raised by the term primarily mentioned in art. 22; (2) the risk of the contingency of the amounts collected and (3) their permanence from one financial year to another.

Law No. 10.881/04 provided solutions to these obstacles, conferring consistency to the financial flow of fees charged for the use of water resources, and ensuring “to the delegatee entity the ANA transfers generated from the fee revenues for the uses of water resources in rivers under the Union’s domain, collected in the respective river basin(s)” (GRANZIERA, 2015, pp. 299-300).

In addition, there is express mention in Art. 4, § 3, that the provisions of § 2 of Art. 9 in Complementary Law No. 101 of 2000, which states that “the expenses that represent a constitutional and legal obligations by the entity, including those intended to pay the debt service, and those excepted by the Budgetary Guidelines Law, shall not be subject to any limitation” (GRANZIERA, 2015, p.300).

The 1st § of Art. 4 in Law 10.881/04 expressly assures the ANA transfers to the Delegatee Entity from the revenues raised from fees charged for a diversion or catchment, discharge of sewage and waste and other uses that alter the regime, quantity or quality of water resources. As a result of the law, the amounts derived from the collection are free of contingency and are linked to the application in the river basin where they were generated.

2.2.4 *Categorization of watercourses (surface and groundwaters)*

The classification of water bodies is a management tool that is directly related to the quality

of waters. Its purpose is to establish the technical parameters and administrative measures aimed at achieving an improvement in quality, either for the entire water bodies or stretches of them.

Under the terms of art. 9 of Law nº 9.433/1997, the classification of water bodies into classes, according to the prevailing uses of water, aims:

- ensure that the water is of the highest quality for the most demanding uses for which it is intended;
- reduce the costs of combating water pollution through constant preventive actions.

The classification refers to the health safety from the point of view of the achievement and maintenance of quality improvement. In these lines, water quality is a variable associated with the most demanding uses: the better the quality, the greater the availability (quantity) of the resource, including for uses that are contrary to pollution and contamination, as is the case with human supply, vegetable crop irrigation and maintaining aquatic communities. Considering the water crises that Brazil has faced in recent years, this issue is highly important.

In addition, the principle of prevention is included in the classification of water bodies, not just from the perspective of food safety, but also as an economic factor. Achieving the quality targets will generate savings for water supply service providers, insofar as they will pay less for water treatment for consumption purposes. In addition, the rates of occurrence of waterborne diseases tend to decrease, exonerating the Unified Health System. However, depending on the situation of water bodies, it is necessary to invest in depollution in order to achieve quality targets. Hence the affirmation that environmental law is intrinsically related to the economy.

From the purposes established in the law, the classification presupposes the use of another instrument, provided for in the National Environmental Policy, instituted by Law no. 6.938/1981, which are the “standards of environmental quality.” The term “standard” refers to the “level or degree of quality of

an element (substance or product), which is proper or appropriate for a particular purpose (Moreira, 1990). In terms of water quality, the standards may refer to:

- Quality and other conditions of effluents (Emission Standards) to be discharged into water bodies or public sewage systems. Ex: amount of toxic substances per liter, temperature, turbidity.
- The quality level of a receiving water body (Predominant use class), according to the requirements of intended uses. For example, water intended for human consumption must be in such a condition that it does not endanger health.

Domestic (and industrial) liquid effluents must meet the Emission Standards (*end of the pipe*) and simultaneously not compromise the classification of the receiving water bodies, i.e., must meet the quality standards.

In Brazilian law, non-compliance with the standards characterizes, among other situations, the occurrence of pollution, as established in art. 3, III, of Law 6.938/1981. Consequently, the polluter is subject to civil, administrative, and criminal liability, as stipulated in 6th of Art. 225 of the CF/88.

An important point related to the purpose of the classification (and standards) refers to environmental licensing, another instrument used in environmental policy, provided for in Art. 10 of Law No. 6.938/1981, as amended by Complementary Law No. 140/2011:

The construction, installation, expansion, and operation of establishments and activities that use environmental resources, effectively or potentially polluting or that are capable, in any way, of causing environmental degradation will depend on previous environmental licensing.

In order for a development to be licensed, the discharges (effluents) resulting from the activity under review must be appropriate both to the Emission Standards and to the class established in the classification of the receiving body, as will be seen.

It should be noted that the concept of “setting water quality objectives” predates the water resources policies that were established in the 1990s. Long before this, Ordinance No. 13/1976 of the Ministry of Interior and State Standards, at the time proceeded the classification of water bodies.

However, there was no legal provision associated with the frameworks contained in these norms regarding how to achieve the established quality levels. Nor have there been, over time, any relevant initiatives aimed at making these classifications effective.

This lack of political decision regarding the adoption of measures that would guarantee, in fact, water quality is part of the picture of water pollution experienced in the country, including with regard to the commitment of the quantities of water available for the supply of populations.

Under the terms of Ordinance No. 13 and other state acts, the water bodies, under the strictly legal point of view, are classified, considering that those not expressly mentioned were automatically categorized as Class 2. CONAMA Resolution No. 357/2005, in art. 42, similarly affirms. In other words, while the classifications are not approved, fresh water will be considered Class 2, which refers to the assertion that all surface water bodies in the country are classified in a particular category of predominant use, but this use does not have any factual relationship with the measures needed to reach the true quality that is equivalent to the established classes of use.

In most cases, the real situation of rivers and lakes does not correspond to legally defined quality standards, since the effectiveness of the classification of a water body requires a series of actions in order to achieve, in a concrete way, the established quality goals, configuring a complex and conflicting process.

In this scenario, it is important to remember that the classification impacts other critical issues, such as the use and occupation of land, a matter of municipal jurisdiction, pursuant to Article 30, VIII,

of the Federal Constitution. Hence the need for a wide-ranging discussion on the intended quality goals. This theme touches on the great challenge that the country faces in implementing water resources management instruments.

Legal Basis

Considering that the classification refers to water quality, its relevance for the protection of public health and the environment is undeniable. It can, therefore, be affirmed that the right to an ecologically balanced environment, as set out in art. 225 of the Constitution, is the basis for the effective implementation of the classification that is still in its infancy in Brazil.

The Law nº 9.433/1997 establishes, in Art. 5, II, the classification of the water bodies in categories, according to the preponderant uses of the water as one of the instruments of the National Water Resources Policy. Given that the focus of this instrument is the quality of water, the law stipulates in art. 10 that the classes of water bodies shall be established by environmental legislation. In this case, the resolutions from the National Environmental Council (CONAMA), a collegiate body in the National Environmental System (SISNAMA).

Some of CONAMA's attributions, under article 8 of Law nº 6.938/1981 include establishing norms, criteria, and standards related to the control and maintenance of the quality of the environment, with a view to the rational use of environmental resources, especially water resources (item VII).

In other words, the intersection between environmental management and the management of water resources is in the classification of water bodies. Given this interrelationship, the classification involves agencies and entities responsible for environmental and water resources control and management.

According to CONAMA Resolution No. 357/2005 in its Art. 2, XX, the classification is the “establishment of the goal or objective for water quality (Class) that

needs to be achieved or maintained in a portion of a water body, according to the intended predominant uses over time.” This goal or objective is reflected in the setting of a certain standard of water quality, specifically for a water body or a stretch of it.

Note that, according to item XXIV of Art. 2 in the above-mentioned provision, the term “goals” involves the establishment of the objective in physical projects and management activities, according to mandatory pre-established units of measurement and schedule. The mandatory nature related to the goals binds the action of the bodies and entities involved in the classification.

If CONAMA has regulated water quality standards, the Resolution by the National Water Resources Council (CNRH) No. 91/2008 establishes general procedures for classifying surface and underground water bodies, now in an integrated way between the decision on the levels required for the water quality of each body or stretch of water, and the measures for implementing this classification.

Article 2 of Resolution CNRH No. 91/2008 sets forth that the classification of water bodies corresponds to the “establishment of quality objectives to be achieved through intermediate and final progressive water quality goals, using the following as basic references: 1. the river basin as a management unit and 2. the most restrictive predominant uses.”

The classification is associated with the grouping of water bodies in classes of predominant use. The classification does not refer to a specific water body. The classification is to establish general standards of quality for water bodies that receive effluents, to be applied through a governance process to a body or stretch of water, including the latter in the same grouping.

CONAMA Resolution No. 357/2005 outlines the classification for water bodies and environmental guidelines for their classification and, in its art. 2, IX, defines the quality class as “the set of conditions and standards for water quality needed to meet the prevailing current or future uses.”

The classification of a water body can maintain the current quality or define the quality that needs to be achieved over time by setting the mandatory targets to be reached. As such, a schedule needs to be implemented that points out the sources that will finance the measures required to reach the goals, in addition to monitoring and inspection by the Public Authority.

The purpose of CONAMA Resolution 357/2005 is fresh waters (with a salinity equal to or less than 0.5‰), saline waters (waters with salinity equal to or greater than 30‰) and brackish waters (salinity greater than 0.5‰ and less than 30‰).

The provision classifies fresh water in Special, Class 1, Class 2, Class 3 and Class 4, each of which is intended for predominant uses, at decreasing levels, from the Special Class, as follows (Art.4):

special class: waters intended:

- to supply for human consumption, with cleansing;
- to preserve the natural balance of aquatic communities; and,
- to preserve aquatic in fully protected environmental units.

class 1: water that can be allocated:

- to supply for human consumption, after basic treatment;
- to protect aquatic communities;
- to recreational activities such as swimming, water skiing, and diving, according to CONAMA Resolution No. 274/2000;
- for irrigating vegetables that are eaten raw and fruits that develop close to the ground and are eaten raw without removing the skin; and
- to protect aquatic communities in indigenous territories.

class 2: waters that can be allocated:

- to supply for human consumption, after conventional treatment;

- protect aquatic communities;
- to recreational activities such as swimming, water skiing, and diving, according to CONAMA Resolution No. 274/2000;
- for irrigating vegetables, fruit trees and parks, gardens, sports and leisure fields that the public might have direct contact with; and
- to aquaculture and fishing activity.

class 3: waters that can be allocated:

- to supply for human consumption, after conventional or advanced treatment;
- for irrigating tree crops, cereals and feed crops;
- for amateur fishing;
- to secondary contact recreation; and
- Watering of animals.

class 4: waters that can be allocated:

- to navigation; and
- to maintaining a balanced landscape.

Saline waters are classified as follows (Art.5°):

special class: allocated waters:

- the preservation of aquatic environments in integral protection conservation units; and
- preservation of the natural balance of aquatic communities.

class 1: waters that can be allocated:

- to primary contact recreation, according to CONAMA Resolution n° 274/2000;
- the protection of aquatic communities; and
- aquaculture and fishing activities.

class 2: waters that can be allocated:

- a) for amateur fishing;
- b) to secondary contact recreation.

class 3: waters that can be allocated:

- a) navigation; and
- b) landscape harmony.

Article 6 establishes the following classification for brackish waters:

special class: allocated waters:

- the preservation of aquatic environments in integral protection conservation units; and,
- to preserve the natural balance of aquatic communities.

class 1: waters that can be allocated:

- to recreational activities according to CONAMA Resolution No. 274/2000;
- to protect aquatic communities;
- aquaculture and fishing activities;
- supply for human consumption after conventional or advanced treatment; and
- irrigation of vegetables that are consumed raw, and of fruits that develop close to the ground and that are eaten raw without removing the film, and irrigation of parks, gardens, sports, and leisure fields, with which the public may have direct contact.

class 2: waters that can be allocated:

- for amateur fishing; and
 - to secondary contact recreation.
- class 3: waters that can be allocated:
- to navigation; and
 - to maintain a balanced landscape.

CONAMA Resolution No. 396/2008 provides for the classification and environmental guidelines for categorization, prevention and control of groundwater pollution by establishing the following classification (Art. 3.):

- Special Class: water from aquifers, set of aquifers or a portion of them intended for the preservation of ecosystems in integral protection conservation units and those that directly contribute to the stretches of surface water bodies classified as a special class;
- Class 1: water from aquifers, set of aquifers or portion thereof, without alteration of its quality by anthropic activities, and which do not require treatment for any preponderant

uses due to their natural hydrogeochemical characteristics;

- Class 2: water from aquifers, set of aquifers or portion thereof, without alteration of its quality by anthropic activities, and which may require appropriate treatment, depending on the predominant use, due to their natural hydrogeochemical characteristics;
- Class 3: water from aquifers, set of aquifers or portion thereof, with alteration of its quality by anthropic activities, for which treatment is not necessary due to these alterations, but which may require adequate treatment, depending on the predominant use, due to their natural hydrogeochemical characteristics;
- Class 4: water from aquifers, set of aquifers or portion thereof, with alteration of its quality by anthropic activities, and that can only be used, without treatment, for the less restrictive predominant use; and
- Class 5: water from aquifers, set of aquifers or part of them, which may be with alteration of its quality by anthropic activities, destined to activities that do not have quality requirements for use.

The decision about the classification of a water body consists of an administrative act that in turn results from a governance process that goes beyond the figure of the river basin committee, to the extent that the legislation provides for the holding of public hearings.

But the implementation of the classification for water bodies is a continuous process that involves a number of agencies and management entities for water resources and the environment.

The Legal Regime, Implementation and Jurisdictions

The proposed classification, under the terms of the legislation in force, is a formal process, which should make it possible to achieve or maintain the

conditions and quality standards, determined by the classes in which the water body is classified.

This process, which is being carried out within the scope of the Water Resources Management System, results from an extensive discussion in the preparation of the proposal for a classification, which will have significant participation by the river basin community through public consultations, technical meetings, workshops, and others.

Note that art. 3, § 2, which deals with the matter, not only mentions members of the river basin committee but provides for “broad participation of the river basin community, through public consultations, technical meetings, workshops, and others.”

In this governance process, the participation of municipalities is essential because of their constitutional authority to classify land use and occupation, which is impacted according to the categorization of water bodies, as there may be restrictions to the use of the land.

With regard, therefore, to the classification proposals, CNRH Resolution No. 91/2008 cites that surface and underground waters should be considered in an integrated and associated way. Furthermore, the provision establishes that the proposed classification should be developed in accordance with the Water Resources Plan of the river basin, preferably during its preparation. The following steps should be established as part of the process: 1. diagnosis; 2. prognosis; 3. proposed targets for classification alternatives; and 4. program for implementation.

The diagnosis, in accordance with Resolution No. 91/2008 CNRH, art. 4, should address:

- general characterization of the river basin and the use and occupation of soil, including the identification of surface and underground water bodies and their hydraulic interconnections on a compatible scale;
- identification and location of uses and interferences that alter the system, quantity or quality

of existing water in a water body, highlighting the predominant uses;

- Identification, location, and quantification of loads of current point and diffuse sources of pollution originating from household and industrial effluents, agricultural and livestock activities and other sources that cause degradation of surface and underground water resources;
- availability, demand and quality conditions of surface water and the potential and natural quality of underground water;
- mapping of vulnerable areas susceptible to risks and effects of pollution, contamination, overexploitation, water scarcity, conflicts of use, floods, erosion, and subsidence, among others;
- identification of areas regulated by specific legislation;
- relevant legal and institutional framework;
- existing local and regional policies, plans and programs, especially sectoral, socioeconomic development, multi-annual government plans, municipal and environmental directors, and ecological, economic, industrial and agricultural zoning;
- socioeconomic characteristics of the river basin;
- capacity to invest in water resources management actions.

In the prognosis (CNRH Resolution 91/2008, art. 5), the impacts on surface and underground water resources resulting from the implementation of the plans and development programs should be evaluated, considering the regional reality with short, medium and long term horizons, and projections should be formulated based on simulation studies of the following items:

- potentiality, availability, and demand for water;
- polluting loads from urban, industrial, agricultural, livestock and other sources that cause alteration, degradation or contami-

nation of surface and underground water resources;

- quantity and quality conditions of water bodies; and
- alleged uses of surface and underground water resources, considering the specific characteristics of each basin.

Both the diagnosis and prognosis and the proposal of alternatives are technical documents to be prepared in the context of the water resources plans of the river basins. Their elaboration is the responsibility of the water agencies, the river basin agencies or the delegates, provided for in Law No. 10.118/2004. In the absence of these institutions, these duties are preformed by the agencies that manage water resources. Once the document is prepared, it is submitted to the respective River Basin Committee for discussion and approval and, from then on, submitted to the National or State Water Resources Council for deliberation.

Once the council has ratified the proposal for the framework, begins the challenge to execute the actions related to the program for the implementation of the framework, consisting of 1. management actions and execution deadlines; 2. investment plans; 3. commitment instruments.

According to the Federal Public Prosecutor's Office, this is a true "Strategic Action Plan and Articulator of the Basin for the Improvement of Water Quality." Considering the specificities of the Basin, through guidelines and terms of commitments with a mandatory schedule, different multi-sectoral and multilevel strategic plans and measures are articulated for the achievement or maintenance of water quality goals, including Municipal Plans for Basic Sanitation, Master Plans, Drainage Plans, Payment Programs for Environmental Services, Specific Plans and Programs for the Springs, Civil Defense Plans, among others (MPF, 2018).

According to CNRH Resolution No. 91/2008, the *program to implement the classification* as an expres-

sion of objectives and goals linked to the corresponding river basin plan should contain proposals for *management actions* and their lead times, investment plans and the instruments of compromise that include five recommendation types (Art. 7):

Firstly, the recommendations for the water and environment management agencies that can support the implementation, integration or adaptation of their respective management instruments according to established goals, especially granting of the right of use of water resources, and environmental licensing.

A key point, on which the success of the *program to implement the classification* depends, is the implementation of institutional articulation mechanisms between the agencies and entities who manage water resources, in an effort to reach the intermediate and final goals. Without coordinated action involving environmental licensing and granting of the right of use of water resources, the continuity of the process is impaired.

Secondly, the recommendations for educational, preventive and corrective actions, social mobilization and management, identifying the costs and the main sources of financing. Two issues arise here: 1. the need to articulate the entities that manage water resources and the environment with the other agencies and entities to promote education and social mobilization on water quality and 2. obtaining resources to ensure the sustainability of the programs.

Thirdly, the recommendations to the public and private agents involved, to enable the achievement of the goals and formalization mechanisms, indicating the attributions and commitments to be undertaken. Once again, it is a matter of articulating the bodies and entities involved with water resources and the environment, this time with the entrepreneurs.

Fourthly, the proposals to be presented to the federal, state and municipal public authorities for

the adaptation of their respective plans, programs, and development projects and plans for the use and occupation of the soil to the goals established in the classification proposal. It will be the responsibility of the entities that manage water resources and the environment, in addition to preparing the proposals, to establish a broad institutional articulation that can result in an agreement on the achievement of the goals set in the classification, not only in preparing the plans, but going beyond, in their joint implementation.

Fifth, the technical subsidies and recommendations for the action of the river basin committees, which participate in a part of the process related to the proposals for the classification of water bodies.

In the classification implementation process, in addition to the articulation that involves the actors, especially management bodies and entities, it is still necessary to implement or continue the implementation of other water resources management instruments, such as the granting of the right of use of water resources, and the charge for water use.

The classification involves technical, institutional, financial, and management aspects. The classification proposal is part of the Water Resources Plan for the River Basin. Law No. 9.433/1997, aiming at establishing the minimum content for the plans, expressly mentions the targets for [...] improving the quality of available water resources and the measures to be taken, programs to be developed, and projects to be implemented, to meet the planned targets (Art. 7, IV and V). In other words, the legal expectation of what to do already exists at the national level.

According to the Federal Public Ministry (2018, p. 25),

By defining common objectives for all actors involved, water quality targets can be compared to true 'gears' of water management. A robust and efficient preparation and implementation, combined with an Implementation Program that adheres to good governance practices, optimize and gather all other public and private management instruments, including environmental licensing,

granting of water resources, charging, implementation of ISO standards in companies, *compliances* in public and private management and Information System, Water Resources Plans, Sanitation Plans, Water Safety Plans, Master Plans, Specific Water Resources Programs, Civil Defense Plans, Zoning and environmental recovery and preservation areas, along with physical achievements in pollution control", as is the case, for example, in the construction of Sewage Treatment Stations (ETE).

2.2.5 Water Resources Information System

The National Water Resources Information System (SNIRH) is one of the management tools provided for in the National Water Resources Policy, Law 9.433/97 (Art. 5, VI). It is a national system for collecting, treating, storing and retrieving information on water resources, as well as intervening factors for their management (art. 25).

The SNIRH, together with Hidroweb (database with all the information collected by the Hydrometeorological Network) and the Telemetry system (real-time hydrological data collected by the stations known as Data Collection Platforms - PCDs, transmitted by the Brazilian SCD and CBERS satellites), is one of the means of making data available from the National Hydrometeorological Network, including more than 4 thousand stations, which monitor the volume of rainfall, the level and flow of rivers, the amount of sediment, the evaporation and water quality. The National Water Agency (ANA) is responsible for coordinating these activities.

Watch:

Video 11: *The National Hydrometeorological Network.*

Production: ANA

The SNIRH was implemented with the objective of gathering, ensuring consistency and disseminating data and information on the qualitative and quantitative situation of water resources in Brazil; permanently updating information on the availability and demand of water resources throughout

the national territory; and providing subsidies for the preparation of Water Resources Plans (art. 27).

The SINRH's basic operational principles are:

- decentralization of data and information collection and production;
- system unified coordination;
- access to data and information assured to all society (Art. 26).

The data available are intended for the entities in the National Water Resources Management System, as well as for users of water resources, the scientific community, and society as in general.

As provided for in Law 9.433/97, Art. 44, VI and Law No. 9.984/00, Art. 4th, XIV, it is the National Water Agency's responsibility to organize, implement, and manage the National Water Resources Information System at the federal level. In addition to the National System, in the implementation of the National Water Resources Policy, it is the responsibility of the States and Federal District Executive Authorities, in their sphere of competence, to implement and manage the Water Resources Information System (art. 30, III). Water Agencies are also responsible for managing the Information System in their area of activity (art. 44, VI).

Accordingly, all agencies and entities that are part of SINGREH should provide the data generated so that it can be incorporated into the National Water Resources Information System (Art. 25, sole paragraph), including users of water resources.

The information available from the SNIRH is currently divided into the following themes:

Hydrographic Division: division of basins, surface water bodies, and dominion;

Water quantity: precipitation, water availability, quantitative monitoring, and reservoirs;

Water quality: quality indicators and qualitative monitoring;

Water Uses: Total consumptive demand, urban supply, irrigation and hydroelectricity;

Water balance: critical basins and stretches, quantitative balance, qualitative balance and qualitative-quantitative balance;

Critical hydrological events: critical events and situation rooms;

Institutional: Basin committees and agencies;

Planning: water resources plans and classification of water bodies;

Regulation and supervision: surveillance, granting and charging; and

Programs: Water Producer, Prodes and Progestão.

The SNIRH is also composed of a set of computer systems, grouped into: 1. Systems for management and analysis and hydrological data; 2. Systems for regulating the use of water resources; 3. Systems for managing and planning water resources.

Finally, as part of the National Water Resources Information System, the National Water Resources Council, through Resolution 58/2006, assigned responsibility to ANA for the systematic and periodic preparation of the Report on the Situation of Water Resources in Brazil. The document provides key support for assessing the degree of implementation of the National Water Resources Plan (PNRH) and the National Water Resources Policy, as well as for guiding the revisions and updates for this Plan.

The first edition of the Annual Situation Report was published in 2009.

Find the 2017 report online and take a look at the data and structure of this document, which provides an overview of water management in Brazil.

Situation Report 2017

ONLINE

Table 6: Relationship between SINGREH bodies and instruments from the Water Resources Policy

	Basin Water Resources Plan	Classification	Granting of Rights of Use	Charging for use	Water Resources Information System
River Basin Committee	Approves and monitors the implementation.	Selects alternative.	Establishes usage priorities and approves proposed non-grantable uses.	Proposes mechanisms and values, and defines an application plan for the funds collected.	-
Regulator/Grantor	In the absence of the water agency, drafts, submits for committee approval and executes.	Proposes alternatives, and supports the implementation of the approved proposal, in the absence of the water agency.	Grants usage rights in accordance with the guidelines of the plan, and the classification, supervising compliance with the grant.	Prepares studies for the decision by the councils, collects and applies the funds, with power to transfer them to the water agency.	Implements and manages state and national systems.
Water Agency	Drafts, submits for committee approval, and executes.	Proposes alternatives, and supports the implementation of the approved proposal.	Prepares studies for defining usage rules, and for non-grantable uses.	Proposes values and mechanisms, collects, applies, and manages the funds.	Implements and manages the basin system.
Water Resources Councils	Regulating general guidelines.	Approves alternative.	Regulates general guidelines and non-grantable approvals for use.	Approves.	-

Source: National Water Agency, 2014, p. 24.

2.3 Success stories

2.3.1 The Case of the São Francisco River Basin

The São Francisco Hydrographic Region has an area of approximately 638,466 kilometers ² (7.5% of the country), covering seven Brazilian states: Bahia, Minas Gerais, Pernambuco, Alagoas, Sergipe, Goiás and the Federal District. The São Francisco River starts in Minas Gerais, in Serra da Canastra, and reaches its mouth in the Atlantic

Ocean, between Alagoas and Sergipe, covering about 2,800 km (ANA, 2015).

This Hydrographic Region is divided into four hydrographic units: High São Francisco, Middle São Francisco, Sub-middle São Francisco, and Low São Francisco. The principle rivers in the region are the São Francisco (2,637 km), das Velhas (689 km), Grande (502 km), Verde Grande (458 km), Paracatu (448 km), Urucuia (381 km), Paramirim (345 km), Pajeú (333 km), Preto (315 km) and the Jacaré (297 km).

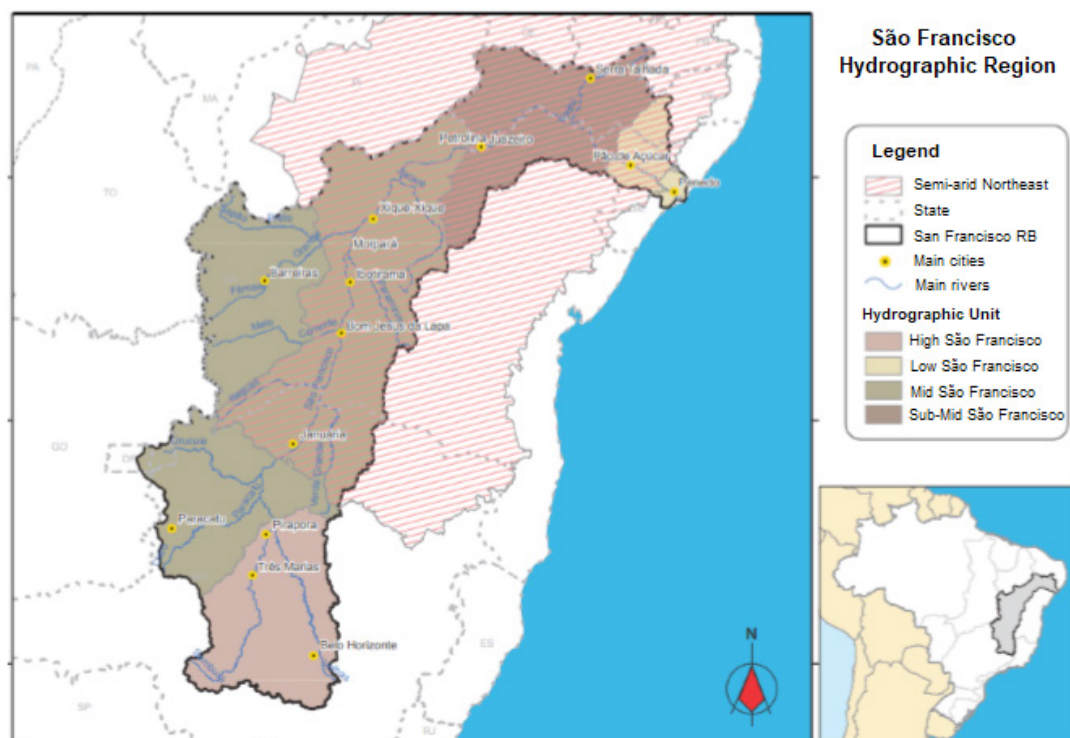


Figure 8: San Francisco Hydrographic Region

Source: ANA, 2015.

The São Francisco River Basin Committee (CBHSF) was established through a Presidential Decree, dated June 5, 2001. It was a major breakthrough for water resources management, especially due to the size and complexity of the basin. The Law No. 9.433/97, which established the National Water Resources Management System and, consequently, the River Basin Committee model, came into effect on January 8, 1997, and the creation of the CBHSF was approved by the Brazilian President in 2001.

According to Law No. 9.433/97, the CBHSF is a collegiate body with normative, deliberative, and advisory duties, within the respective river basin, linked to the National Water Resources Council, pursuant to CNRH Resolution No. 5/2000.

TCBHSF is composed of representatives of public authorities, civil society, and water-user companies. It currently has 62 full members, among which users account for 38.7% of the total number

of members, the public power (federal, state and municipal) represents 32.2%, civil society holds 25.8% and traditional communities 3.3%.

Under the Internal Rules of the CBHSF, the collegiate body is responsible to:

- promote discussion on issues related to water resources and to coordinate the activities of those entities involved;
- mediate, in the first administrative instance, disputes related to water resources;
- approve the Water Resources Plan for the basin;
- monitor the implementation of the basin's Water Resources Plan, and suggest the necessary measures to meet its goals;
- proposing to the National Council and to the State Water Resources Councils which accumulations, diversions, catchments, and releases are relatively small to effect an exemption from the obligation of granting rights for using water resources, according to their domains;

- to set mechanisms in place for charging fees to use water resources and to suggest the amounts to be charged;
- to establish criteria and promote the distribution of cost for projects involving multiple use, common or collective interest.

Through the CBHSF deliberation no. 3/2003, the CBHSF established the guidelines for the elaboration of the Decennial Water Resources Plan of the São Francisco River Basin (2004-2013). The Water Resources Plan was approved through the CBHSF Resolution 7/2004 and published by ANA in 2005.

By ANA Resolutions 267/10 and 327/10, the users were requested (Notice of General Meeting No. 2/2010) to register or amend their registered data. Users who have not registered are considered illegal, and are subject to the penalties provided for in Law 9.433/97.

From that point, the entity initiated studies on charging fees for water resources and the alternatives of institutional models of the future Basin Agency. After processes involving public consultations, workshops, and meetings with the actors having an interest in the river basin, a Delegatee Entity was chosen, and the amounts and mechanisms for charging were approved. The Delegatee Entity that received a delegation from the CNRH to act as the Single Agency of the Basin was the public association “Peixe Vivo,” a private legal entity created in 2006, that already played a leading role in state basins, acting as a Delegated Entity in the State of Minas Gerais.

On June 30, 2010, the management contract (Contract No. 14/10) was signed with ANA, within the scope set forth by Law 10.881/2004, so that the Peixe Vivo Agency could perform the CBHSF Basin Agency functions. Currently, the Peixe Vivo Agency is legally empowered to exercise the functions of the Basin Agency for two state committees in Minas Gerais, CBH Velhas (SF5), and CBH Pará (SF2), as well as the Interstate Committee of the São Francisco, CBHSF and CBH, of the Rio Verde Grande.

Among the functions performed by the Agência Peixe Vivo in CBHSF, we highlight:

- Acting as the executive secretariat of the Committees;
- Assist the Basin Committees in the decision-making process, and management of the River Basin, evaluating projects and works based on technical reports, signing agreements, and contracting financing and services for the execution of their attributions;
- Maintain updated socio-environmental data on the river basin, particularly information related to the availability of water resources in its operational area, and records of water resources use and users;
- Assist in the implementation of water resource management instruments in its operational area, such as the charging of fees for water usage, a master plan, an information system, and water bodies.

At the same time as the management contract was signed, the São Francisco River Basin Committee implemented water use charging and was the third committee to implement water charging in rivers under Union domain, after the Paraíba do Sul River Basin and the Piracicaba, Capivari and Jundiaí Basins. The water use charging system was established after the consolidation of a pact between public authorities, user sectors, and public organizations represented in the CBHSF context, to improve the quantity and quality of water in the basin.

The current collection mechanisms and values are established in CBHSF Decision No. 40/08, approved by CNRH Resolution No. 108/10. The charges apply to water catchment and consumption, and the discharge of effluents by users subject to Grants of the Right of Use of Water Resources, with water abstraction higher than 4.0 l/s. Table 7 presents a summary of the amounts charged.

Table 7: Amounts charged to users with grants for water catchments and consumption, and effluent discharge.

Type of Use	Unit	Amount	
		2017	2018
Raw Water Catchment	R\$/m ²	0.01	0.0103
Raw Water Consumption	R\$/m ³	0.02	0.0205
Release of effluents	R\$/m ³	0.07	0.0719

Source: National Water Agency. Available at: <<http://www3.ana.gov.br/portal/ANA/gestao-da-agua/cobranca/saofrancisco>>.
Accessed on: Oct. 30th, 2018.

The amounts collected by ANA are fully passed on to the Peixe Vivo River Basins Management Support Executive Association – Peixe Vivo Agency (Contract n° 14/10). The Peixe Vivo Agency is responsible for disbursing funds for the activities outlined in the basin's Water Resources Plan, and following the guidelines established in the application plan, both approved by the CBHSF.

In 2014 the CBHSF entered into a discussion process to update the Plan, which resulted in the Water Resources Plan of the São Francisco River Basin, for the 2016-2025 period. The Plan is in line with the Water Law and the CNRH Resolution No. 145/2012, which establishes guidelines for drafting the Water Resources Plans for River Basins.

The Water Resources Plan of the São Francisco River Basin for the 2016-2025 period is available at:

ONLINE

2.3.2 The case of the Piracicaba, Capivari, and Jundiaí River Basins

The area covered by the Piracicaba, Capivari, and Jundiaí River Basins (PCJ) comprises a spatial cut-off defined as the basin boundary, with an area of 15,377.81 km², of which 92.45% in the State of São Paulo (SP) and 7.55% in the State of Minas Gerais (MG). In hydrographic terms, there are seven main sub-basins, five belonging to Piracicaba (Piracicaba, Corumbataí, Jaguari, Camanducaia, and Atibaia), besides Capivari and Jundiaí (PCJ Basin Agency, 2018, p. 9).

Within the PCJ Basins are rivers under the domain of the Union and the states of São Paulo and Minas Gerais. The building of governance between the three Brazilian states can be considered a success story, as the management of water resources is done in a decentralized, participative, and integrated manner.

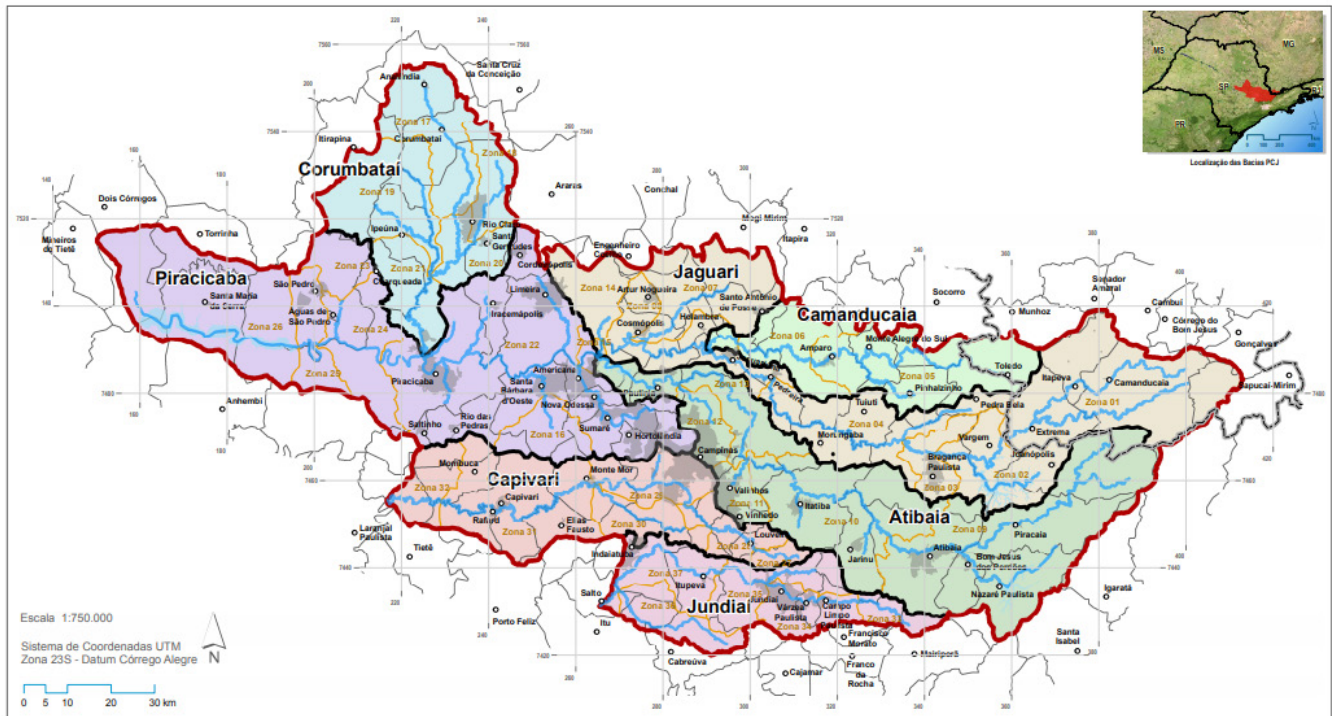


Figure 9: Map of the PCJ Basins.

Source: PCJ Basins Agency Available at:

< http://www.agenciapcj.org.br/docs/plano-bacias-2010-2020/PCJ_PB-2010-2020_Mapa-02.pdf>.

Accessed on: Oct. 30th, 2018.

Before the promulgation of the Water Law, Law nº 9.433/97, 12 municipalities of the PCJ Basins created, in 1989, the embryo of this governance – the Intermunicipal Consortium of the Piracicaba and Capivari River Basins. Initially composed only of municipalities, the entity currently comprises 39 municipal governments, and 33 public and private companies, water users from various segments: supply for the public, industrial, agricultural, hydro-electric, and entertainment.

The PCJ Consortium focuses on the planning, promotion, and development of actions in the areas of environment, sanitation, and water resources. It aims to promote the protection, preservation, and conservation of the environment, and sustainable development, with the recovery of the quality and quantity of the waters of the rivers in the region, besides seeking to guarantee the multiple uses of water. The Consortium

has consolidated a water resources management system and has expanded to other agencies and entities in the basin.

With the enactment of State Law no. 7.663/91, before the issuance of the Water Law, the Piracicaba, Capivari, and Jundiá Rivers Hydrographic Basins Committee (UGRHI 5) was instituted on November 18, 1993, as the first basin committee in the State of São Paulo, starting the consolidation of water resources management.

Nearly ten years after the creation of the CBH-PCJ, the Piracicaba, Capivari, and Jundiá River Federal Basins Committee (Federal PCJ Committee) was established through a Presidential Decree on May 20, 2002, now in the implementation stage of Law No. 9.433 of January 8, 1997. In Minas Gerais, the Piracicaba and Jaguari River Basin Committee was created under the State Law No. 13.1999, of Minas Gerais, of January 29, 1999.

For the PCJ Basin, which has the domain of federal and state rivers from the States of São Paulo and Minas Gerais, three committees were created for compliance with the National Water Resources Policy, and the Water Resources State Policy for the States of São Paulo and Minas Gerais. Consequently, three jurisdictional instances of collection coexist, however, with efforts at joint deliberations on their criteria and plans for the management and application of funds.

In 2008, the PCJ Basin Committees consolidated the coordination that was designed, through the Joint Deliberation of the PCJ Committees, no. 098/2008, of 06/27/2008, which approved the integration of water resources management in the PCJ Basins. This resolution standardized the name for the PCJ COMMITTEES, although each has a specific composition.

Between 2005 and 2010, the Piracicaba and Capivari River Basins Intermunicipal Consortium performed the duties of a Water Agency, as a delegatee entity, appointed by the PCJ Committees, having been delegated by the CNRH to perform the work.

After this period, the PCJ Basin Agency Foundation (PCJ Agency), created and installed based on Laws No. 7,663/1991 and No. 10.020/1998 of São Paulo, has been acting since 2009 as the executive arm of the PCJ Committee of São Paulo. Also, it is the Delegate Entity at the federal level (Resolution CNRH No. 111/2010), has signed a management contract as Delegate Entity, replacing the Intermunicipal Consortium of the PCJ Basins, given the appointment of the PCJ Committees (PCJ Committees Resolution No. 033/2009). To date, the PCJ Basin Foundation has not received a delegation, from the State Council for Water Resources of Minas Gerais, to act as Delegated Entity in that state.

Under the mining legislation, due to its legal nature, of a Private Law Foundation cannot receive

the equivalence of the functions of the Basin Agency. Thus, the PCJ Basins Agency has been working in collaboration with the Mining Institute of Water Management (IGAM) in the work of the executive secretariat of CBH-PJ.

The PCJ Agency is responsible for:

- conducting studies on the waters in the PCJ Basins, in conjunction with agencies from the Union, states, and municipalities;
- participating in the management of water resources, along with other agencies from the PCJ Basins;
- Advise on the compatibility of the project, service or action, with the Basin Plan;
- applying financial resources on a non-refundable basis or through loans, within the criteria established by the PCJ COMMITTEES;
- providing technical, legal, and financial analysis of investments requests, according to the priorities and criteria established by the PCJ COMMITTEES;
- providing subsidies to the PCJ COMMITTEES for them to decide on the fees to be charged for the use of water, and other pertinent matters of interest to the PCJ COMMITTEES;
- managing the FEHIDRO sub-account, related to the PCJ Basins funds;
- to charge for the use of PCJ Basins water resources, as established by law;
- managing the funds generated from the fees charged for the use of waters in the PCJ Basins, and others defined by law, according to current legislation;
- preparing the PCJ Basins Plan, in conjunction with Union, State, and Municipal agencies, with the periodicity established in the legislation, submitting it for analysis and approval by the PCJ COMMITTEES;

- preparing annual reports on the “Status of the PCJ Basins’ Water Resources,” and submitting them to the National and State Water Resources Councils, after approval by the PCJ COMMITTEES;
- providing the administrative, technical, and financial support needed for PCJ COMMITTEES to function; and
- signing any conventions, contracts, and agreements to receive aid, contributions or subsidies from legal entities governed by public or private law;
- performing other duties assigned to it by the PCJ COMMITTEES provided that they are

compatible with their purpose, and are accompanied by proof of the need for funding.

As for charging for the right of use of water resources, each state established equivalent amounts to the fullest extent possible, according to the types of use. Types of use charged include water catchment, water consumption, and the discharge of effluents, from holders of Grants for the Right of Use of Water Resources, and Grant Exemptions. Existing mechanisms and charge amounts are established in Resolutions of the PCJ Committees, as seen in the tables below.

Table 8: Charging for the use of water resources under the domain of the State of São Paulo

CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE STATE OF SÃO PAULO – SÃO PAULO STATE COLLECTION (In effect since 1/1/2016)		
Types of Uses	Unit	Basic Unit Prices (PUBs)
Catchment, Extraction and Derivation	R\$/m ³	0.0127
Raw Water Consumption	R\$/m ³	0.0255
Discharge of organic loads (DBO5,20)	R\$/Kg	0.1274

Source: PCJ Basins Agency Available at: <<http://www.agencia.baciaspcj.org.br/novo/instrumentos-de-gestao/cobranca-pelo-uso-da-agua>>. Accessed on: Nov. 12, 2018.

Table 9: Charging for the use of water resources under the domain of the Union

CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE UNION– FEDERAL FEES			
Types of Uses	Unit	Values of Basic Unit Prices (PUBs)	
		(Valid until 12/31/2017)	(Comes into effect in 2018)
Catchment, Extraction and Diversion	R\$/m ³	0.0127	0.0130
Raw Water Consumption	R\$/m ³	0.0255	0.0262
Release of organic loads (DBO5,20)	R\$/Kg	0.1274	0.1308
Basin transposition	R\$/m ³	0.0191	0.0196

Source: PCJ Basins Agency Available at: <<http://www.agencia.baciaspcj.org.br/novo/instrumentos-de-gestao/cobranca-pelo-uso-da-agua>>. Accessed on: Nov. 12, 2018.

Table 10: Charging for the use of water resources under the domain of the State of Minas Gerais

CHARGING FOR THE USE OF WATER RESOURCES UNDER THE DOMAIN OF THE STATE OF MINAS GERAIS – MINAS GERAIS STATE COLLECTION (In effect since 1/1/2010)		
Types of Uses	Unit	Values of Basic Unit Prices (PUBs)
Raw surface water catchment	R\$/m ³	0.01
Raw underground water catchment	R\$/m ³	0.0115
Raw Water Consumption	R\$/m ³	0.02
Release of organic loads (DBO5,20)	R\$/Kg	0.10
Basin transposition	R\$/m ³	0.015

Source: PCJ Basins Agency Available at: <<http://www.agencia.baciaspcj.org.br/novo/instrumentos-de-gestao/cobranca-pelo-uso-da-agua>>. Accessed on: Nov. 12, 2018.

The PCJ Basin Agency, exercising the functions of a Basin Agency, collects and manages the financial resources under the São Paulo State Collection, applies the funds from the Federal, and São Paulo State Collection in activities outlined in the Water Resources Plan of the Basin, according to the guidelines established in the application plan, both approved by the PCJ Committees.

The National Water Agency (ANA) is responsible for collecting and transferring the full amounts collected from fees charged, under the domain of the Union, to the PCJ Basins Agency, as determined by Law 10.881/04.

For more information about the practice of water governance in the PCJ basin, watch:

Video Testimonial 3 –
Governance of fresh water
in the PCJ Basin –
Part 1 Eduardo Cuoco Léo

Video Testimonial 4 –
Governance of fresh water i
n the PCJ Basin –
Part 2 Sérgio Razera

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THE LEGAL TREATMENT OF GROUNDWATERS IN BRAZILIAN LAW





3. THE LEGAL TREATMENT OF GROUNDWATERS IN BRAZILIAN LAW

As in other parts of the world, groundwater was not the priority of law and water management in Brazil. The indifference with aquifer management is cited in literature as “hydroschizophrenia” (Jarvis et al, 2005), since groundwaters are the primary reserve of water available to humans, corresponding to 30.1% of the world’s volume of fresh water, while fresh water accounts for only 0.3% of the available volume. Most of the fresh water is unavailable for consumption because it is located in the polar ice caps (68.7%) (Shiklomanov and Rodda, 2003).

Their inclusion in the Brazilian legal system is surrounded by controversies ranging from the difficulty of understanding aquifers and groundwaters, the discussion on the categorization of their domain, the submission to completely different legal regimes, the lack of clarity on the requirements for their classification as a water or mineral resource and the difficulties in including them in the instruments of the National Water Resources Policy.

Despite these problems, there has been more efforts to manage these hidden resources, along with adapting water policy instruments to their specific features. The National Water Resources Council, the National Water Agency, and the States are key players in this process. The next sessions aim at presenting some background on underground water and aquifers, and illustrating how the hidden dimension of the hydrological cycle was incorporated into the Brazilian legal system.

3.1 Unveiling the Brazilian Underground Waters and Aquifers: Features and Importance

The exploration of aquifers assures the water security of millions of people around the world, from

small villages to large urban centers. Underground water is one of the key resources available to mankind, particularly in arid, and semi-arid regions. These two related but distinct concepts are explained below.

Aquifer	Groundwaters
“hydrogeological body with the capacity to accumulate and transmit water through its pores, fissures, or spaces, resulting from the dissolution and transport of rocky materials” (CNRH Resolution 15/2001, Art. 1, item III).	“the waters that naturally or artificially exist underground” (CNRH Resolution 15/2001, Art. 1, item I).

Despite the similarities between these two terms, there are important distinctions: aquifers contain groundwater, but not all groundwater corresponds to an aquifer. Moreover, the term groundwater does not include the geological formation that encompasses it because the concept of an aquifer corresponds to the geological formation that holds water, and this rock must have a considerable volume of water and the ability to transmit it.

Aquifers are categorized according to their geological formation, and the pressure to which they are subjected. These characteristics will influence the water storage capacity, flow velocity, recharge rates, and vulnerability to contamination. Regarding their geological constitution, aquifers are divided into three categories: a) porous or sedimentary; b) fissured or fractured; and c) karst. Figures 10 to 15 detail each of these aquifers. They are also classified into three categories, according to the pressure they are subjected to: a) free; b) confined; or c) semi-confined. Figures 16 to 18 detail these aquifers.

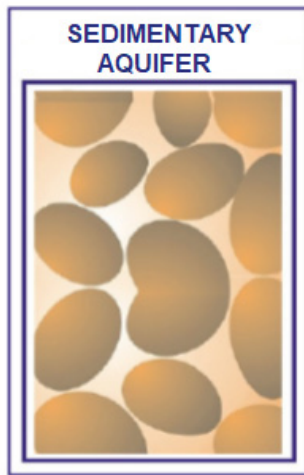


Figure 10: Diagram of the pore structure in a sedimentary aquifer.

Source: Borghetti et al., 2011, p. 133

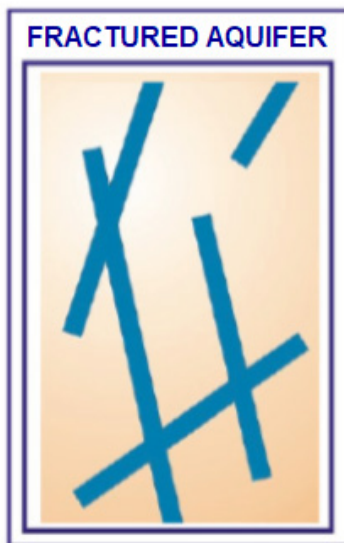


Figure 12: Diagram of fractures in fractured aquifers

Source: Borghetti et al., 2011, p. 133

Porous or sedimentary aquifer: formed by consolidated sedimentary rocks, unconsolidated sediments, or sandy soils (Borghetti et al., 2011, p 133). Water storage and circulation occur in rock pores. These aquifers occupy 48% of the Brazilian territory and have a significant storage capacity (ANA, 2017).



Figure 11: Photo of a sandstone rock sample.

Source: <http://carlosrabello.org/geografia/geologia/rochas-e-minerais/arenito/>

Fractured or fissured aquifer: "formed by igneous, metamorphic or crystalline, hard and massive rocks" (Borghetti et al., 2011, p. 133). Storage and circulation of water occur through rock fractures.



Figure 13: – Basalts from the Serra Geral aquifer, with vertical fractures

Source: Photo courtesy of Luis F. Scheibe

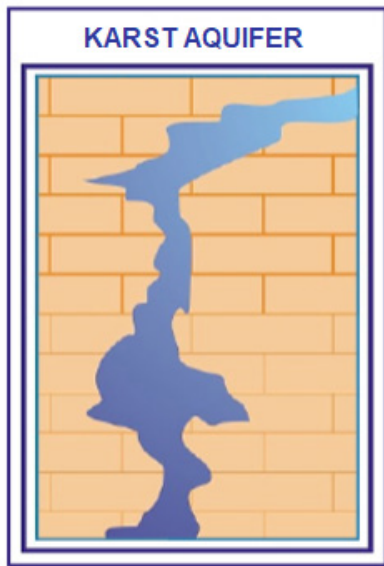


Figure 14: Diagram of channels from a karst aquifer.
Source: Borghetti et al., 2011, p. 133

Karstic aquifer (Karst) is formed by limestone or carbonate rocks. The water dissolves the rocks forming fractures, channels, and other discontinuities that allow its storage and circulation. These aquifers form underground rivers and lakes.



Figure 15: Lago Azul Cave, in Bonito (MS) which is an example of a karst aquifer.
Source: Photo from the author's collection.

The characteristics of unconfined (free), confined or semi-confined aquifers are detailed below.

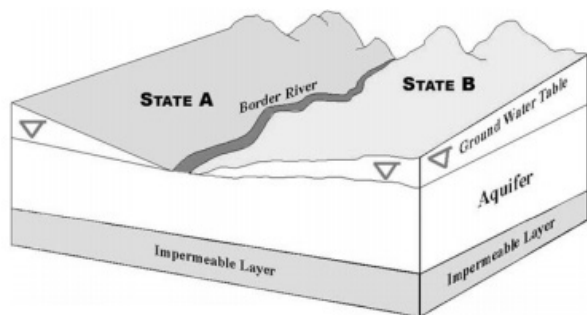


Figure 16: Diagram of a unconfined (free) aquifer
Source: Eckstein; Eckstein (2005), p. 683

Unconfined or phreatic aquifer: consisting of a surface permeable geological formation, which is fully outcropping, and limited at the base by an impermeable layer. A recharge takes place directly through rain or the contribution of surface water bodies. They are easy to explore and are more vulnerable to contamination.

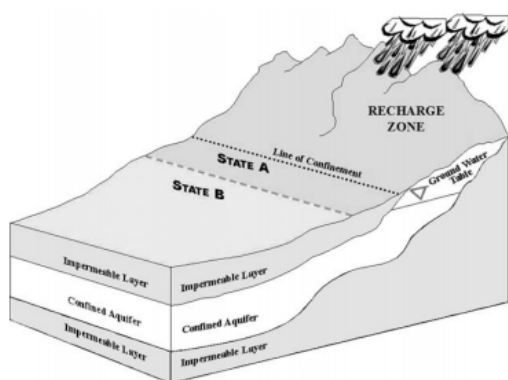


Figure 17: Diagram of a confined aquifer.

Source: Eckstein; Eckstein (2005), p. 683

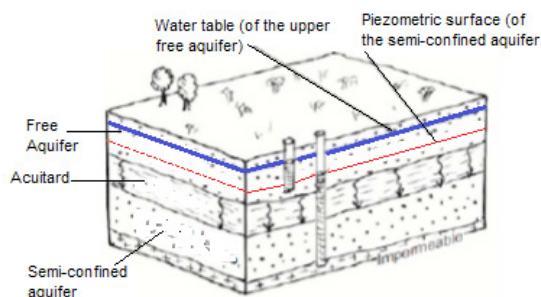


Figure 18: Diagram of a semi-confined aquifer

Source: Román, s/d, p.6

Watch:

Video 12: Groundwaters – Aquifers

Production: ANA

Brazilian groundwater potential is distinguished by 181 aquifers and aquifer system outcrops that are divided into three categories: fractured, sedimentary, and karst. Of these, 11 are transboundary aquifers, that is, are shared with other countries. There are 151 sedimentary aquifers, representing the key

Confined aquifer: a permeable geological formation that is confined between two impermeable or semipermeable layers. In some cases, the water level is under pressure, giving it the property of an artesian. Water entering these aquifers is restricted to potential recharge points. In some cases, the aquifer has no recharge, so its exploitation is equivalent to water mining, and the aquifer is classified as a fossil aquifer.

Confined aquifers are naturally more protected from contamination, but their exploitation requires care in the face of recharge restrictions.

Semi-confined aquifer: permeable rock formation “confined at the base, top, or both, by layers whose permeability is less than that of the aquifer itself” (Borghetti et al., 2011, p. 135). This means that the confinement layers are not completely impermeable, and allow water to infiltrate into the aquifer.

potentials for exploitation. They belong to the group that includes: the Guarani, Bauru-Caiuá, Barreiras, Urucaia/ Areado, Solimões, Alter do Chão, Açu, Barreiras, and Beberibe. The karst area contains 26 aquifers, among which are the Bambuí, and the Jandaíra. The fractured category has reduced water potential and was grouped in four large blocks: Semi-arid Fractured Aquifer System, North Fractured Aquifer System, Central-South Fractured Aquifer System, and the Serra Geral Aquifer (ANA, 2013, pp. 54-56).

MAP OF THE 181 BRAZILIAN AQUIFERS, DIVIDED BY THEIR DOMAINS (SEDIMENTARY, FRACTURED AND KARSTIC)

[ONLINE](#)

The use of aquifers has intensified since the 1970s, and continues to grow due to several factors: a) advances in hydrogeology and well-drilling techniques; b) a decrease in extraction costs; c) lower climate susceptibility; (d) the quality of groundwater; e) increases in demand; and (f) surface water degradation, (REBOUÇAS, 2006; VILLAR, 2016).

Brazilian underground reserves are under evaluation. Its estimated availability is 14,600 m³/s (exploitable reserve) (ANA, 2017), lower than the surface availability of 91,300 m³/s (ANA, 2015, p.29). They represent a key source for public supply and human consumption, contributing to approximately 40% of public supply demand, in addition to being vital for industry and agriculture. Groundwater is the only source of water supply in almost 40% of Brazilian municipalities (ANA, 2010). They supply

55.3% of private households in rural areas (IBGE, 2009). Their use stands out in small municipalities, because they guarantee safe water and low treatment costs. But they are also used in large and medium-sized cities (ANA, 2010; Villar, 2016). In all, around 87,214,502 inhabitants in 2,917 municipalities benefit from these waters, either as an exclusive source of supply or by the composition of volumes in mixed systems (ANA, 2010; Villar 2016).

These waters are also essential for maintaining wetlands and river base flows (i.e., the water that feeds into rivers during the year) functioning as regulators during dry periods, as shown in figure 19. Their constant water supply is largely responsible for sustaining rivers and related ecosystems. Water from aquifers is responsible for maintaining perennial 90% of Brazilian rivers during dry seasons (ANA, 2017). If the aquifer's water level is below that of the river, the river will divert water to the aquifer. Overexploitation of an aquifer may interfere with this contribution system and impact surface water availability.

RELATIONSHIP BETWEEN RIVERS AND AQUIFERS

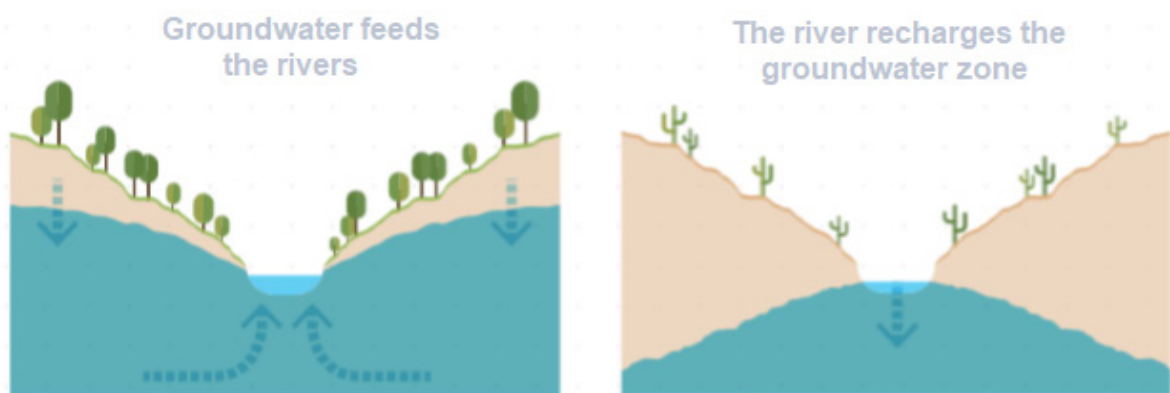


Figure 19: Relationship between rivers and aquifers

Source: ANA, 2017, p. 37

Major threats to aquifers include overexploitation, pollution, and soil sealing. Overexploitation is characterized when the extraction of water from an aquifer exceeds, or approaches the average recharge rate for several consecutive years. In practice, overexploitation is conventionally considered to take place when specific adverse results are detected, like a continuous decrease of water levels, a deterioration in the quality of the water, increased water extraction, ecological damage, compaction of the aquifer, a loss of wells, a decline in surface waters, and subsidence of land (CUSTODIO, 2002). Soil sealing prevents aquifers from recharging and exacerbates the risk of overexploitation.

According to specialized literature, the primary sources of groundwater contamination are: industrial waste dams; landfills and dumps; septic tanks; irrigation by atomization of sewage water; sewage sludge dumping on land; injection wells; agricultural fertilizers and pesticides; underground pipes and storage tanks; atmospheric contaminants that combined with air humidity; sea saltwater intrusion; municipal sewage networks and dams; sea saltwater discharge; accidental spills; contaminated urban rainwater infiltration and recharge basins; mining (FOSTER; HIRATA, 1991).

The protection of aquifers is directly related to the monitoring of their exploitation and to the installation of uses that conform to the vulnerability of the aquifer. Cases of groundwater pollution caused by human actions are commonplace. Urbanization, industrial development, agricultural activities, and mining are threats to the integrity of these resources. While they are naturally less vulnerable to contamination, the depollution of an aquifer takes many years, requires advanced technologies with high investments and, in many cases, can mean the loss of the aquifer (UN-WWAP, 2006). Aquifers are viable sources of water and can be exploited, but using them requires management measures compatible with their characteristics.

Thus, the law plays a key role in the protection of aquifers. It establishes the authorities and agencies

that are responsible for their management, determines the set of guidelines and instruments that will guide their protection and use, or even applies sanctions to those who cause damage to these reserves.

3.2 The groundwater domain

The regulation of groundwater is expressed in the publication of the Water Code (Decree No. 24.643/1934). Article 96 has provides that

Art. 96. – The owners of any land may take ownership of the waters that exist under the surface of their buildings, through wells, tunnels, etc., as long as it does not damage existing uses, nor derive or divert from their natural course, waters that are under public domain, common, or private use.

The use of groundwater was free for the owners of the land, since this water was not considered as public property, or public property of common use, and can be classified in the category of private water that belonged to the owner of the land, as provided in article 526 of the Civil Code of 1916. Restrictions on its use were related to the obligation not to cause damage to pre-existing uses and to public or private waters. These losses addressed issues related to the quantity and quality of water (see Art. 96, single paragraph and article 98 of Decree 24.643/1934), as well as the restriction not to drill wells near the neighboring property (art. 97).

The Federal Constitution of 1988 and Law No. 9,433/1997 transformed the legal nature of groundwater, to the extent that it promoted the publication of all waters. The waters dominion was divided between the Union and the States, extinguishing the municipal or private waters. This understanding was corroborated by the National Water Resources Policy (Federal Law 9.433/1997), which classified water as an asset under public domain (Art. 1, I). The Superior Court of Justice (STJ), in SPECIAL APPEAL REVIEW No. 1.354.582 - RS (2012/0177457-3) determined that Article 96 of the Water Code was not accepted by the Federal Constitution (VILLAR, 2018).

Groundwaters, as well as surface waters, are classified as public property, but it should be remembered that the water belongs to the category of environmental assets, which are considered assets for common use of the people, as established in article 225 of the Federal Constitution. The domain of water was established in Articles 20 and 26 of the Constitution, as follows:

Art. 20. The following are the property of the Union:

III – the lakes, rivers and any watercourses in lands within its domain, or that wash more than one state, that serve as boundaries with other countries, or that extend into foreign territory or proceed therefrom, as well as bank lands and river beaches;

IX - the mineral resources, including those of the subsoil;

Art. 26. The property of the States includes:

I – surface or groundwaters, as well as flowing, emerging, or in-deposit waters, with the exception, in this case, of those resulting from work carried out by the Union, as provided by law.”

In this way, groundwaters belong to the States. The Union reserved the domain over surface resources (lakes, rivers and any other watercourses) that cover more than one State, or are shared with other countries, but made no mention of groundwaters that exceed state boundaries. Similarly, the wording of Article 26 does not place any restriction on the state domain of groundwater resources.

In some measures taken on the feasibility of maintaining wells as an alternative source of supply, in areas that are served by a public water network, the Superior Court of Justice indirectly addressed the issue of dominance of groundwater, and offered a different view from the specialized doctrine (Camargo and Ribeiro, 2009; Pompeu, 2006; Granziera, 2003; Villar, 2008).

Some judgments by the Superior Court of Justice (STJ) have cited the existence of federal groundwater, however this thesis was not built in a lawsuit aimed at questioning its dominance by the states. This position arose in measures that were focused in

discussing the legality or illegality of acts performed by the public power that are backed by state decrees or by Article 45 of the National Sanitation Policy (Federal Law 11.445/2007), and geared towards curbing the use of wells as an alternative source of water in areas with a supply network. Even in the decision of merit, it was always said that the well, object of the dispute, exploited groundwater of state domain.

The debate over these judgments on the existence of groundwater focuses on the idea that, although Article 20, item III, of the Constitution, does not explicitly include them, they would be included to the extent that the law makes no allusions whether “rivers, lakes, and any streams of water” are surface or groundwaters, simply that they need “to be located in lands within their domain, serve as boundaries with other countries, or that they extend to or from foreign territory.” In this sense, we transcribe a fragment of the Special Appeal that deals with the subject:

As noted above, groundwater is not explicitly mentioned in Art. 20, item III of the Federal Constitution, which defines the Union’s assets. But, in Art. 26, item I, which provides for state water resources, it deals directly with them. The different form of expression in the two constitutional provisions led some to defend the thesis that groundwater would be – always and in any circumstance – the domain of the States, never of the Union. It is worth repeating that this represents a misinterpretation of the constitutional text. First, at the teleological level, since the same fundamentals that materially justify it, under the terms of article 20 of the Federal Constitution, the federal dominion of surface waters (occupation of federal land, spread by more than one State, demarcation of international border, or origin or international destination) would recommend, with even greater reason, that groundwater not be left under the exclusive domain of the States and Federal District. Second, because what we have, in the comparison of the two articles, is not the omission of groundwater, pure and simple, from art. 20, but the use of writing technique that dispenses with such mention, because the legislator was limited to talking about lakes, rivers, and any streams of water on land under their control, or that bathe more than one State, serve as limits

with other countries, or extend to foreign territory, or originate from it (underlining added). Now, no allusion was made to the fact that such rivers, lakes, and currents were on the surface or underground. Art. 26 certainly had to mention groundwater, because if it had not done so, there would be the risk of misinterpretation, that is, affirming that all groundwater would be the property of the Union, although almost impossible (a situation that changes, gradually, with technological advances) to say precisely where an aquifer begins and ends. The intention, however, was not to exclude the Union from dominance, but to ensure that the States would not be separated from groundwater, in order to coincide the same factual hypotheses of recognition of their dominance over surface water. (STJ, Special Appeal No. 1.306,093 - RJ, 2nd Panel, Reporting Justice Herman Benjamin, j. May 28, 2013).

This understanding does not have the legitimacy to produce practical effects in the interpretation about the domain of the States, since it was not rendered in a lawsuit with the purpose of discussing this matter. This is a legal thesis, launched in an case whose purpose was not to discuss the domain, so much so that the States or the Union were not part of the process. At the Executive and Legislative levels, this issue was discussed at the time of the proposal of a Draft Amendment to the Constitution (PEC 43/2000), whose objective was to change the dominance of groundwater that exceeded state limits or was shared with other countries.

PEC 43/2000 was filed, since it was recognized that the management of these waters must be done at the local level, due to the characteristics of the underground flow. The National Water Agency and a number of Basin Committees expressed opposition to the proposal. The idea of water currents refers to “bodies of water generally flowing into a natural surface channel” and comprises water courses of more modest volumes such as streams, streams, streams, etc. (Pompeu, 2006, p. 81). Groundwater cannot be equated with rivers, lakes, or water currents, as it moves through pores and rock cracks, so the flow is very slow and heterogeneous, assuming different behaviors along the aquifer.

Unlike surface waters, groundwater do not have their limits easily determined, and this identification is usually surrounded by uncertainties. Therefore, creating a system that requires determining which aquifers belong to the Union and which to the States would generate more difficulties than facilities for their management.

In addition, the geological formation of the aquifer may extend to various countries and states, but this does not mean that the flow of water will be shared. In many cases the flow will assume a local nature. In the Guarani Aquifer section, this theme will be taken up again, because although the aquifer extends over several countries, the flow is shared only in a small fraction of the aquifer.

Thus, groundwater is part of the domain of the States of the Federation, which must establish policies for the management of their water resources, in a manner compatible with the assumptions of the National Water Resources Policy and their specific state policies for water resources. The aspects related to the quantity of water are the direct responsibility of the state agencies that are part of the National Water Resources Management System, while the aspects related to quality will be evaluated by the state environmental agencies.

3.3 Mineral, thermal, gaseous, potable table water, or water for bathing purposes: water resources under the aegis of the mineral system

Mineral, thermal, sparkling, and bottled waters, potable table water and water for bathing purposes, used are not recognized as water resources. The law classifies them as mineral resources, class VIII, by virtue of Decree-Law no. 227/1967 (Mining Code), Decree no. 62.934/1968 and Decree-Law no. 7.841/1945 (Mineral Water Code). Such waters are governed by the mineral system, under the management of the National Mining Agency (ANM), which replaced the National Department of Mineral Production (DNPM) (see art. 32 of

Federal Law 13.575/2017). The ANM was instituted by Federal Law No. 13.575/2017 and is linked to the Ministry of Mines and Energy (MME). With the extinction of the DNPM, the ANM became responsible for its attributions, which include the concession of the right to mine mineral waters. The text will use the ANM/DNPM terminology for historical reasons and clarity, since the documents cited refer to the DNPM. The Mineral Water Code defines mineral waters and table water as follows:

Art. 1: Mineral waters are those originating from natural sources or artificially collected sources, that possess chemical compositions or physical or physicochemical properties that are distinct from common waters, with characteristics that impart medicinal properties.

Art. 3: "Potable table water" shall mean waters of normal composition, from natural or artificially captured sources, which only fulfill the conditions of potability for the region.

The ANM/DNPM understands that mineral and potable table waters are "special groundwaters", and "distinct from ordinary waters by different stages of mineralization" (Queiroz and Bridges, 2015, p. 15). O Brazil has more than one thousand areas of mineral and potable table water extraction, 48% of which are located in the Southeast region (Queiroz and Pontes, 2015). Figure 20 shows the concessions for mineral water or potable table water. Several of these concessions are located in areas that present problems related to water scarcity.

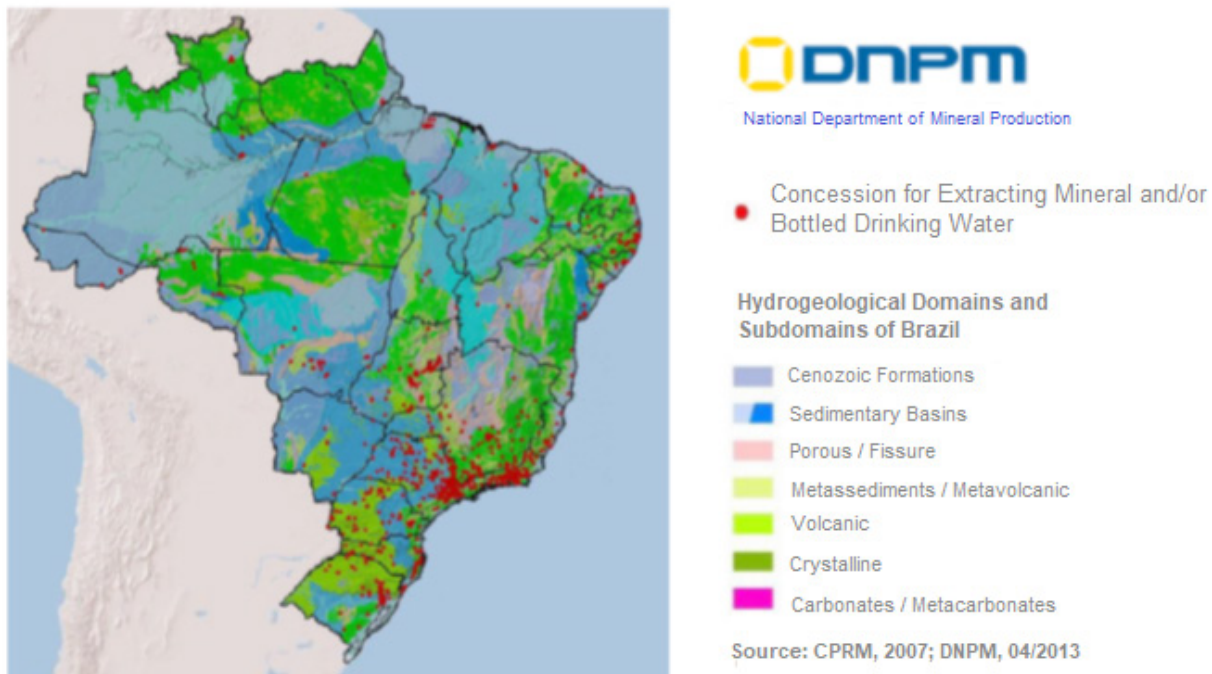


Figure 20: CPRM's (2007) Map of Brazil's Hydrogeological Domains and Sub-domains, which was used as an background for indication of the concessions for the mining of mineral and potable table waters in the Brazilian territory

Source: Queiroz and Pontes, 2015, p. 27

For the water to be considered mineral it is necessary a procedure with the ANM/DNPM, which will classify it as a mineral resource, and without this procedure there will be no deposit under the Mining Code (Queiroz and Bridges, 2015). In other words, even if groundwater meets the requirements to be classified as mineral, in order to have this special legal categorization, submission to the mineral administrative procedure is required. This procedure will be mandatory if there is a wish to exploit the bottling and spa potential of these waters.

A good part of the groundwaters have physicochemical characteristics that allow their classification as mineral waters, or table potable waters, because they meet the requirements of ANM/DNPM, and potability of ANVISA, for natural mineral water, natural water, bottled water, and salt-added waters (see Resolution - RDC No. 274/2005 and Resolution - RDC No. 275/2005). However, these waters are not recognized as mineral, because they do not aim to exploit this differentiated economic potential of mineral waters, so they do not need to go through administrative procedures within the ANM/DNPM.

Thus, groundwater may be subject to different legal treatment. Regular exploitation of groundwater (water used for water supply, irrigation, or industry) would be subject to state provisions on water resources, which normally require the granting of water use rights or a corresponding statement of exemption, an entry in the wells register, and use chargers if this requirement is implemented in the basin. Grants for groundwater must be aligned with the priorities in the water resources plans, and this extraction is accounted for in the water balance of the basin. However, if these groundwaters are intended for the special purposes established in the mineral legislation, and fulfill the needed quality requirements, they will fall within the category of deposits of mineral water (Art. 7, VIII of Decree 6.2934/1968), which is under the Union's domain, and its exploitation will be subject

to the authorization regimes for research, and extraction concessions, under the authority of the ANM/DNPM. Consequently, if groundwaters are used for common purposes, they are classified as underground. If they are used for special purposes, such as bottling or spas, they will be classified as mineral waters.

This distinct legal treatment allows waters that are extracted from the same aquifer, and have identical physicochemical characteristics, to have completely different regulations. For example, groundwaters intended for public and private supply are classified as groundwater, belonging to the state, and their extraction requires a grant from the responsible agency in the State Water Resources Management System. While the water utilized for bottling or having a potential use for a bathing resort will be classified as a mineral resource, which belongs to the Union, and whose use requires the concession of a mining license, as determined by ANM/DNPM (BOSON, 2002; CAUBET, 2009).

As a result of this distinction, mineral waters are not under the protection of the National Water Resources Management System, nor are they subject to the management format imposed by Law No. 9,433/1997, which has as assumptions the integrated and decentralized management, with the participation of civil society, users, and public power, through river basin committees (BOSON, 2002). Such distinction ignores that these waters belong to the groundwater gender, and are therefore part of the hydrological cycle. The exploitation of these mineral deposits can impact the management of water resources, interfering negatively not only in the availability of groundwaters but also in surface waters.

To overcome this problem, the National Water Resources Council (CNRH) issued Resolution no. 76/2007, which “establishes general guidelines for the integration between the management of water resources, and the management of mineral, thermal, gaseous, potable table water, or waters

intended for use in bathing resorts.” Such legislation expressly recognized “the need for integrated and coordinated action between agencies and entities whose jurisdictions refer to water resources, mining, and the environment.”

The enactment of the CNRH Resolution 76/2007 was a positive step towards management integration. However, its practical operationalization faces difficulties. So much so that the Minas Gerais Forum of Basin Committees issued a Supporting Motion in 2017, to comply with this Resolution, stressing its importance, and difficulties in consolidating itself in practice.

Mineral, thermal, gaseous, potable and table water for bathing purposes are mineral resources, but they are also water resources that integrate the water balance of the Basin and constitute one of the multiple uses of water. In fact, these waters actually possess a special legal nature, since they are part of the field of action of two legal systems, the mineral, and the water resources.

Therefore, its users should comply with mining and water resources norms, since these have complementary approaches (FERREIRA JUNIOR, 2007). In this sense, CNRH Resolution No. 76/2007 states that:

Art. 6 The mineral resources managing body must observe the acts issued, granting rights of use of water resources, other authorizing acts, and the existing registered uses when analyzing the request for authorization to search for mineral, thermal, gas, potable water or water for bathing resorts purposes.

Art. 7 The competent water resource management body shall observe the information existing in the research requirements, research permits and mining ordinances for mineral, thermal, gaseous, potable water or water for bathing purposes, when analyzing the request for granting the right to use water resources.

The ANM/DNPM is responsible for granting the research permits and mining ordinances for mineral water and table potable water. However, this decision is conditional on compliance with the

administrative acts that occur in the water resources management system.

States, as holders of the groundwaters domain, may establish rules that demand the granting of groundwaters that have been classified as mineral, thermal, gaseous, potable table water, and those intended for spa purposes, based on the concurrent and common jurisdiction guaranteed in the Federal Constitution (FERREIRA JUNIOR, 2007).

Other mining activities that use groundwaters for final consumption or input to the production process are already required to request the grant, as provided in Article 2, item 1 of CNRH Resolution No. 29/2002. However, this rule excluded from its scope the mining activity provided for in the Mineral Waters Code.

The grant is an instrument that has a dual purpose. The first is to guarantee access to the resource; the second is to control the use of water in order to guarantee the basin’s water balance. If an explorer of a deposit regulated by the Mineral Water Code obtains from ANM/DNPM the right to access, by means of the mining ordinance for mineral, thermal, gas, potable water or water for bathing resorts purposes, he should also obtain the grant from the state water resources management body, as a way to submit his exploration to the social-environmental control (quantity/quality) (FERREIRA JUNIOR, 2007).

The Mineral Water Code needs to be made compatible with Federal Law 9.433/1997. Due to a legal fiction, the legal nature of mineral resources has been attributed to these so-called special groundwaters; however, from an objective point of view, it cannot be ignored that they belong to the category of subterranean waters. The integration proposed by CNRH Resolution 76/2007 would be more effective with this double requirement, making the granting of water resources a mandatory document for the granting of the mining ordinance, thus resolving this impasse between the water and mineral legal systems.

3.4 The National Water Resources Policy instruments and Groundwaters

As we already studied in Unit 2, Article 5 of Law No. 9.433/1997 established the following instruments for water management: the Water Resources Plans; the categorization of water bodies according to the preponderant uses for the water; the granting of rights of use of water resources; the collection of charges for the use of water resources, and the Water Information Resources System. Such instruments apply to groundwater. However, their operationalization faces practical difficulties, since in general surface water resources have been prioritized.

3.4.1 Water Resources Plans

In the case of water resources plans, the lack of information, and the concealed nature of groundwater have justified a superficial approach to the subject. Progressively, there is a growing concern of the plans to include these waters in the framework of the Resolutions CNRH n° 92/2008, and n° 22/2002, as specified in Unit 2. These provisions spotlight the significance of producing hydrogeological information and studies on aquifers, in order to determine groundwater availability, recharge and discharge areas, hydrogeological characteristics, the vulnerability of aquifers, protection zones, and the protection perimeters for supply sources.

This instrument is the basis of groundwater management. It enables the identification of aquifers and their potential, as well as the determination of priorities for groundwater management and allocation. Article 6 of Resolution CNRH No. 15/2001 assigns to SINGREH, the State Systems, and to the

Water Resources Management Federal District the responsibility to guide the municipalities regarding the guidelines for the promotion of integrated management of groundwaters, as prescribed in the plans of the basin.

SUGGESTED ACTIVITY:

REFER TO THE BASIN PLAN FOR YOUR REGION AND IDENTIFY HOW IT INCLUDED GROUNDWATERS.

3.4.2 Categorization of Groundwater Bodies

The classification of water bodies, according to the prominent uses of water for aquifers is regulated by CONAMA Resolution 396/2008. CONAMA Resolution No. 357/2005 does not apply to groundwaters. According to Article 29 of CONAMA Resolution No. 396/2008, the categorization should consider at least the following aspects:

- I. hydrogeological and hydrogeochemical characterization;
- II. the characterization of vulnerability and pollution risks;
- III. the registration of existing and operating wells;
- IV. the use and occupation of the soil and its history;
- V. the technical and economic feasibility of the categorization
- VI. the location of potential pollution sources;
- VII. the natural quality, and the condition of groundwater quality.

Based on these criteria, groundwaters will be categorized into classes, as shown in Table 11.

Table 11 - Classification of groundwater according to Art. 3 of CONAMA Resolution No. 396/2008.

Classes	USES
Special Class	The water from aquifers, set of aquifers, or a portion of them, intended for the preservation of ecosystems in integral protection conservation units, and those that contribute directly to the stretches of surface water bodies, classified as a special class.
1	water from aquifers, set of aquifers, or portion thereof, without alteration of their quality by anthropic activities, and which do not require treatment for any preponderant uses, due to their natural hydrogeochemical characteristics.
2	water from aquifers, set of aquifers, or portion of them, without alteration of their quality by anthropic activities, and that may require adequate treatment, depending on the predominant use, due to their natural hydrogeochemical characteristics.
3	water from aquifers, set of aquifers or part of them, with alteration of its quality by anthropic activities, for which treatment is not necessary, due to these alterations, but which may require adequate treatment, depending on the predominant use, due to their natural hydrogeochemical characteristics.
4	water from aquifers, set of aquifers or portion of them, with alteration of their quality by anthropic activities, and that can only be used, without treatment, for the less restrictive predominant use.
5	water from aquifers, set of aquifers, or a portion thereof, which may be affected by anthropogenic activities, intended for activities that do not have quality requirements for use.

CNRH Resolution nº 396/2008 presents two annexes of technical importance. Annex I offered a list of parameters with the highest probability of occurrence in groundwaters, their respective Maximum Permitted Values (MPV) for each of the uses considered predominant, and the practicable quantification limits (PQL), considered as acceptable for the application of Resolution (ANNEX I). Annex II exemplified the establishment of standards by class, for selected parameters, according to Art. 12, considering the concomitant use for human consumption, animal uses, irrigation, and recreation.

The Basin Committees have not yet been able to implement this instrument of territorial and water management for aquifers. In addition to the technical difficulties linked to knowledge production, consideration should be taken that this instrument may have impacts on the spatial production of the basin, which makes its applicability difficult, even in the case of surface water resources.

3.4.3 Granting of groundwater resources

The National Water Resources Policy established the need to grant the right to use water resources for the exploration of aquifers. Article 12, item II conditioned the “extraction of water from underground aquifers for final consumption, or for production process input,” in order to obtain a grant; Thus, except for the situations described in Article 12, § 1, the drilling of wells requires this administrative act by the relevant state agency, since these resources are part of the state domain. In the case of the hypotheses from the first paragraph, the state agencies for water resources usually require that the use of groundwater be reported in a Register of Wells, as well as a declaration that the use is grant-free.

The granting of rights to use water resources is a vital instrument for groundwater. In addition to ensuring the user access to water, it allows the Public Power to control water use. Nevertheless,

many users use these waters clandestinely without proper authorization. The situation is serious, to the point where the SINGREH agencies are unable to determine the actual number of wells in the country.

ANA (2017) accounted for 278,000 wells in October 2016, but its projections indicate that there are around 1.2 million. Thus, it can be seen that most of the wells are illegal or irregular. Villar (2018) differentiates these wells as follows:

Illegal wells are those whose drilling and use of groundwater are not supported by the law; therefore, their existence is prohibited and, consequently, if the interested party entered a request for a grant, it would be denied. Irregular wells are those whose drilling and use of groundwater is supported by the law, but which require compliance with certain procedures, or impose restrictions or conditions on such use, which were not met by the owner of the well.

The concession of groundwater must be based on the hydrogeological studies described in article 2 of CNRH Resolution No. 92/2008, which constitute the basis of the basin plans, as explained in unit 2. Unfortunately, in many cases, the grants are given without this technical foundation. Groundwater does not have a consolidated methodology for allocation, as in the case of surface waters using Q7.10, Q90, or Q95. In practice, these methodologies have been adapted to the definition of groundwaters concessions. However, they have not been designed to meet the needs of aquifers. The lack of technical data and methodologies for granting concessions, combined with the high number of clandestine wells, creates a situation of vulnerability for groundwater and makes it difficult to draw diagnoses and prognoses for aquifers. This overexploitation can cause damage to legalized users of groundwater and surface water, because overexploitation generates the loss of wells, and compromises the availability of surface water, interfering with surface catchment rights. It should be emphasized that there is no specific policy for granting concessions in fossil aquifers (aquifers without a recharge, whose extraction is equivalent to mining).

3.4.4 *Charging for the use of water resources*

Charges apply to surface and underground resources. In the case of surface water, this instrument can be regulated by federal or state regulations, depending on the nature of the basin. However, in the case of groundwater, the charge collection will always be statewide, even if the aquifer is in a federal basin. As explained above, groundwater is the domain of the states, so only the states can regulate charge collection for groundwater use.

As it was seen in unit 2, the CNRH Resolution nº 48/2005, established the general criteria for the collection of charges for the use of water resources. This standard allowed the allocation of the amount to be paid to consider the nature of the water body (surface or underground) (see art. 7). Therefore, in the same basin, different values can be assigned to surface and groundwater. Among the objectives of the collection is that of “inducing and stimulating conservation, integrated management, protection, and recovery of water resources, with emphasis on areas subject to floods and that recharge aquifers [...] through compensation and incentives to users” (article 2, V). In addition, the standard specifies that, in arbitrating the amount of collection, the characteristics and vulnerability of the aquifer used should be observed.

The collection of charges for groundwater, as well as for surface water, is conditioned to compliance with the requirements of Art. 6 of CNRH Resolution nº 48/2005. As a positive aspect of the collection, the financial resources coming from it can be of great value to subsidize research on underground waters, increase the monitoring networks, promote protection programs, and promote investments for combating pollution sources.

3.4.5 *Water Resources Management System*

The primary information system for groundwaters is the Groundwater Information System – SIAGAS, which was developed and is maintained by the Brazilian Geological Survey (CPRM). This system

manages the National Well Register, composed of about 304,444 registered wells. It is a tool for planning and managing water resources available on this website: <http://siagasweb.cprm.gov.br/layout/>.

In order to strengthen this system, the CNRH issued Motion No. 38/2006, which recommended the adoption of SIAGAS by the state management bodies, State Government Secretariats, the National Water Agency – ANA, and Users of Underground Water Resources, as a shared national base for the storage, handling, exchange, and dissemination of information on groundwaters.

The system is the main information base, but it has shortcomings. It covers only part of the existing wells, and, in many cases, the number of empty data fields is high. This is due to the impossibility of obtaining complete information from registrations, or to the lack of a drill report. There are also problems in communicating data to society, because only part of the information is available on the Internet, and more complete data depends on authorization by the Brazilian Geological Service.

Another issue concerns integration with other public information systems. CNRH Motion No.

39/2006 recommended the integration of this system, through the sharing of databases, and standardizing information with other related systems, including: National Environmental Information System - SINIMA, Brazilian Hydrogeological Resources System - SIGHIDRO, National Sanitation Information System - SNIS, National Water Resources Plan Information System - SIPNRH, and National Water Resources Information System - SNIRH.

Despite its limitations, SIAGAS is the primary information base for on the profile of groundwater users. Improving the system and integrating it with others are fundamental to promote a systemic and transparent approach to groundwaters.

3.5 The main legal bases for groundwater management

In view of the above, Table 12 summarizes the primary legal basis for groundwater at the federal level. The states, based on these guidelines, must build their state policies for the management of their groundwater resources.

Table 12: Table of summaries with the legal bases for groundwater management at the federal level

Legal basis for the groundwater management within the Federal scope	
Federal Constitution	Domain - Art. 20, IX and III and Art. 26, I Jurisdiction: Art. 22 IV; 23; 24 and 25 § 1
Law No. 9.433/97	Establishes the National Water Resources Policy, creates the National Water Resources Management System, regulates item XIX of Art. 21 from the Federal Constitution, and alters Art. 1 of Law No. 8.001 of March 13, 1990, which amended Law No. 7.990 of December 28, 1989.
Decree Law No. 7.481/45	Mineral Waters Code

FEDERAL RESOLUTIONS	
CNRH Resolution No. 184/2016	Establishes guidelines and general criteria for the definition of derivations and catchments of surface and underground water resources, and discharge of effluents into water bodies, and accumulations of small volumes of water, considered insignificant, which are independent of the granting of the right to use water resources, and sets other provisions.
CNRH Resolution No. 153/2013	Establishes criteria and guidelines for the implementation of Artificial Recharge of Aquifers in the Brazilian territory.
CNRH Resolution No. 126/2011	Approves guidelines for the registration of water users and the integration of databases relating to the uses of surface and groundwater resources.
CNRH Resolution No. 107/2010	Establishes guidelines and criteria to be adopted for the planning, implementation, and operation of the National Network for Integrated Qualitative and Quantitative Monitoring of Groundwaters.
CNRH Resolution No. 92/2008	Establishes general criteria and procedures for the protection and conservation of groundwaters in the Brazilian territory.
CNRH Resolution No. 91/2008	Provides for general procedures regarding the categorization of surface and groundwater bodies.
CONAMA Resolution No. 396/2008	Provides for environmental classification and guidelines for groundwaters categorization.
CNRH Resolution No. 76/2007	Establishes general guidelines for the integration between water resources management and the management of mineral, thermal, sparkling, bottled water, and water for bathing resorts purposes.
CNRH Resolution No. 48/2005	Establishes the general criteria for charging fees for the use of water resources.
CNRH Resolution No. 29/2002	Defines guidelines for granting the rights of use of water resources for utilization of mineral resources.
CNRH Resolution No. 22/2002	Establishes guidelines for the insertion of groundwater in the Water Resources Plans instruments.
CNRH Resolution No. 15/2001	Establishes the general guidelines for the management of groundwater.

To learn about state laws regarding groundwater, the following article is recommended: SOUZA-FERNANDES, OLIVEIRA, E. (Orgs.). Coletânea de Legislação das Águas Subterrâneas do Brasil. (Compilation of Legislation on Groundwaters in Brazil) 1. ed. São Paulo: Instituto Água Sustentável, 2018. v. 5. 1800p.

[ONLINE](#)

It can be seen that groundwaters management is a phenomenon that has become increasingly prevalent from 2000 onwards. For further information on the evolution of the legal treatment for groundwaters watch:

Video lesson 5: Perspectives and Challenges for the governance of aquifers
By Prof. Pilar Carolina Villar.

3.6 Specific initiatives for the protection of Groundwaters

In addition to the instruments provided by Law No. 9.433/1997, there are specific instruments for groundwaters dispersed in the CNRH resolutions, mineral legislation, and in state laws. They are: areas of restrictive use, which are divided into 3 categories: a) aquifer protection areas, b) groundwater restriction and control areas, and c) well protection perimeters; registration of groundwater users, monitoring networks, and artificial recharge of aquifers.

3.6.1 Restrictive Use Areas: Areas for the restriction and control of groundwaters, well protection perimeters, and aquifer protection areas

The creation of restrictive use areas is done to properly condition the use of soil and water, in order to maintain the aquifer. Its legal basis can be found in Art. 6 , § 2 of CNRH Resolution No. 22/2002. CONAMA Resolution No. 320/2009, which addresses the management of contaminated areas, contemplates in art. 34, single paragraph, II, that the intervention alternatives for the rehabilitation of contaminated areas may include actions related to zoning, and restrictions on the use and occupation of soil, and surface and groundwater.

Federal law does not provide details on how these restrictive use areas will be for groundwaters, but the analysis of state legislation and management practice allows three main categories of restrictive

use for groundwaters to be detected: the aquifers' protection areas, the restriction and control areas of groundwaters, and the protection perimeters of wells.

Aquifers Protection Areas

CONAMA Resolution no. 396/2008 mentions, in a generic way, the the Public Power's obligation to create Protection Areas for Aquifers, and Protection Perimeters for Supply Wells, with the objective of protecting groundwaters. When analyzing the CNRH Resolutions, there is no detail on how the aquifer protection areas would take place, but they are not confused with the groundwaters restriction and control areas defined by CNRH Resolution no. 92/2008 or with the Well Protection Perimeters.

By analyzing the literature and state legislations, it becomes clear that the idea behind the aquifers protection areas is aligned with the creation of territorially protected spaces to guarantee the recharge of aquifers, and ensure water quality in areas that are highly vulnerable. Therefore, this instrument aims to maintain areas of infiltration in vulnerable or strategic aquifers for the supply of a given region. Although some state legislations have regulated this instrument – usually referred to as areas of maximum protection – no practical cases of its application have been found in the literature that has been reviewed. For example, the States of Ceará, Pernambuco, and São Paulo provide for this instrument in their state laws.

Groundwater Restriction and Control Areas

CNRH Resolution No. 92/2008 established, in Article 4, the possibility of creating restriction and control areas for groundwater use, with the intention of protecting, conserving, and recovering:

- I – water sources for human consumption and animal feed;
- II – ecosystems threatened by over-exploitation, pollution or contamination of groundwaters;
- III – areas that are vulnerable to the contamination of groundwaters;
- IV – areas with contaminated soil or groundwater; and
- V - areas subject to or identified as being overexploited.

Groundwater restriction and control areas aim to discipline the use of land and groundwaters in a given region, in order to reverse a situation of potential risk to the aquifer, which can be related to the quantity or quality of water. The main measure of this type of initiative is the restriction on the catchment of groundwater, imposing several restrictions on the granting of concessions, and in some cases prohibiting the possibility of new ones. Restrictions may also be imposed on certain types of land use and occupation.

Several states have regulated this instrument, and there are practical examples of its application, and potential to contribute to the management of aquifers. For example, the State of São Paulo regulated this issue by means of CRH Resolution No. 52/2005, and instituted 4 areas of restriction and control of underground water:

- Region: Ribeirão Preto / SP

Area for the restriction and control of catchment and use of groundwaters, in accordance with CRH Decision No. 165 of September 9, 2014, which refers to CBH-PARDO Decision No. 201 of August 1, 2014. Map of the restricted area for the municipality of Ribeirão Preto.

- Region: Jurubatuba – São Paulo / SP

Area for the restriction and control of catchment and use of groundwaters, in accordance with CRH Decision No. 132 of April 19, 2011, which ratifies CBH-AT Decision No. 1 of February 16, 2011 – Map of the restricted area for the Jurubatuba region.

- Region: Surroundings of the Lagoa de Carapicuíba – São Paulo / SP

Area for the restriction and control of catchment and use of surface and groundwaters, in accordance with DAEE DECREE No. 2653 of December 15, 2011 (ratified in the DOE of March 8, 2012) – Map of the restricted area for the Lagoa de Carapicuíba region.

- Region: Monte Azul Paulista / SP

Area for the restriction and control of catchment and use of groundwaters, in accordance with DAEE DECREE No. 1066 of March 28, 2015 and extended

by DAEE Ordinance No. 860 of March 27, 2017 – Annex I: Map of the restricted area for the municipality of Monte Azul Paulista.

The restriction and control areas apply to those regions where risky situations or potential impacts to the aquifer have already been reported, whether arising from overexploitation or the contamination of these waters. This instrument is usually used in a reactive way to reverse or prevent the onset of situations that may pose a potential for environmental damage. But, there is nothing to prevent it from being used in a preventive manner, before there is actually a basis for overexploitation or contamination.

Well Protection Perimeters

The well protection perimeter (PPP) is an area around a well that is used to prevent soil and groundwaters from being contaminated by human activities. Their size and shape depend on the hydrogeological characteristics of the aquifer and local uses. Technical literature establishes different types of PPPs, with the most common being (Formentini, 2018):

- the Immediate Perimeter of Sanitary Protection (PIPS), established for the protection of water catchments;
- the Warning Perimeter (PA) intended to protect the contaminant contribution zone with an average of 50 days of traffic;
- the Perimeter Prevention (PP), which seeks to protect the contaminant contribution zone with average of 150 days of traffic; and
- which is defined through evidence of the transit of contaminants before the extraction of waters of a particular activity.

The well protection perimeters were regulated at the Federal level through the mineral water law. DNPM Ordinance No. 231/1998 determined that the protection perimeters “are intended for the protection of water quality and aim to establish the limits within which there should be restrictions on occupation and certain uses that may compromise their use” (item 3.3).

These protection perimeters must consist of three zones as prescribed in the ordinance referred to item 3.3:

The zone of influence (ZI) is that associated with the depression cone (lowering of the potentiometric surface) of a pumping well or a natural spring or source, deemed here as an outcropping of the piezometric or phreatic surface, equivalent to a drain. It is associated with the immediate perimeter of the well, and also delimits a vicinity of microbiological protection. No buildings will be allowed in this zone, and there will be severe restrictions on agricultural activity or other uses that could be considered potentially polluting.

The zone of contribution (ZC) is the recharge area associated with the catchment point (source or well) delimited by the lines of flow that converge at this point.

The zone of transport (ZT) or capture is that between the recharge area and the catchment point. This is the zone that determines the transit time that a contaminant takes to reach a catchment point, from the recharge area. This time generally depends on the distance of the course or underground flow, the hydraulic characteristics of the aquifer medium, and the hydraulic gradients.

The zones of contribution and transport are intended to protect against more persistent contaminants. Its definition and dimensions will be based on the activities, levels and intensity of land occupation and use, also taking into account the estimates on transit time.

CONAMA Resolution No. 396/2008, Article 20, determined that it is the responsibility of the environmental agencies, along with the water resources agencies, to implement the PPPs. Several States have already defined and regulated standards for implementing PPPs. For example, the states of Mato Grosso, Pernambuco, Rio Grande do Sul, Santa Catarina, and São Paulo are cited. In general, state regulations include at least the Immediate Health Protection Perimeter and an Alert or Prevention Perimeter that aims to protect the contribution zone of the well from contaminants for a certain transit time that may vary according to the characteristics of the aquifer.

3.6.2 Register of Groundwater Users

The National Water Resources Policy has entrusted the National Water Agency with the responsibility of maintaining the National Registry of Users of Water Resources - CNARH (art. 44, II of Federal Law no. 9.433/1997 and ANA Resolution no. 317/2003). This registry is “a mandatory registration of individuals and legal entities of public or private law, who use water resources” (Art. 1 of ANA Resolution 317/2003). CNRH Resolution No. 126/2011 defined the registry of water resources users as a “set of data and information on users, utilization and interferences in water resources” (Art. 3, I).

For registration purposes, users are considered to be “individuals or legal entities, of public or private law, that make use of water resources, which depend on or are independent of granting, under the terms of art. 12 of Law No. 9.433/1997 (art. 1, II of Resolution ANA No. 317/2003), as well as the state rules in force (art. 3, III of Resolution CNRH No. 126/2011). Therefore, any user of water resources (surface or underground) is obliged to register, even in the case of exempted uses that do not depend on a grant.

The registry does not give the user the right to use water resources, it is another formality that must be followed by the user. Access to water resources is conferred by the granting of water resources. The uses that are considered exempt from grants are legitimized by administrative acts that confirm their compliance with the assumptions of Art. 12, § 1 of Federal Law 9.433/1997 or of the pertinent state laws. In this way, anyone intending to drill a well must register it, just as someone already owning a well must have it legitimized through registration, even in the case of an exempted use.

CNRH Resolution No. 126/2011 compelled the managing bodies from each State to adhere to the CNARH or establish a system for the storage and integration of data for users of water

resources (Art. 4). Thus, it will be possible to outline a national profile of water users, including the groundwaters. The states usually have their state registries of users, including groundwaters. But, considering the high number of clandestine wells, the registers do not reflect the reality of groundwater exploitation.

3.6.3 Groundwater Monitoring Networks

Monitoring networks are prerequisites for managing aquifers because it is through them that the processes taking place in groundwater are observed. Monitoring can be preventive (in order to assess the behavior and development of the aquifer) or reactive (when some damage has already been detected, and there is an intention to monitor its progress).

CNRH Resolution No. 92/2008, Art. 10, emphasizes the importance of establishing qualitative and quantitative groundwater monitoring programs for the following situations:

- Protection of Aquifers
- Restriction and control areas;
- Zones of influence for ventures that pose a potential for pollution, and risks of contamination;
- Geotechnical risk;
- Overexploitation;
- Saltwater intrusion;

- Recharge and discharge areas;
- Artificial recharge areas.

The monitoring programs can be conducted by public agencies or users. Article 10, in the single paragraph of the referred resolution, authorizes environmental and health agencies to “require from users the monitoring of groundwater”.

A few states rely on groundwater monitoring networks, such as São Paulo, Rio Grande do Norte, the Federal District, and Minas Gerais (ANA, 2017). The Guarani Aquifer System has had 5 monitoring points since 2008 (ANA, 2017). At the federal level, there is the initiative of the National Network for Integrated Qualitative and Quantitative Monitoring of Groundwater - RIMAS, which is regulated by Resolution CNRH No. 107/2010.

This network has to be planned and coordinated by ANA, and implemented, operated, and maintained by CPRM, in coordination with the agencies and entities that manage water resources for the states and the Federal District (Art. 2 of Resolution CNRH 107/2010). Since 2009, CPRM has been implementing this program, which consists of existing and constructed wells. The data obtained are stored in SIAGAS and must be integrated into the SNIRH. Figure 21 illustrates the wells in the monitoring network and respective aquifers. In 2017, the network included 347 monitoring stations (ANA, 2017).

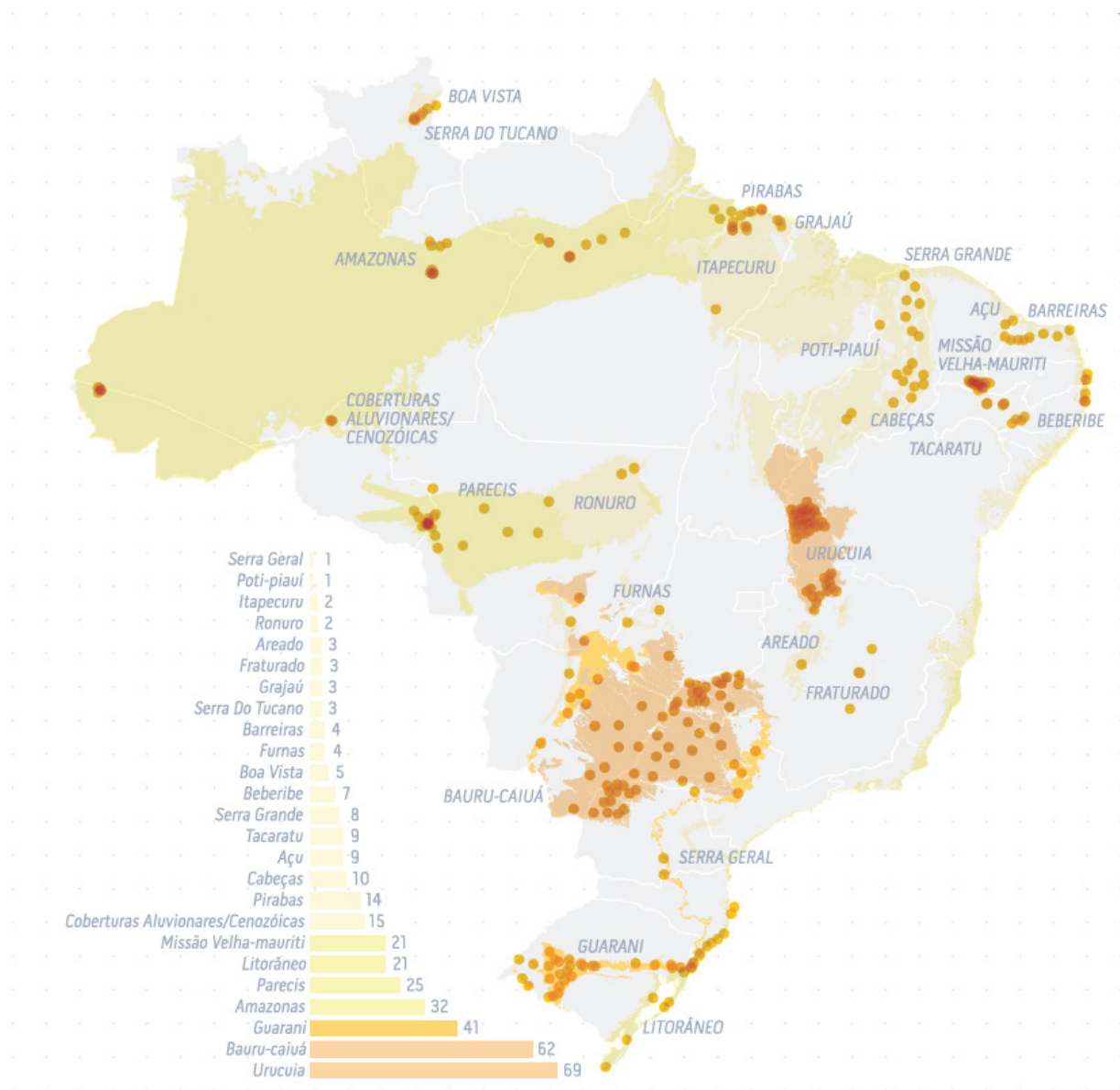


Figure 21: Map showing the distribution of the 374 aquifer-based monitoring stations in RIMAS.

Source: ANA, 2017, p. 41.

RIMAS seeks to encourage the on-going and continuous monitoring of aquifers in order to specify water availability, and to detect any impacts resulting from the exploitation and use, as well as impacts from land occupation, in the groundwaters. This program intends to expand and already benefits the following aquifers: Açu, Alter do Chão, Barreiras, Bauru-Caiuá, Beberibe, Boa Vista, Cabeças, Coberturas Cenozoicas, Costeiro, Furnas, Grajaú, Guarani,

Içá, Itapecuru, Litorâneo, Mauriti, Missão Velha, Parecis Indiviso, Parecis-Rio Ávila, Parecis-Ronuro, Pirabas, Poti-Piauí, Prosperança, Ronuro, Salto das Nuvens, Serra do Tucano, Serra Grande, Tacaratu, Trombetas, Tucunaré, Urucuia, Areado, Fissurados, and Coberturas Cenozoicas. The network still needs to be expanded, based on the fact that this initiative represents an important step for the management of Brazilian aquifers.

3.6.4 Artificial Recharge of Aquifers

CNRH Resolution No. 15/2001, Art. 6, entrusted SINGREH entities with the role of providing guidance to municipalities in adopting reuse, and artificial recharge practices, in order to increase water availability and groundwater quality.

The Artificial Recharge of Aquifers was regulated by CNRH Resolution 153/2013 and was defined in art. 2 as the “unnatural introduction of water into an aquifer, using planned human intervention, through the construction of structures designed for this purpose.” This is a procedure that attempts to encourage recharge, through structures that optimize the infiltration of surface or underground water, or from alternative sources, such as wastewater, excess runoff or desalinated water. According to Art. 4, this intervention is justified in the following cases:

- I – Storing water to ensure water security;
- II – Stabilizing or raising the water level in aquifers to control seasonal variations;
- III – Compensating for the effects of overexploitation of aquifers;
- IV – Controlling saltwater intrusion;
- V – Controlling soil subsidence.

The implementation of this procedure depends on authorization by the state entity or agency responsible for water resources, and requires studies that attest to its technical, economic, health and environmental viability (Art. 5). Another requirement is that recharging does not compromise the quality of the water in the aquifer. The Resolution does not apply to cases where there is a remediation of contaminated aquifers, an accidental recharge, and processes for re-pressuring geological formations for the recovery of hydrocarbons (Art. 4, § 2).

After the artificial recharge system is set in place, the legal representative must keep a System Behavior

Registry (Art. 9) that includes the following basic information:

- I – The volume of water used for the type of recharge;
- II – The infiltration rate throughout operations, and the total amount infiltrated;
- III – The tracking of recharge water quality, and water from the aquifer recharge;
- IV – The monitoring of the potentiometric level variation;
- V – The records on precipitation, and evaporation within the area;
- VI – The effects of the recharge on water supply sources in its catchment area.

The artificial recharge has helped to maintain the levels of aquifers that have been intensively exploited. This procedure is used in a number of countries, as a way of guaranteeing the supply of certain regions, and uses the filtering capacity of the soil to reduce water treatment costs.

3.6.5 Management of Contaminated Areas

For centuries, the soil has been used as a site for solid waste or effluents, as well as problems related to infrastructure or its maintenance, which have allowed harmful substances to leak, and compromised its quality. Soil and subsoil are the substrate of groundwater. As such, preventing it from being contaminated is directly linked to the protection of groundwater.

Soil contamination requires corrective actions to minimize this problem because the underground water flow can carry this contamination beyond its original location, compromising wells located within and outside this perimeter.

Thus, the management of contaminated areas appears to be an important instrument to remedy the situation of already contaminated groundwaters, and prevent soil contamination from reaching these resources or even the damage from spreading to other areas. Art. 3 of Federal Law No. 12.305/2010

defines contaminated areas as “a location where there is contamination caused by the normal or unlawful disposal of any substance or waste.” CONAMA Resolution No. 460/2013320/2009 provides criteria and values that guide soil quality in relation to the presence of chemical substances, and establishes guidelines for the environmental management of areas contaminated by such substances, as a result of anthropic activities; This provision is a breakthrough for the management of contaminated areas, due to the fact that there were no federal standards pertaining to soil quality (Araujo-Moura and Caffaro Fillho, 2015). Some of the improvements brought on by this norm include:

- A definition of the guiding values on benchmarks for quality, prevention and soil research;
- An obligation to define standards for monitoring soil and groundwater quality, in the area where there are business ventures carrying out activities that have a potential for contamination;
- The determination of a process for managing contaminated areas;
- Carrying out a health and ecological risk assessment;
- The disclosure of contaminated areas through the registration of this information in the registry of the Real Estate Registry Office of the District where the property is inserted, as well as the real estate registry of the municipalities and the Federal District;
- The implementation of a National Database on Contaminated Sites.

The management of contaminated areas expressly includes concern over the quality of groundwater. Unfortunately, many states have not yet advanced in the implementation of this type of management, which generates a risk framework for soil and groundwater (Araujo-Moura and Caffaro Fillho, 2015).

3.7 Legal Implications of Irregular Use of Groundwaters (Sanctions)

Water resources legislation imposes a number of obligations on those who wish to use groundwater resources, of which the following stand out:

- Well drilling requires grants for water use, awarded by the relevant authority.
- The use of groundwater must comply with the terms prescribed in the grant.
- All users of groundwaters must register in the Water Resources Users Registry.
- Several states have determined that users considered exempt, according to the terms of article 12 of Law 9433/1997 and state law, must register with a Water Resources User Registry and seek the manifestation of the competent body in order to declare it as exempt use.
- Exempt users must use the water within the limits of the legislation and the request that underlies the declaration of exempt use granted by the water resources management body.
- Groundwater catchments must be designed, constructed, and operated in accordance with prevailing provisions.
- Groundwater abstractions must be equipped with devices that allow water collection, measurements of the level, flow, and volume captured, to allow quantitative and qualitative monitoring.
- The use of groundwater subject to the grant is subject to charges for the use of the resource, if this instrument has been regulated in the basin.
- Any activity or project should take preventive measures to avoid damage to aquifers.
- The owner of abandoned or unproductive wells, or a well that causes harmful changes to the quality of groundwater while it is operating, must take measures according to the procedure approved by the governing water resources management.

In the case of groundwater that is used as mineral water, thermal water, drinking water for tables or for bathing purposes, the following obligations must be highlighted:

- Anyone that would like to use groundwater to exploit its potential related to the characteristics of mineral, thermal, bottled drinking water or water intended for spas is required to apply for a mining license with the ANM/DNPM.
- The use of mineral, thermal, bottled drinking water, and spa waters is subject to compliance with the terms of the mining license issued by ANM/DNPM.

Failure to comply with any of these obligations can lead to civil, criminal and administrative liability

under Article 14, § 1 of Law 6.938/81 and Article 225, § 3 of the Federal Constitution.

Administrative responsibility will take place under the context of the environmental agencies and managing bodies of water resources. At the federal level, administrative violations that may relate to groundwaters are found in Article 49 of Federal Law 9.433/1997, and in Articles 61, 62, item III, 63, 66 and 82 of Federal Decree No. 6514/2008. In addition to these standards, the state standards related to water resources management or environmental protection should be consulted. Penalties for failing to comply with administrative rules could lead to a warning, basic or daily fine, temporary suspension of the well, definitive suspension, with a termination of the grant or capping of the wells.

Table 13: Administrative Violations Box

BOX - ADMINISTRATIVE VIOLATIONS

Law No. 9.433/1997

Art. 49. The following shall constitute a violation of the statutes governing the utilization of surface or groundwater resources:

- I – diverting or using water resources for any purpose without having been granted a right to that use;
- II – deploying or undertaking any venture related to the diversion or utilization of surface or groundwater resources that alters their flow rate, quantity, or quality, without prior authorization from the relevant agencies or entities;
- III – (VETOED).
- IV – using water resources or performing works or services related thereto in any way that contravenes the terms of the grant;
- V – drilling wells for the extraction of groundwater, or operating such wells without due authorization;
- VI – committing fraud when measuring the volume of water used, or declaring values that are different from those measured;
- VII – violating rules established in the regulations and administrative provisions of this Law, including instructions and procedures established by the relevant agencies or entities;
- VIII – impeding or hampering the supervisory activities of the relevant authorities in the exercise of their duties.

Federal Decree 6514/2008

Art. 61. To cause pollution of any kind, at levels such that will result or may result in damage to human health, or to cause the death of animals or significant destruction of the biodiversity:

Single Paragraph. The fines and other penalties, referred to in the heading, will be applied after a technical report is prepared by the relevant environmental agency, identifying the extent of the damage resulting from the violation, and according to its degree of impact.

Art. 62. The same penalties from Art. 61 will incur to those who:

[...]

- III – cause water pollution that requires the interruption of the public water supply for the community;

Art. 63. Conduct research, mining or extraction of minerals without the relevant authorization, permission, concession or license from the appropriate environmental authority or conflicts with permission obtained:

A fine of R\$ 1,500.00 (one thousand and five hundred *reais*) to R \$ 3,000.00 (three thousand *reais*), per hectare or fraction thereof.

BOX - ADMINISTRATIVE VIOLATIONS

Art. 66. Build, renovate, expand, install or operate facilities, activities, projects or services that use environmental resources that are considered effectively or potentially polluting, without any license or authorization from the relevant environmental agencies, that conflicts with the license obtained or is contrary to pertinent legal provisions and regulations:

A fine of R\$ 500.00 (five hundred *reais*) to R\$ 10,000,000.00 (ten million *reais*).

Art. 82. Prepare or submit information, study, or environmental report that is completely or partially false, misleading or contains omissions, either in the official control systems, in the licensing, in the forest concession or in any other environmental administrative procedure:

A fine of R\$ 1,500.00 (five hundred *reais*) to R\$ 1,000,000.00 (one million *reais*).

Criminal responsibility occurs under the context of criminal justice, and its legal basis is seen in Federal Law 9605/1998, Articles 54, 60, 68 and 69-A. In the case of mineral waters, misuse is also included in Article 55 of Law 9605/1998, as well as deemed to be a crime of usurping the assets of the Union that is established in Article 2 of Law 8.166/1991.

Table 14: Environmental Crimes Box

BOX – ENVIRONMENTAL CRIMES

Federal Law No. 9.605/1998

Art. 54. To cause pollution of any kind, at levels such that will result or may result in damage to human health, or to cause the death of animals or significant destruction of the biodiversity:

Penalty – imprisonment, from one to four years, and a fine.

§ 1. If the crime is culpable:

Penalty – detention for six months to a year, and a fine.

§ 2. If the crime:

III – causes water pollution that requires interruption of the public water supply for the community;

Art. 55. To carry out research, mining or extraction of mineral resources without the relevant authorization, permission, concession or licensing or differing from the granted authorization, permission, concession or license:

Penalty – detention for six months to a year, and a fine.

Art. 60. Build, renovate, expand, install or operate, in any part of the national territory, establishments, works or services potentially polluting, without a license or authorization from the competent environmental agencies, or contrary to the relevant legal and regulatory standards:

Penalty – detention for one to six months, or fine, or both penalties cumulatively.

Art. 68. Omission of compliance with an obligation of relative environmental interest by whoever has the contractual or legal duty to do so:

Penalty – detention for one to three years, and a fine.

Single Paragraph. If the crime is culpable, the sentence is from three months to a year, without prejudice to the fine.

Art. 69-A. Prepare or present, in the licensing, forest concession or any other administrative procedure, a study, report or environmental report that is totally or partially false or misleading, including by omission:

Penalty – imprisonment from three to six years, and a fine.

§ 1º If the crime is culpable:

Penalty – detention for one to three years.

§ 2º The penalty is increased from 1/3 (one third) to 2/3 (two thirds) if there is significant damage to the environment, due to the use of false, incomplete or misleading information.

Law No. 8.176/1991

Art. 2 It constitutes a crime against property, in the form of usurpation, to produce goods or exploit raw materials belonging to the Union, without legal authorization or in disagreement with the obligations imposed by the authorizing title.

Penalty: detention for one to five years, and a fine.

Civil liability occurs within the context of civil justice when environmental damage occurs, and its main focus is to restore or repair an environmental asset, or in the event when this can not be done, to arbitrate a compensation. Environmental damage is seen from two fronts: the first is to repair, remedy or compensate for the unwanted change caused to the environment and its elements, including water resources; the second seeks to compensate for any damage that this change has caused to the health and interests of the people affected.

Damages inflicted on groundwaters are related to the direct use of the aquifer, either by the use of the waters or the rock formation or, by carrying out certain activities or ventures that do not use the aquifer but cause its degradation, as they impair the permeability of the soil or permit the leaching of contaminants. Within the scope of civil jurisprudence, there are several actions holding the owners of wells civilly liable without a concession or mining ordinance, as well as legitimizing actions of the Public Power in the sense of tamponing wells that do not have authorization to use the waters. There have also been judgments seeking to repair water pollution and requiring the remediation of contaminated areas that have degraded the soil and groundwater. Finally, for mineral water exploration, there are decisions ordering the unlawful user to pay indemnities to the Union, as financial compensation for exploiting raw material belonging to that State, without proper authorization.

3.8 The case of the Guarani Aquifer System.

The Guarani Aquifer System occupies a 1,087,879 km² area and spreads between Argentina (225,500km²); Brazil (735,918 km²), Paraguay (71,700 km²) and Uruguay (45,000 km²) (OAS, 2009, p. 62). The Guarani aquifer system comprises a number of geological formations with various names in their countries, such as: Pirambóia/Botucatu in Brazil, Misiones in Paraguay, Tacuarembó in Argentina, and Buena Vista/Tacuarembó in Uruguay.

It is a sedimentary aquifer composed of wind and tidal-wind deposits overlaid on the basaltic rocks of the Serra Geral Formation (which is a fractured aquifer). As shown in Figure 22, the aquifer is confined to 90% of its total area (light green portions). The dark green areas are outcrops that correspond to approximately 124,650 km², equivalent to only 10% of the total area (LEBAC/UNESP, 2008).

The largest portion of the aquifer is in Brazil (61.65%), where it extends across eight states: Goiás (39.367,72 km²), Mato Grosso (7.217,57 km²); Mato Grosso do Sul (189.451.38 km²), Minas Gerais (38.585,20km²), Paraná (119.524,47 km²), Rio Grande do Sul (154.680,82 km²), Santa Catarina (44.132,12 km²), São Paulo (142.958,48 km²) (LEBAC/UNESP, 2008). Brazil is the primary user of the water resources. The country consumes 93.6% of the total volume extracted, 1.04 km³/year, with the State of São Paulo accounting for a majority of this amount at 80% of use (WORLD BANK/GWMATE, 2009; OAS, 2009).



Figure 22: Schematic Map of the Guarani Aquifer System

Source: Borghetti, Borghetti, Rosa Filho, 2011, p. 163

Its average thickness is 250 meters and the estimated water volume is 30,000 km³, corresponding to 100 years of cumulative flow in the Paraná River. The SAG water is located at depths ranging from 50 to 1,500 meters (Borghetti et al., 2011).

The aquifer's features are rather distinct, with regions where it appears on the surface, while located more than 1,500 meters deep in other locations.

For this reason, the ages and water quality vary considerably. The age of water exceeds 20,000 years in containment areas, suggesting extremely slow replenishment rates and more frequent water quality problems due to the natural interaction between water and minerals from the rock. Waters are more recent in the recharge areas and are usually suitable for human consumption (OAS, 2009, page 66).

Based on these hydrogeological distinctions, Figure 23 divides the aquifer into five possible management zones: I - unconfined recharge and discharge zone; II - recharge zone covered by basalt; III - intermediate confined zone; IV - deep confined zone; and V confined zone with saline groundwater (WORLD BANK/GWMATE, 2009).

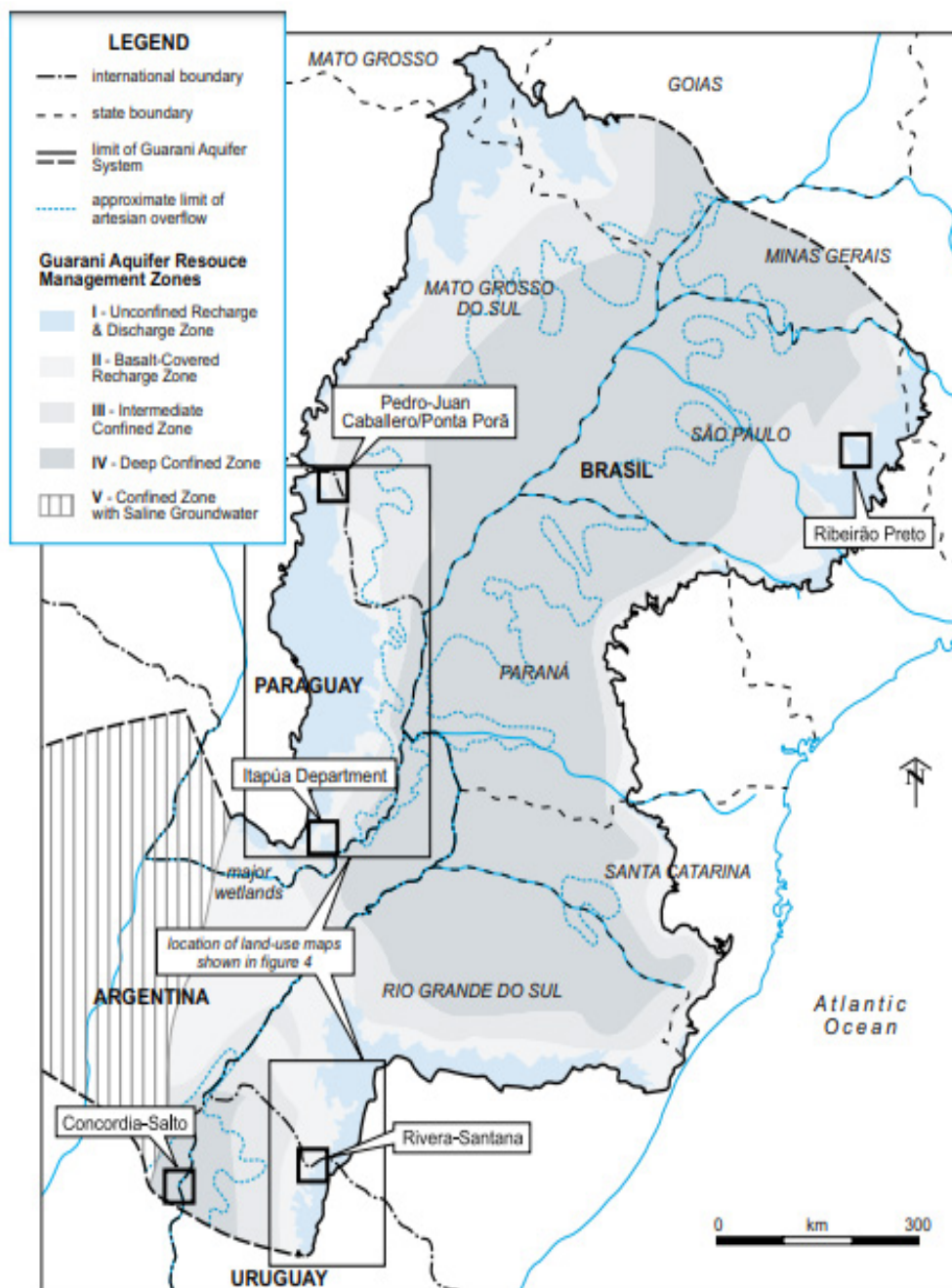


Figure 23: The Guarani Aquifer System and its Management Zones

Source: World Bank/GWMATE, 2009, p. 11.

While the SAG is a continuous geological structure, its features vary significantly from one area to another. For example, the aquifer only recharges in zones I and II: a) through the direct infiltration of rain and the streams found in the outcrop area; b) from indirect infiltration through basaltic fractures; and c) through discontinuities in basalts, which are overlaid by other more recent aquifers (OAS, 2009).

The groundwaters extracted in zone I are renewed through the infiltration of rainwater. As such, this is the area most vulnerable to contamination. In zone II, the sandstone is covered by a thin layer of basalt (under 100m), and is very fractured, taking on the state of a semi-confined aquifer. Consequently, the recharge is lower than zone I because the water that reaches the aquifer enters through the fractures or discontinuities in the basalt. In other words, it is an indirect recharge (WORLD BANK/GWMATE, 2009). Managing these areas demands a use that is compatible with recharge rates, and land use policies that are adapted to the vulnerability of the aquifer.

Contrary to popular belief, the water entering recharge areas does not replenish the central portion of the aquifer, but forms “local flow cells that discharge almost entirely into rivers that cut through the outcrop areas of the SAG” (WORLD BANK/GWMATE, 2009, p. 5). The result is that the water flow assumes a regional profile.

There is no significant recharge in the confined zones (intermediate, deep and high salinity) and the extraction of water is equivalent to mining the aquifer. In this case, management should encourage conscious and long-term usage because the water that is abstracted will not be replenished. On the other hand, the aquifer is covered by a thick basalt layer which protects it from anthropic pollution (OAS, 2009; WORLD BANK/ GWMATE, 2009). In addition, consumption requires care because they are more prone to exhibiting issues related

to quality due to the content and type of dissolved salts.

In confined areas, the groundwaters do not connect with the surface waters of the Prata basin. The Guarani aquifer and Prata Basin are two distinct water bodies, even though they overlap in much of the territory. Despite this, there may be points of communication between the groundwaters and the bodies of surface water that make up the basin in some stretches of the recharge areas.

Concerning the aquifer characteristics, areas most likely to develop transboundary effects coincide with border areas and are restricted “to a narrow strip of territory of no more than a few dozen kilometers, depending upon local specific hydrodynamic conditions.” (OAS, 2009, p 18). Although the SAG spans across four countries, the water flow is only shared in a small portion that coincides with the boundary zones. These boundary zones can not be viewed as a uniform body of the aquifer, but rather as a zone composed of distinct sub-zones and water flows that are restricted to that portion of the boundary zone (Villar, 2015).

Borghetti, Borghetti and Rosa Filho (2011, p. 199) have further limited the area of potential cross-border effects. According to these authors, despite the convergence of geological formations in the four countries, “the condition for a hydraulic connection” would only be present in the “region between Mato Grosso do Sul and Paraguay, and between southwestern Rio Grande do Sul, Argentina and Uruguay.”

That said, the areas most vulnerable to transboundary conflicts are the recharge areas located on the countries’ borders, as Figure 24 points out. In this case, conflicts could stem from the contamination of the aquifer, sealing these areas or uses that interfere with aquifer levels or related surface resources (Villar, 2015).



Figure 24: Guarani Aquifer System and Areas with the potential for transboundary conflict.

Source: Villar, 2015, p. 215

The Guarani aquifer has received notable prominence in relation to other Brazilian aquifers thanks to the establishment of the Environmental Protection and Integrated Sustainable Management Project for the Guarani Aquifer System, or simply the Guarani Aquifer System Project. This project was set up between Brazil, Argentina, Paraguay and Uruguay and had the support of various organizations, notably the World Bank, the Organization of American States – OAS and the *Global Environmental Facility* (GEF). It was initially set up to last four years, from March 2003 to March 2007, but it was extended until January 31, 2009 (Villar, 2015).

Its goal was to help countries draw up and implement a common institutional and technical framework for the management and conservation

of these waters. This project helped to increase knowledge of the aquifer, and its technical legacy can be found on the website for the Regional Center of Groundwater – CeReGAS <https://www.ceregas.org/publicaciones/>. In addition to supporting knowledge, this project also publicized groundwater along with this particular aquifer.

Check out the The Marvelous Guarani Aquifer video (Magnífico Acuífero Guarani) in the video library, which explains the formation of the Guarani aquifer and describes how the Guarani Aquifer Project was brought forward. Data regarding the size of the Guarani varies from those shown here because the fine tuning for the extension of aquifer had already been done with the completion of the project.

Watch:

Video 13: *The Marvelous Guarani Aquifer video*

(Magnífico Aquífero Guarani)

Production: Argentina, Brazil, Paraguay and Uruguay, in partnership with the GEF, OAS and World Bank

3.8.1 The Legal Treatment of the Guarani Aquifer

The Guarani Aquifer in Brazil shares the same legal treatment that applied to groundwater, regardless of its limits. Each State in the Brazilian Federation will therefore be responsible for managing their portion of the aquifer. The Union has not established specific provisions for aquifers on a national level, if only because their status in relation to the risks of exploitation or contamination is low. The CNRH issued Motion No. 49/2009, which “Recommends the application of investments in science and technology to obtain strategic knowledge on the potentials, availabilities, and vulnerabilities of the Guarani Aquifer System – SAG within the scope of the States covered by the Aquifer.” Hence, the need to consider aquifer management at the state level is reinforced. The states have incorporated specific regulations, highlighted by São Paulo, that established a restriction and control area in the aquifer region in the city of Ribeirão Preto, due to the occasional overexploitation.

At the international level, Brazil signed the Guarani Aquifer Agreement on August 2, 2010, with the other aquifer countries. The conception of an agreement for a transboundary aquifer that removes disputes, and whose risk of conflict is restricted to a small portion of its territory, is a major step for shared management (Villar, 2015). The agreement was approved by the four countries. Argentina and Uruguay ratified the agreement in 2012, through the enactment of Law 26.780/2012 and Law 18.913/2012. In 2017, Brazil issued

Legislative Decree No. 52/2017; and in 2018, Paraguay approved Law No. 6.037/2018. Although it has been adopted by all the States, the treaty has not yet taken effect because it still awaits the submission of the instrument of ratification from Paraguay.

3.9 The Management of Groundwaters and the Need for Coordination

The Federal Constitution guaranteed the ownership of groundwaters to States, even when aquifers exceed state limits. Because of this, each State will be responsible for managing its aquifers, or portion of them, in the event that the aquifers cross state or country lines. Much of the underground water bodies exceed the state's territory or do not converge with the regions or river basins. In many cases, the recharge area of an aquifer will be located in one committee while the discharge occurs in another. Or, the exploitation of water or soil in one region may compromise the quality or quantity of water in another basin.

The States play a key role in the management of groundwater because they are the owners of the domain, but groundwaters require the coordination of the three entities under the Federation. The aquifers that do not converge with the river basin or are shared with other states and countries require coordination mechanisms to be set in place, and common strategies be adopted, either within the State, between the States, or between the States and the Union.

When the aquifer is located within a single State's territory, coordination is much easier because state policies and agencies responsible for managing it are the same. However, the challenge to coordinate the various state committees, and have the municipalities involved, still remains. Without the municipalities' involvement, efficiently managing aquifers remains a challenge because these entities are responsible for urban planning, and have the jurisdiction to impose restrictions on land use and occupation.

With interstate aquifers, in addition to the difficulties mentioned above, there is the challenge to integrate different water resources policies and agencies. Exchanging information, establishing shared monitoring networks, standardizing methodologies to calculate the groundwater recharge and reservoirs, as well as identifying vulnerable areas and discharge points, are all essential steps in this process.

This coordination directly benefits surface waters, as the aquifers are the primary resources responsible for the flow of various state and federal rivers. As a result, mismanaging them compromises the quality and quantity of water available in the rivers.

The Union plays an essential role in encouraging coordination in this process, especially in the case of interstate or transboundary aquifers. It also has jurisdiction over mineral waters, so it is necessary to build articulations not only between the various state and federal water resources agencies, but also to foster the connection between the system of mineral resources management agencies and that of water resources.

In order to contribute to the construction of this coordination, the National Groundwaters Program was created and incorporated into the Regional Water Resources Programs of the National Water Resources Plan (PNRH). Some of the goals of this initiative include accelerating projects and studies for transboundary and interstate aquifers, conducting studies and projects on a local scale, quantitative monitoring of groundwaters, measures for developing institutional and legal elements, as well holding programs for training, communication, and social mobilization.

One example of constructing this interstate and federal cooperation is the case of the Integrated and Shared Management Plan for the Urucuia Aquifer System. This aquifer extends through the States of Bahia, Goiás, Maranhão, Minas Gerais, Piauí, and Tocantins, and is part of the São Francisco River basin, forming one of the major aquifers that contribute to the flow of waters in this river.

The National Water Agency has been conducting hydrogeological studies to gather information for the management of groundwater resources related to this aquifer in the São Francisco river basins, and the Tocantins river, in order to support the integrated management of surface and groundwaters.

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WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING NEXUS





4. WATER GOVERNANCE AND MANAGEMENT INTEGRATION: BUILDING NEXUS

The concept of an integrated water resources management has gained prominence over the last few decades, along with an understanding of the connections between environmental resources and their multiple uses by distinct actors and sectors. In this context, the term *nexus* emerges, which is used in the literature in several ways, but linked to the idea of understanding how the various economic and social sectors are linked in the use of environmental resources, in order to verify the coherence of intersectoral governance (Strasser et al, 2016). Understanding these relationships is essential for stimulating water governance. These distinct sectors have a positive or negative influence on the qualitative and/or quantitative status of the waters and, as such, require governance schemes that promote cross-sectoral convergences.

In the specific case of water resources, several Brazilian regions present problems related to scarcity, on the other hand, the demand for the resource does not decrease and, in some cases, increases. Whether caused by climatic conditions or reductions in reserves – combined with higher demands – diminished water availability jeopardizes water, energy, food and environmental security while triggering conflicts between sectors (Strasser et al, 2016). At the same time, the policies and institutions that should be coordinating management, in order to avoid this situation or mediate disputes are usually structured by niche segments with little or no convergence between them. In this sense, the more indispensable and scarce is the resource, the more evident becomes the need to build these *nexus* (interconnections) (Strasser et al., 2016).

The law plays an important role in this construction. The law's interaction with public policies consists of several processes. Public policies are either externalized through laws in a formal

manner (issued by lawmakers) or in a material sense (regulatory acts enacted by the Executive branch, including decrees, regulations, ordinances, resolutions, circulars, provisional, and operational instructions, and others) (Coutinho, 2013). Law permeates public policies in a variety of ways, such as in establishing its objectives and expected results, in stipulating institutional arrangements, or constructing participatory spaces (Coutinho, 2013). It also acts on defining agendas and issues, conceiving proposals and actions, as well as evaluating programs (Coutinho, 2013).

Thus, in previous units we studied how the law covered water management. This law has gained body and relevance to the point of establishing the so-called Water Law, which has a sectoral focus on the resource and even needs to build bridges between the management of the various phases of water in the hydrological cycle. This unit will attempt to confirm how the law in other areas converges with the water issue (especially related to the following themes: environment, agriculture, urban planning, sanitation and energy). This unit is not intended to exhaust each of these rights and topics, since each of them deserves a course of its own, but to indicate their points of convergence with the water theme.

Public policies generally have a tradition of sectoral planning and measures. However, environmental, agriculture, urban planning, sanitation, and energy policies somehow contemplated the waters, with a greater or lesser degree of interdependence.

4.1 Environment, Water and Law

Because water is an environmental resource, its availability is directly associated with the environmental conditions in which it is found. Environmental degradation causes a decrease in water resources, and this has a direct impact on the local, regional and even global water balance.

From this perspective, the environment becomes a legal asset to be protected by Law. Environment concern creates synergies that are configured on an

international and domestic scale. These movements stimulated the advent of Environmental Law, which is primarily structured at the international level and is gradually incorporated by the countries.

4.2 International Environmental Law and the Waters

The International Environmental Law (IEL) is a branch of International Law that “intends to relate subjects under International Law with the environment and seek a common purpose, which is the protection (and management) of this environment” (Rei, 2006, p.5). This law is a product of the States. But it is heavily influenced by International Organizations and NGOs, making *soft law* an important source of this Right (Rei, 2006).

The IEL's work is guided by two dimensions. The first is to encourage the protection of the environment by means of the International Law instruments. The second is to inspire countries to establish domestic environmental laws and standards, as well as adopting environmental principles (Birnie, Boyle and Redgwell, 2009).

This right gained to prominence in 1970, with the United Nations Conference on the Human Environment held in Stockholm in 1972, and was consolidated with the United Nations Conference on the Environment and Development, also known as the Earth Summit or Rio-92, held in 1992 in Rio de Janeiro (Soares, 2001).

The Stockholm Declaration, or the United Nations Conference on the Human Environment, laid the foundations for the construction of IEL, and influenced national law of several countries. This was the case of Brazil, which created the Special Secretariat for the Environment (1973), which was replaced by the Ministry of the Environment to plan, coordinate, supervise and control, as a federal body, the national policy and government guidelines established for the environment (Law No. 8,028/1990) and began to issue environmental

standards. Prior to this period, there had been a few provisions that addressed natural resources, like the Water Code, but the environmental focus was incidental. The primary concern was in assuring the protection of private rights in neighborhood disputes, or the control of certain activities by the Public Authority, particularly the use of hydraulic potential (Granziera, 2014, Viegas, 2005, Milaré, 2015).

At the Rio-92, the Rio Declaration on the Environment and Development (United Nations, 1992) set forth the basic principles of the environmental law, including the principle of sustainable development, safeguarding/prevention, polluter-pays principle, social participation, and international cooperation (SOARES, 2001). Further relevant findings included the Global Agenda 21, and the signing of the United Nations Framework Convention on Climate Change, and the Convention on Biological Diversity (SOARES, 2001).

Water was a central theme in discussions on the International Environmental Law, whether during the cycle of major conferences or through specific conferences. Among the general conferences, the following stand out: Stockholm Conference (1972); Rio-92; World Summit on Sustainable Development in Johannesburg, South Africa (2002); United Nations Conference on Sustainable Development, Rio+20, held in Rio de Janeiro (2012). In the context of the specific ones, the following can be mentioned: The United Nations Conference on Water at Mar del Plata, Argentina (1977); International Conference on Water and Environment, Dublin, Ireland (1992); The Bonn Conference on Freshwater, Bonn, Germany (2000); Conference on Water in Stockholm, Sweden (2007) (Ribeiro, 2005).

In addition to the Conferences, whose documents influenced practices by States, the International Environmental Law stimulated the signing of several multilateral conventions that had a direct impact on the quality and quantity of water. Table 15 shows those to which Brazil is a party.

Table 15: International Conventions Ratified by Brazil for the Protection of the Environment that impact Waters

MULTILATERAL CONVENTIONS FOR ENVIRONMENTAL PROTECTION RATIFIED BY BRAZIL	SCOPE	STATUS AND DATE OF RATIFICATION
BIODIVERSITY AND WATER		
Convention on Wetlands of International Importance, particularly as a Habitat for Waterfowl, Ramsar	Protection of wetlands and associated fauna	In effect 9/24/1993
Convention on International Trade in Endangered Species of Wild Fauna and Flora in danger of becoming Extinct (CITES)	Regulation of trade in wild specimens in danger of extinction	In effect 11/4/1975
Convention on Biological Diversity	Conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits arising from the use of genetic resources;	In effect 2/28/1994
Cartagena Protocol on Biosafety	Sets regulations on the transboundary movement, transit, handling and use of all living modified organisms that may have adverse effects on biological diversity or human health.	In effect 11/24/2003
The International Convention for the Control and Management of Ships' Ballast Water and Sediments	To prevent environmental and health damages resulting from the transfer of Harmful Aquatic Organisms (HAO) and Pathogenic Agents (PA) through the control and management of the Ballast Water from ships and the sediments contained therein."	State party 10/15/2005
VARIABILITY AND CLIMATE CHANGE		
Vienna Convention for the Protection of the Ozone Layer	Control of human activities that modify or could modify the ozone layer.	In effect 3/19/1990
The Montreal Protocol on Substances that deplete the Ozone Layer	Reduction in the consumption of controlled substances that threaten the ozone layer, according to the parameters established for Group 1 and Group 2 countries.	In effect 3/19/1990
United Nations Framework Convention on Climate Change	Attaining the stabilization of concentrations of greenhouse gases in the atmosphere, at a level that would prevent anthropogenic interference (resulting from human action) in the climactic system	In effect 2/28/1994
Kyoto Protocol	Limitation and reduction of greenhouse gas emissions that are not controlled through the Montreal Protocol, by the countries listed in Annex I, according to the percentages expressed in Annex B, in order to stabilize concentrations of greenhouse gases in the atmosphere to a level that prevents anthropogenic interference in the climate system.	In effect 8/23/2002
Paris Agreement	Fortify the global response to the threat of climate change by maintaining the rise in global average temperature well below 2°C in relation to pre-industrial levels, and carry out efforts to limit this increase in temperature to 1.5°C in relation to pre-industrial levels. Increase adaptive capacity and resilience to climate change, and promote the development of a low emission of greenhouse gases.	In effect 9/12/2016

MULTILATERAL CONVENTIONS FOR ENVIRONMENTAL PROTECTION RATIFIED BY BRAZIL	SCOPE	STATUS AND DATE OF RATIFICATION
SOIL, WATER, AND CLIMATE		
United Nations Convention to Combat Desertification in Countries Affected by Severe Drought and/or Desertification, Particularly in Africa	Combating desertification and mitigating the effects of drought in countries affected by severe drought and/or desertification, particularly in Africa	In effect 6/25/1997
ENVIRONMENTAL POLLUTION		
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Controlling the transboundary movements of hazardous wastes and their disposal.	In effect 10/1/1992
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	To promote shared responsibility and cooperative efforts between the Parties in international trade involving specific hazardous chemicals, in an attempt to protect human health and the environment, and contributing to the correct use of these products, facilitating the exchange of information on their characteristics, establishing a decision-making process for its import and export, and disseminating the resulting decisions to the Parties	In effect 6/16/2004
Stockholm Convention on Persistent Organic Pollutants (POPs)	To protect human health and the environment from persistent organic pollutants	In effect 6/16/2004
Minamata Convention	To protect human health and the environment from anthropogenic emissions, and releases of mercury and mercury compounds	In effect 7/4/2017
WORLD CULTURAL AND NATURAL HERITAGE		
Convention on the Protection of World Cultural and Natural Heritage	Identify, protect, conserve, develop, and convey the cultural and natural heritage to future generations	In effect 9/1/1977

Brazil is a signatory for the major multilateral conventions related to environmental issues, but has not signed the United Nations Convention on the Law of Non-Navigational Uses of International Watercourses, which is the instrument specifically dedicated to how international watercourses are used.

The MERCOSUR integration process has also incorporated the environmental issue through the Mercosur Environmental Framework Agreement and the Additional Protocol to the MERCOSUR Framework Agreement on the Environment in Matters of Environmental Cooperation and Assistance. The Framework Agreement was signed in Asunción (Paraguay) on June 21, 2001,

by Argentina, Brazil, Paraguay, and Uruguay, and became valid on June 23, 2004. Its objective is to promote cooperation for the protection of the environment and the rational use of natural resources by MERCOSUR member countries. The Additional Protocol was signed in Puerto Iguazú on July 7, 2004, and entered into force on April 21, 2012. It was devised to foster cooperation and assistance in case of emergencies that actually or potentially cause risks to the environment and the population; to synchronize the procedures for taking action in these cases; and to promote the exchange of information.

In addition to the multilateral conventions and treaties agreed upon under the scope of the

regional integration process, Brazil has signed several international treaties with neighboring countries for environmental protection and water resources. Several of these treaties focused on the protection or shared use of river basins, border, or successive rivers, or on infrastructure projects linked to energy or navigation. The Amazon Basin, La Plata Basin and its sub-basins, the Mirim Lagoon and Guaraní Aquifer have international treaties, including 14 international organizations to promote the management of transboundary water resources in the region (Villar, Ribeiro, Sant'Anna, 2018).

4.3 Brazilian Environmental Law and the Waters

International efforts aided in consolidating environmental law within Brazil. This law can be defined as an autonomous legal branch that has its own concepts, principles, and assumptions. Its primary goal is to regulate human behavior through a complex of principles and provisions devised to protect the environment, mitigate environmental damage, and improve the overall quality of life for people (Sirvinskis, 2010, Villar and Cibim, 2017).

In Brazil's case, there has been a progressive advance in its coherence and breadth since the 1980s. Its main legal frameworks are based on the following instruments: a) the National Environmental Policy (Law No. 6.938/1981), which establishes the key environmental protection instruments, and the National Environmental System (SISNAMA); b) the Public Civil Action Law (Law No. 7.347/1985), which created the main procedural instrument for the defense of the environment and other diffuse and collective interests; c) The Federal Constitution of 1988, which determined a consortium constitutional engineering for environmental protection (art. 23, IV and art. 24, VI, VII and VIII), included environmental protection in the economic order (art. 170, VI) and in the exercise of the property right (art. 186, II), as well as enshrining the fundamental right to the ecologically balanced environment (art.

225); and (d) the Environmental Crimes Law (Law No. 9605/1998), which established criminal liability and initiated the systemization of administrative liability for conduct that proves harmful to the environment, which was regulated by Decree 6514/2008 (Milaré, 2015 ; Villar and Cibim, 2017).

The following are the main environmental instruments available to the public administration to foster integration between the environment and water, especially those provided for in the National Water Resources Policy.

4.3.1 *Federal Constitution: the Right to an Ecologically Balanced Environment*

The 1988 Federal Constitution is the formal key source of Environmental Law (Antunes, 2012). It defined the ownership of environmental assets, their domain and related jurisdictions and, for the first time, instituted a specific chapter for the environment, and mentioned it in several other headings and chapters. The highest point of the environmental treatment is found in Title VIII (Of the Social Order), in its Chapter VI, in art. 225.

The right to an ecologically balanced environment belongs to all people, and can be characterized as a fundamental right (Antunes, 2012, Machado, 2013). The term "asset of common use" conditioned the exercise of economic activity, and the right to property, to its social and environmental role, as prescribed in article 170, III and VI, which deals with the economic order.

Therefore, the environment concurrently has an individual and collective dimension, as explained by Amirante apud Machado (2013, p.151):

The environment is a public asset to be used and enjoyed by individuals and the public as a whole. The right to the environment belongs to each person, but not only to one person – the right is "transindividual". Consequently, the right to the environment falls into the category of diffuse interest. It is not consumed by just one person, but is spread to an indeterminate collectivity.

The Public Authority assumed the role as the manager of environmental assets rather than an owner (Machado, 2013). Everyone has a right to an ecologically balanced environment. On the other hand, the duty to protect it rests with the whole community, insofar as it is their responsibility and within their power to defend it. But it was directly incumbent upon the Public Authority to ensure environmental conditions and control activities or business ventures that could compromise the quality of the environment, as had been outlined in Module 1.

4.3.2 *The National Environmental Policy and the National Environmental System*

Law No. 6.938/1981 is one of the key foundations of Environmental Law. This provision established the National Environmental Policy and the National Environmental System. Its goal is the “preservation, improvement, and recovery of environmental quality conducive to life, seeking to ensure conditions, within Brazil, for socioeconomic development, the interests of national security, and to protect the dignity of human life” (Art. 2). The inland, surface, and groundwaters were deemed environmental resources (Article 3), they are therefore part of the environmental protection system created by this legislation.

The protection of water is incorporated into the principles of this policy, both in the quality factor (Art. 2, sections I to IX), as well as the quantitative sense. Art. 2, section II, uses the term “rationalization of water use”, which allows an interpretation that incorporates both of these aspects.

This provision established a complex institutional system that was designed to ensure environmental assets, known as the National Environmental System (SISNAMA) (Art. 6 of Law 6.938/1981 and Art. 3 of Decree No. 99.274/1990). SISNAMA is a network of government agencies and institutions, at various levels of the Brazilian Federal Government, that was implemented to protect the environment (Antunes,

2012; Milaré, 2015). Its structure consists of the following agencies (Art. 6 of Law 6.938/1981, and Art. 3 of Decree nº 99.274/1990):

higher body: the Government Council, with the function of advising the President of the Republic in the formulation of the national policy and in the government guidelines for the environment and environmental resources;

consultative and deliberative body: the National Environmental Council (CONAMA), with the purpose of advising, studying and proposing guidelines to the Governing Council on governmental policies for the environment and natural resources and to make decisions, within its powers, on provisions and standards that are compatible with an ecologically balanced environment and are essential to the healthy quality of life;

central body: Ministry of the Environment, as federal body, responsible for planning, coordinating, supervising, and controlling national policy and governmental guidelines established for the environment;

executing bodies: the Brazilian Institute for the Environment and Natural Resources – IBAMA and the Chico Mendes Institute for Biodiversity Conservation – Instituto Chico Mendes, established to execute and enforce government policy and guidelines set for the environment, according to their respective jurisdictions;

Sectional Bodies: the state agencies or entities responsible for rolling out programs, projects, and for the control and inspection of activities capable of causing environmental degradation;

Local Bodies: municipal agencies or entities responsible for the control and supervision of these activities in their respective jurisdictions.

These bodies and entities, to the extent of their competence, will be responsible for establishing and coordinating the implementation of public policies aimed at improving environmental quality, which certainly includes water.

CONAMA is a collegiate and decision-making body, whose jurisdiction is established in Art. 8 of Law No. 6.938/1981 and Art. 7 of Decree No. 88.351/1983. Its duties include the establishment of provisions, criteria and standards related

to controlling and maintaining the quality of the environment, aimed at the rational use of environmental resources, particularly water resources”(Art. 8, VII). CONAMA is responsible for regulating the framework of waters and the conditions and standards of effluent discharge (see CONAMA Resolutions No^s 357/2005, 370/2006, 396/2008, 397/2008 and 410/2009 and 430/2011).

The Ministry of the Environment (MMA), the body that replaced the Secretariat of the Environment of the Republic (Law No. 7.735/1989), had its competence regulated by art. 1 of Annex 1 of Decree No. 8.975/2017, which was repealed by Decree No. 9672/2019. Up to the time that Decree No. 8.975/2019 was issued, the MMA was not only responsible for SISNAMA, an authority that was maintained by the decree, but also for the coordination of SINGREH. Decree No. 8.975/2019 transferred the area of water resources and its institutional structure to the Ministry of Regional Development. The MMA actively worked on implementing and coordinating public policies to protect water resources and to promote access to water. This agency is responsible for SISNAMA. For example, the Fresh Water Program has established a permanent public policy for access to quality water for human consumption, through the implementation and management of desalination systems for brackish waters, and salt pans in the Brazilian semi-arid region. Video 14 exhibits this program in detail.

Watch:

Video 14: *Learn about the Freshwater Program.*

IBAMA has its jurisdictions expressed in art. 1 and 2 of MMA Ordinance n° 341/2011. Its attributions include: the power of environmental police through monitoring and enforcing environmental administrative infractions, including those that

affect water resources; the environmental licensing of federal jurisdiction (Complementary Law 140/2011); and environmental monitoring and control. IBAMA can work together with state environmental agencies, as is the case of the Pilot Project for Monitoring and Deforestation and Inspection of the Atlantic Forest and Cerrado, in the Rio Grande and Piracicaba, Capivari and Jundiá Basins, carried out jointly with the state environmental agencies of Minas Gerais and São Paulo. This project foresees the joint monitoring of the conditions of the basin by means of satellite images.

ICMBIO has its powers specified in Art. 1 of Law No. 11.516/2007. Its core mission is to protect the natural heritage, and promote social, and environmental development through the administration of the Federal Conservation Units (CUs) (Art. 1 of Law 11.516/2007). ICMBIO manages 335 UCs spread over all Brazilian biomes, several of which correspond to areas of water relevance, as is the case of the Iguaçu National Park.

To see where the Federal CUs are located, click here

ONLINE

The states and municipalities are responsible for defining their administrative bodies for environmental control, and their collegiate structures for environmental management.

4.3.3 The National Environmental Policy and the Instruments for Environmental Protection

The National Environmental Policy has introduced a legal structure of instruments for environmental protection, that are designed to guarantee environmental quality, and place conditions on the exercise of economic activities. Art. 9 defines the following environmental management instruments:

- I – the establishment of environmental quality standards;
- II – environmental zoning;
- III – environmental impacts evaluation

IV - licensing and review of effective or potentially polluting activities;

V – incentives to produce and install equipment, and the creation or absorption of technology aimed at improving the environmental quality;

VI - the creation of territorial spaces specially protected by the federal, state, and municipal public authorities, such as areas of environmental protection, of relevant ecological interest and extractive reserves;

VII – the national system of environmental information;

VIII – Federal Technical Registry of Activities and Instruments for Environmental Defense;

IX – disciplinary or compensatory penalties for non-compliance with the measures required to preserve or correct environmental degradation.

X – instituting the Environmental Quality Report, which will be published annually by the Brazilian Institute of Environmental and Renewable Natural Resources - IBAMA;

XI - the guarantee of the provision of information related to the Environment, the Government being obliged to produce them, when they do not exist;

VI – the Federal Technical Registry of Potentially Polluting Activities and/or Users of Environmental Resources;

XIII – economic instruments, such as forest concession, environmental servitude, environmental insurance, among others.

As for water, examples include the establishment of environmental quality standards, environmental zoning, environmental impact assessment, licensing, the creation of protected territorial areas and the national environmental information system. As previously stated, CONAMA is responsible for assuring that the environmental standards for the quality for water are met, in an effort to establish environmental standards.

Environmental zoning, the evaluation of environmental impacts, licensing, and protected territorial spaces are instruments that have a direct influence on shaping land use and occupation, and impose restrictions on this occupation, in order to protect the environment from non-compliant uses, according to their vulnerability or potential risks.

4.3.4 *Environmental Zoning*

Environmental zoning, also known as Ecological-Economic Zoning (EEZ), was regulated by Decree No. 4.297/2002 and corresponds to an “instrument involving territorial organization” that must be “followed when implementing public and private plans, works and activities” (Art. 2 of the above cited decree). Its intent is to establish “environmental protection measures and standards devised to ensure environmental, water and soil quality, and the conservation of biodiversity, guaranteeing sustainable development and improving living conditions for the population” (Art. 2). It has been adopted by several States to characterize portions of the territory, considering their environmental vulnerability or implementation for certain uses, such as, for example, zoning for coastal areas, the viability of developing agriculture or industry, etc. The federal level includes the Ecological-Economic Macro-zoning (MacroZEE) for the Legal Amazon, approved by Decree No. 7.378/2010.

4.3.5 *Environmental Impact Evaluation*

Environmental impact evaluations are conducted through the drafting of environmental studies, which were defined by CONAMA Resolution No. 237/1997, Art. 1, III as:

any and all studies on the environmental aspects relating to the location, installation, operation and expansion of an activity or enterprise, presented as an input to the analysis of the required Permit, such as an environmental report, plan and environmental control project, preliminary environmental report, environmental assessment, management plan, degraded area recovery plan and preliminary risk analysis.

In this manner, environmental impact assessments reflect the genre of all environmental studies, including the Environmental Impact Study/ Environmental Impact Report (EIA/RIMA), provided for in Article 225, § 1, IV of the Federal Constitution and in CONAMA Resolution No. 1/1986. The EIA/ RIMA already has these attributes

for implementing business ventures, and it is applied whenever there is construction or an activity that has the potential to cause significant environmental damage. It relates to more complex evaluations, which require a multidisciplinary team to become involved. A public hearing must be held, according to CONAMA Resolutions 1/1986 and 9/1987, during the licensing processes that require the EIA/ RIMA. The meeting is intended to publicize the conclusions coming from of the technical studies and whether there are potential risks to society. In cases where there is not any potential for a significant impact, other studies (simplified studies, Project Characterization Memorandum, etc.) may be applied according to prevailing laws.

Environmental studies are part of the environmental licensing process, and the environmental agency or entity may choose the kind of study that will be applied. A significant portion of hydraulic works will be subject to these environmental studies. Moreover, CONAMA Resolution No. 1/1986 determines the EIA/ RIMA requirement for “hydraulic works intended to exploit water resources”, in cases involving an “dams for hydroelectric purposes, over 10MW, sanitation or irrigation, opening of channels for navigation, drainage and irrigation, adjusting watercourses, opening of bars and inlets, transposition of basins, dikes”. Depending on the level of complexity for the project or its vulnerability, the environmental agency or entity may request an alternate study, other than the EIA/ RIMA, if it believes that the work does not pose a significant threat for degradation.

4.3.6 *Environmental Licensing*

Environmental licensing is based on Articles 9, section IV and 10 of Law 6.938/1981, CONAMA Resolution No. 237/1997, Complementary Law No. 140/2011 and Federal Decree No. 8.437/2015, in addition to applicable state and local laws. Its most recent legal definition is found in Art. 2, I, of Complementary Law No. 140/2011, which defines it as:

the administrative procedure intended for licensing activities or ventures using environmental resources that are effectively or potentially polluting or capable, in any way, of causing environmental degradation;

This instrument is applicable in the construction, installation, expansion and operation of establishments and activities that use environmental resources, effectively or potentially polluting, or that are capable, in any way, of causing environmental degradation. Complementary Law No. 140/2011 defined the authority for licensing. It can be done at the federal, state, or municipal level according to the degree of impact, the domain of the environmental resource that will be affected, or the activity that will be performed.

The Union’s authority is expressed in Art. 7, XIV, of Complementary Law 140/2011 and in Art. 3 of Decree No. 8.437/2015. Municipalities may license the activities established in Art. 9 and XIV of the referred Law. In order to apply municipal licensing, the municipality must have a qualified environmental agency and environmental council (Art. 15, II), and the State Environmental Council must have environmental impacts defined at a local level for the activities or projects, accounting for criteria such as scale, polluting potential and type of activity (Art. 9, XIV, a). The state will have residual jurisdiction (Art. 8). The general aspects of the licensing procedure and its types of license are regulated within Articles 8 and 10, of CONAMA Resolution No. 237/1997, and in applicable state and municipal legislation.

Environmental licensing protects water in two ways. First, it controls any impacts that construction projects or ventures using environmental resources may have that are, or could be, polluting or capable of causing environmental damage. The second demands that works directly related to the water be obliged to follow this procedure. In this case, CONAMA Resolution No. 273/1997 determined whether projects such as waterways, dams, dikes, drainage canals, diverting waterways, transposing

river basins, etc. are subject to licensing. Item 22.9, of Annex I, from the IBAMA Normative Instruction No. 06/2013 included the boring and drilling of artesian wells, in its list of activities that are potentially polluting and use environmental resources.

4.3.7 Protected Territorial Spaces

Protected territorial spaces may be characterized as “public or private areas that are subject to special protection systems or, in other words, on which limitations are imposed in an effort to provide full or partial protection of their natural attributes” (Leuzinger, 2002, p. 93).

These spaces function as a way to conserve biodiversity and have a direct relationship with maintaining the native forest. They provide a series of environmental services that include the conservation of water resources and climate regulation. In this sense, video 15 demonstrates the importance of forests for water and climate.

Watch:

Video 15: *Live Volume Project:*

Where does water come from?

Directed by: Caio Silva Ferraz.

The forest's evapotranspiration in contributes to the rainfall pattern in Brazil. Studies show that the Amazon forest contributes to the water regime of the Midwest, Southeast and Southern regions, producing moisture masses that are moved via air currents. This movement of moisture mass is referred to as “*Rios Voadores*” (Flying Rivers). That relationship is studied by many researchers. Some examples include the Flying River Project, which is carried out with support from Petrobras. For more information please visit this website: <http://riosvoadores.com.br/o-projeto/>. Video 16 exhibits this project and calls attention to the importance of protected spaces and vegetation.

Watch:

Video 16: *Flying Rivers.*

Production: PETROBRAS.

The protection of forests is benefited by these protected spaces, and specific regulations, such as the case of the special regime applied to the Atlantic Forest biome that was instituted by Law No. 11.428/2003 and Decree No. 6.660/2008.

There are several different types of Protected Territorial Areas, such as: a) the national system of protected areas, based on Article 225, § 1, items I, II, III and VII, Law 9.985/2000 and Decree No. 4340/2002; b) permanent preservation areas, c) legal reserves, and d) restricted use areas, regulated by the Forest Code (Law No. 12.651/2012).

4.3.7.1 National System of Conservation Units

Law No. 9.985/2000 established the National System of Nature Conservation Units - (SNUC), consisting of all federal, state, and municipal conservation units. SNUC's objectives include the express protection and recovery of water and soil resources (Art. 4, VIII). The SNUC's management is coordinated by the Ministry of the Environment, which is the central agency, by CONAMA, which is an advisory and decision-making agency that is responsible for monitoring the implementation of the system, and by IBAMA and ICMBio, which are the executing agencies that perform the “role of implementing the SNUC, to subsidize proposals for the creation and management of federal, state, and municipal conservation units, in their respective spheres of activity” (Art. 6, III).

Art. 2, item I, of Law No. 9.985/2000, defines protected areas as follows:

I – conservation unit: territorial space and its environmental resources, including jurisdictional waters, with relevant natural attributes, legally established by the Public Authority, with objectives for conservation

and defined limits, under a special administration system in which the proper guarantees for protection apply;

Protected areas are divided into two groups: fully protected areas, and sustainable use areas.

Full-protection units are used to keep the ecosystems free of changes caused by human interference, only permitting the indirect use of natural attributes (Amado, 2015). This group is composed of the following categories, which, according to the type, may be in the public or private domain:

- Ecological station: “intended to preserve nature and to conduct scientific research” (Art. 9 of Law No. 9.985/2000). Public Domain
- Biological Reserve: “devised to carry out the full preservation of biota and other natural assets that are within its borders, without direct human interference or environmental modifications, except for recovery measures for its ecosystems that have been altered, and management actions needed to recover and preserve the natural balance, biological diversity, and natural ecological processes” (Art. 10 of Law 9.985/2000). Public Domain
- National Parks: “their primary objective is to preserve natural ecosystems that have major ecological relevance and scenic beauty, allowing scientific research to be conducted along with educational activities and environmental interpretation, with recreation that maintains contact with nature and ecological tourism” (Art. 11 of Law 9.985/2000). Public Domain.
- Natural Monument: “its basic objective is to preserve rare natural sites that are singular, or sites with great scenic beauty” (Art. 12 of Law 9.985/2000). Public or Private Domain.
- Wildlife Refuge: “seeks to protect natural environments that ensure conditions for the existence or reproduction of species or

communities from the local flora, and the resident or migratory fauna” (Art. 13 of Law 9.985/2000). Public or Private Domain.

Exploitation is permitted within sustainable use units, as long as it is done in a way “to ensure the sustainability of renewable environmental resources and ecological processes, maintaining biodiversity and other ecological attributes, in a socially equitable and economically viable manner”, according to Art. 2, XI of Law 9.985/2000. These units are classified into:

- Environmental Protection Area: “a generally extensive area with a certain degree of human occupation, containing abiotic, biotic, aesthetic or cultural traits that are particularly important for the quality of life and well-being of human populations, and its primary purpose is to protect biological diversity, regulate the occupation process and ensure sustainability in the use of natural resources” (Art. 15 of Law 9.985/2000). Public or Private Domain.
- Area of relevant ecological interest: “a generally small area with little or no human occupation, having extraordinary natural features or that serves as a home to rare examples of the regional biota, and is intended to maintain natural ecosystems with regional or local importance, and regulate the permissible use of these areas in an effort to make it compatible with nature conservation goals” (Art. 13 of Law 9.985/2000). Public or Private Domain.
- National Forest: “an area with a forest cover that features predominantly native species, and its essential purpose is the multiple sustainable use of forest resources and scientific research, with an emphasis on methods for the sustainable exploitation of native forests” (Art. 17 of Law 9.985/2000). Public Domain.
- Extractive Reserve: “an area used by traditional extractive populations, whose livelihood is based on extractivism and, in a complementary manner, on subsistence farming and small-

scale animal husbandry. Its basic objective is to protect the ways of life and culture of these populations, and ensure that the area's natural resources are used in a sustainable manner" (Art. 18 of Law 9.985/2000). Public Domain.

- Fauna Reserve: "is a natural area populated by native, terrestrial or aquatic, resident or migratory animal species, conducive for technical and scientific studies on the sustainable economic management of fauna resources" (Art. 19 of Law 9.985/2000). Public Domain.
- Sustainable Development Reserve: "a natural area that shelters traditional populations, and whose existence is based on sustainable systems for exploiting natural resources, developed over generations, adapted to local ecological conditions, and which play a fundamental role in protecting nature and maintaining biological diversity" (Art. 20 of Law 9.985/2000). Public Domain.
- Private Natural Heritage Reserve: "a private area, recorded with perpetuity, seeking to conserve biological diversity" (Art. 21 of Law 9.985/2000). Private Domain.

The protection areas are created through an act by the Federal Government (Art. 22) and must include a management plan approved by the relevant environmental agency, within five years after its creation (Art. 27). The management plan is "the technical document by which [...] establishes its zoning and the provisions that should govern the use of the area and the management of natural resources, including the implementation of the physical structures that may be required for environmental management" (Art. 2, XVII of Law 9.985/2000). This document must include restrictions on the use and occupation of a Conservation Unit.

With the exception of environmental protection areas (APA), and the private natural heritage reserve (RPPN), conservation units will include a buffer zone for their protection, that corresponds to the surrounding areas of a conservation unit, and

entails restrictions on human activities in an effort to minimize impacts on the unit. These areas must also establish ecological corridors corresponding to portions of natural or semi-natural ecosystems, that permit linkages between conservation units, allowing for the flow of genes, biota movement, the dispersal of species, recolonization of damaged areas, and maintaining populations (Art. 2, XIX of Law 9.985/2000).

As a way to promote the integrated management of conservation units, mosaics were established (Art. 26 of Law 9.985/2000 and Art. 8 to 10 in Decree 4340/2002), corresponding to: "areas where a set of conservation units, whether or not they are distinct categories, that are close, juxtaposed or overlapping and other public or private protected areas are located" (Art. 26). These areas are certified through an act by the Ministry of the Environment, at the request of the management agencies for the conservation units, and should be connected by ecological corridors.

Disallocating or reducing the limits for a Conservation Unit can only be done through a specific law. Activities or projects that are conducted in the Conservation Units are also regulated by ICMBio Normative Instructions Nos. 4/2009 and 5/2009, in addition to CONAMA Resolution No. 428/2010. This resolution stipulates the specific procedures that need to be complied with, in the sphere of licensing, involving significant environmental impacts that may affect a conservation unit or its buffer zone. State and municipal conservation units need to observe the applicable state and municipal statutes.

4.3.7.2 *The Forest Code*

The Forest Code was enacted through Law No. 12.651/2012 and regulated by Decree Nos. 7.830/2012 and 8.235/2014, as well as MMA Normative Instruction No. 2/2014. This statute establishes three specific forms of protected territorial spaces: the permanent preservation areas, legal reserves, and restricted use areas.

**RECOMMENDED ARTICLES
FOR FURTHER READING**

**3, 4, 6, 7, 8, 10, 11, 11-A, 12, 13, 61-A, 61-B,
64, 65, 66, 67 and 68 of Law 12.651/2012.**

**RECOMMENDED READING:
NEW FOREST CODE
COMICBOOK**

**Production: State Department
of Bahia.**

Permanent Preservation Areas

The areas of permanent preservation (APP) take place in rural and urban areas, and were established by Art. 3, II, of Law No. 12.651/2012 as follows:

“protected area, whether covered by native vegetation or not, with the environmental function of preserving water resources, landscape, geological stability, and biodiversity, facilitate gene flow of fauna and flora, protect soil and ensure the well-being of human populations;

These areas have been listed in Art. 4 of that law. The requirement for their protection is linked

to the presence of certain geographical conditions, requiring vegetation to be maintained in order to protect the environmental role of these areas. The presence of water resources or wetlands is a factor that creates an obligation to maintain APP areas. These areas can be classified into three categories: those related to inland wetlands, coastal wetlands and relevant situations (Milaré, 2015).

The New Forest Code also established administrative APPs, dealing with areas that are covered with forests or other forms of vegetation that were declared APP, through an act by the Chief Government Authority, because they serve one of the specific purposes listed in Art. 6 of Law 12.651/2012. In this case, the Chief Government Authority will not exercise legislative activity. That executive can only identify, mark and declare that a certain area will be deemed to have a social interest for the purpose of permanent preservation (Milaré, 2015). Table 16 demonstrates these two types of APPs, those linked to specific natural and administrative aspects, and when they occur.

Table 16: APPs types set forth in the Forest Code

Permanent Preservation Areas (APP) art. 4° of Law 12.651/2012	
<p>Art. 4 considers Permanent Preservation Areas, in rural or urban areas, for the purposes of this Law as:</p> <p>I - the marginal strips of any natural perennial and intermittent watercourse, ephemeral excluded, from the edge of the regular bed [...];</p> <p>II - the areas surrounding the lakes and natural lagoons [...];</p> <p>III - the areas around artificial water reservoirs due to the damming or impounding natural waterways [...];</p> <p>IV - the areas around springs and water holes [...];</p> <p>V - hillsides or portions of them having a slope of over 45°, equivalent to 100% in the line of a higher slope;</p> <p>VI - sandbanks for dune fixation or as a stabilizer of marshes;</p> <p>VII - the entire strip of mangroves;</p> <p>VIII - the edges of flat tableland, starting at the break in relief, in a strip no less than 100 meter in horizontal projections;</p> <p>IX – on hilltops, hillsides, mountains and ridges, with a minimum height of 100 (one hundred) meters and an average slope greater than 25°, the areas delimited from the contour corresponding to 2/3 (two thirds) of the minimum height of elevation in relation to the base, which is defined by the horizontal plane determined by the adjacent plain or water surface or, in the corrugated reliefs, by the height of the saddle point closest to the elevation;</p> <p>X – areas at a height of 1,800 (one thousand eight hundred) meters, no matter what type of vegetation there is;</p> <p>XI - in palm swamps [...].</p>	
	Inland wetland areas
	Along river banks
	Surrounding lakes and natural ponds
	Artificial water reservoirs
	Around springs and water holes
	Palm swamp shores
	Coastal wetland areas
	Mangroves
	A slope of over 45°
	Sandbanks
Administrative APPs (Art. 6 of Law 12.651/ 2012)	
	Situations of Terrain Relief
	Edges of ridges or plateaus
	Hilltops
	Altitudes higher than 1,800 meters
	Areas subject to erosion, floods and landslides
	Protection of salt marshes and palm swamps
	Protection of wetlands
	Species of endangered fauna and flora
	Sites with exceptional beauty or that feature scientific, cultural or historical value
	Edges of roads and railways
	Public wellbeing
	Defense of the national territory

Source: Forest Code, Prepared by Villar, 2018.

In the case of the APPs established in Article 4, their existence depends solely and exclusively on whether there is a geographical condition in place. If these geographic features occur (river, lake, reservoir, spring and water holes, palm swamps, mangroves, slopes of more than 45°, salt marshes, edges of flat tableland, hilltops and altitudes above 1,800m) the owner is responsible for maintaining a strip of vegetation or to rebuild it according to the

parameters set forth in Art. 4 of Law 12.651/2012. Even if the area has already been cleared, they are still required to be restored. The obligation to maintain the APP is an effective right, and it is passed on to the successor when there is a transfer of ownership or possession of a rural property (Art. 1, § 2 and Art. 7, § 2).

In turn, the existence of administrative APPs is formed through a determination and creation by

the Executive Branch, and it must be based on the situations provided for in Article 6.

According to Article 8 of Law 12.651/2012, intervention and suppression within PPAs areas can only take place in cases involving a public utility, social interest and low environmental impact. Article 2, VIII, IX and X of Law No. 12.651/2012 respectively defines each of these situations. CONAMA Resolution No. 396/2000, which regulated the matter under the former Forest Code, has been considered repealed. Law No. 12.651/2012 had not transferred this authority in the cases of public utility and social interest, and in the case of low impact, all the situations stipulated have already been incorporated in article 2, section X, of the new Forest Code (Milaré, 2015).

In an effort to promote the legalization of rural properties, the new Forest Code created an exception to the recovery parameters in the APPs, set forth in Art. 4th, for cases involving consolidated rural areas. These areas were defined as follows by Art. 3, IV: “rural property area occupied by humans before July 22, 2008, with buildings, improvements or agroforestry activities, authorizing the adoption of a set-aside system in the latter case.” If the area fulfills the requirements - pre-existing occupation on 07/22/2008 and maintenance of agroforestry activities - the maintenance and recomposition parameter of the APP ranges will be reduced and guided by the arts. 61-A and 61-B.

The Forest Code also acknowledged the possibility of an urban consolidated APP, defined as that “referred to in section II of the *caput* of Art. 47 of Law 11.977 dated July 7, 2009” (Art. 3, XXVI). Despite the repeal of Art. 47, through Law No. 13.465/2017, the consolidated urban area is considered to be an item that meets the following criteria (see Art. 16-C, § 2 of Law 9.636/1998).

- The following is included in the urban perimeter or urban area by the master plan or by specific municipal law;

- Equipped with an implanted road system and paved roads;
- Organized into blocks and predominantly erected lots;
- Its use is mostly urban, characterized by buildings that are residential, commercial, industrial, institutional, mixed or focused on providing services; and
- At least three of the following pieces of urban infrastructure equipment are present:
 - a) rainwater drainage network;
 - b) sewage system;
 - c) supply of drinking water;
 - d) electrical energy distribution; and
 - e) urban cleaning, collection and management of solid waste.

The consolidated urban APPs did not garner as much prominence as rural ones in Law No. 12.651/2012, and their treatment is restricted to what is contained in Arts. 3, XXVI, 64 and 65.

Legal Reserve

Another instrument for the protection of forests, which has an impact on water resources in the face of the relationship between water and vegetation, provided for in the Code, is the institute of the Legal Reserve, defined by art. 3, III, as:

an area located within a rural property or rural possession, delimited under the terms of art. 12, serving to ensure the sustainable economic use of the natural resources from the rural property, while helping to conserve and rehabilitate ecological processes and promote biodiversity conservation, in addition to sheltering and protecting wildlife and native flora.

The Legal Reserve only applies in rural areas and serves an economic function. This is done so that the area can be exploited through a Sustainable Forest Management Plan that is approved by the relevant environmental agencies. While serving an economic role, it also has an environmental duty. According to article 14 of Law No. 12.651/2012, its location

must take the following factors into account: i) the guidelines of the river basin plans, making sure that the instruments interact with the water policy; ii) Ecological and Economic Zoning; iii) the formation of ecological corridors with other protected areas, like a Legal Reserve, Permanent Preservation Area, with a Conservation Unit, so there is direct interaction with the SNUC; iv) areas that have significance importance for the conservation of biodiversity; and v) areas that are most fragile environmentally. Like the APPs, maintaining a legal reserve represents an effective right (Art. 1, § 2 and Art. 66, § 1).

Article 12 in the Forest Code specifies that all rural property must have the Legal Reserve defined without impairing the application of rules on Permanent Preservation Areas, noting the following minimum percentages related to the property area, except for the cases provided in Art. 68, of the previously mentioned code:

Art. 12. All rural property must maintain an area covered by native vegetation, under the title of a Legal Reserve, without impairing the application of provisions on Permanent Preservation Areas, noting the following minimum percentages related to the property area, except for the cases provided in Art. 68 of this Law:

I - if located in the Legal Amazon:

- a) 80%, in the property located in a forest area;
- b) 35%, in the property located in a savanna;
- c) 20%, in the property located in area of general fields;

II - if properties are located in other regions of Brazil: 20%

As can be seen, the Legal Reserve percentage required varies according to the Brazilian region. In the Legal Amazon area, this percentage can range from 20% to 80% of the property. For properties located in the Legal Amazon, line a, section I, the legal reserve area may be reduced to up to 50% in the cases established in Art. 12, § 4 and § 5 and in Art. 13, I. If marked by ecological economic zoning, the Legal Reserve can be expanded by up to 50% to comply with

biodiversity protection or greenhouse gas emission reduction targets (Art. 13, II).

According to Art. 12, Legal Reserve areas will not be required to be constituted in public water supply and sewage treatment projects (§6); in areas acquired or expropriated by a concession or permit holder, or someone authorized to exploit hydraulic power potential, where activities related to electric power generation, substations or electricity transmission and distribution lines are being operated (§7); and in areas acquired or expropriated for the purpose of implementing and expanding the capacity of highways and railways (§8).

Art. 15 of the referred law allows the permanent preservation areas to be computed in the calculation of the Legal Reserve as long as they meet the following criteria:

I - the benefit established in this article does not imply the conversion of new areas for alternative land use;

II - the area to be computed is preserved or in the process of being recovered, according to proof of ownership to the state agency that is part of Sisnama; and

III - the owner or possessor has requested to include the property in the Environmental Rural Registry – CAR, under the terms of this Law.

Another innovation coming from the Code was the establishment of Consolidated Areas in Legal Reserve Areas (Arts. which corresponds to those properties that, on July 22, 2018, possessed percentages of a Legal Reserve that were lower than those instituted by Art. 12.

In this case, the Code established conditions and recovery parameters that were different from those set out in Article 12. Article 66 determines how this recovery will happen, which may include planting up to 50% of exotic species in the area, as well as using one of the compensation possibilities of the reserve, provided for in § 5,

Art. 66. The owner or holder of rural property that, on July 22, 2008, held a stretch of a Legal Reserve area under what was established in Art. 12, will be able to regulate

their status regardless of adhesion to the PRA, solely or jointly adopting the following alternatives:

- I – restoring a Legal Reserve;
- II – allowing the natural vegetation to regenerate in the Legal Reserve area;
- III – compensating the Legal Reserve

§ 1 The obligation set forth in the *caput* has a true nature and is transmitted to the successor in the event that ownership or possession of the rural property is transferred.

§ 2 The restoration referred to in item I of the *caput* should comply with the criteria stipulated by the relevant Sisnama agency, and be completed in up to 20 (twenty) years, covering every 2 (two) years at least 1/10 (one tenth) of the total area required for its complementation.

§ 3 The restoration cited in item I of the *caput* may be performed through the interspersed planting of native tropical or fruit trees in an agroforestry system, complying with the following parameters:

- I - exotic or tropical species that are planted should be combined with native species that naturally occur in the region;
- II - the area that is restored with exotic or tropical species may not exceed 50% (fifty percent) of the total area to be reclaimed.

§ 4 The owners or possessors of the property who choose to restore the Legal Reserve according to § 2 and § 3 will be entitled to its economic exploitation, according to this Law.

§ 5 The compensation referred to in item III of the *caput* must be preceded by the property's registration in the CAR and may be made through:

- I - acquiring an Environmental Reserve Quota – CRA;
- II - leasing an area under the environmental services or Legal Reserve system;
- III - donating to the State an area within a public Conservation Unit pending the regularization of land tenure;
- IV - registering an equivalent area exceeding the size of the Legal Reserve in a property belonging to the same owner or in an acquired property belonging to a third party, with established native vegetation, vegetation in a state of regeneration or re-composition, as long as it is located within the same biome.

§ 6 The areas to be used for compensation in the form of § 5o must:

- I - be equivalent in extension to the area of the Legal Reserve to be offset;
- II - be located in the same biome Area as the Legal Reserve to be offset;
- III - if outside the State, be located in areas identified as priorities by the Federal Government or by the states.

§ 7 The definition of priority areas cited in § 6 will seek to promote, among other things, the restoration of excessively deforested river basins to create ecological corridors, to conserve large protected areas, and to preserve or recover threatened ecosystems or species.

§ 8 - In the case of public real estate, the compensation referred to in item III of the *caput* may be made by granting a real right of use or donation, by the legal entity under public law owning a rural property that does not have a sufficient Legal Reserve, to the public body responsible for the Conservation Unit of the area located within the Public Domain Conservation Unit, to be created or pending land title regularization.

§ 9 The compensation measures set forth in this article can not be used as a way of having new areas converted for alternative land use.

Lastly, Articles 67 and 68 established exceptional situations that allow the owner to maintain legal reserve percentages that are lower than those established in Art. 12. The exception provided for in article 67 applies to properties with up to four hectares that had remaining native vegetation, on July 22, 2008, but had legal reserve deficits. The exception to Article 68 aims to protect the rural landowner who followed the law of the time of deforestation of the legal reserve.

Restricted Use Areas

The Forest Code was an innovative step that created a new category of protected space, known as restricted use areas, which include the following areas:

- Pantanal and Other Wetlands: “ecologically sustainable use is allowed, as long as technical recommendations of official research entities are taken into account, and the removal of

native vegetation is authorized by the state environment agency” (Art. 10);

- Areas with a slope between 25° and 45°: “sustainable forest management, agricultural, ranching and forestry activities are allowed, including the necessary physical infrastructure, as long as best agronomic practices are applied. Conversion of new areas is not allowed, except in cases of public utility and social interest “(Art. 11);
- salt flats and salt pans: can be used in shrimp and salt plan activities, provided that the following requirements are met: a) “total area occupied in each State doe not exceed 10% of this type of phytophysognomy in the Amazonian biome and 35% in the rest of the Country [...] “; (b) “safeguarding the absolute integrity of shrubby mangroves and the essential ecological processes associated with them, as well as their biological productivity and nursery condition of fish stocks”; c) licensing of the activity and facilities by the state environmental agency, known as IBAMA and, in the case of use of marine land or other assets belonging to the Union, prior regularization of the entitlement by the Union; d) adequate collection, treatment and disposal of effluents and waste; f) guarantee that water and soil quality is maintained, respecting the Permanent Preservation Areas; and (g) respect for the traditional survival activities of local communities (Art. 11-A, § 1).

4.3.8 *National Environmental Information System – SINIMA*

The National Information System for the Environment - SINIMA is set forth in Art. 9, VII, of Law No. 6.938/198 and was regulated by Art. 11, II, of Decree No. 99.274/1990. The Ministry of the Environment is responsible for its maintenance, and its primary mission is to integrate and facilitate information being shared among the SISNAMA

member agencies. MMA Ordinance No. 160/2009 determines that the Ministry of the Environment’s Information Policy is based on the construction and maintenance of SINIMA as a conceptual platform, based on integrating, sharing or adding to information between the various existing systems within the National Environmental System. Therefore, this system should seek to integrate environmental data as well as related systems, such as the National Water Resources Information System (SNIRH) and the Groundwater Information System (SIAGAS).

4.4 **Urban Territorial System and the Water**

Urban spatial planning is under the authority of the municipalities, as established in Art. 30, VIII, of the Federal Constitution. This urban development policy must plan the city’s development and ensure the population’s well-being (Art. 182 of the Federal Constitution). According to the Federal Constitution, the key instrument for development and urban expansion is the master plan, mandatory for cities with with a population of over 20,000 inhabitants; those in metropolitan regions and urban concentrations, where the Municipal Government intends to use the instruments provided for in the 4th paragraph of Art. 182 in the Federal Constitution; those in tourist locations placed in areas that have business or other activities that may have a significant national or local environmental impact, included in the national register of Municipalities with areas susceptible to the occurrence of impactful mudslides, sudden floods or correlating geological or hydrologic processes. (Art. 182, §§ 1 and 4 of the Federal Constitution and Law No. 10.257/2001, Art. 41). This instrument is responsible for defining the social role of urban property.

In addition to the Federal Constitution, the following laws offer guidelines for implementing this municipal ordinance: Law No. 6.766/1979, which outlines the Urban Land Parceling and provides other Provisions; Law 10.257/2001, which establishes

the general urban policy guidelines, known as the City Statute; and Law 11.977/2009, which discusses the “*Minha Casa, Minha Vida*” (My house, My Life) Program and the landholding regularization of settlements located in urban areas. Also included is the Metropolis Statute (Law 13.089/2015), which establishes guidelines for the planning, management and execution of public duties that are in the common interest of metropolitan regions and in urban concentrations instituted by States, general provisions on the plan for integrated urban development and other instruments related to interdepartmental governance, and criteria for the Union’s support for measures that involve this governance in the field of urban development.

Law No. 6.766/1979 established some environmental restrictions on urban land parceling. Article 3 prohibits urbanization on swamplands that are subject to flooding, in contaminated areas, on land with a slope of 30% or more, in areas where geological conditions are not suitable for building, ecological preservation areas or where there are no proper sanitary conditions available due to pollution. This standard also established a non-building strip of 15m along running and sleeping waters and public domain strips of highways and railways (art. 4, III). However, its focus was putting regulations in place for housing development and subdivision projects, without being concerned with comprehensive city planning.

In return, the City Statute brought the concern to encourage municipalities to develop a policy and urban reform. Some of the general guidelines instituted in Article 2 include the right to sustainable cities; democratic management; urban development planning, spatial distribution of the population and economic activities in order to avoid and correct distortions in urban growth and their negative effects on the environment; the management and control of land use in order to prevent pollution and environmental degradation; land regularization and urbanization of areas occupied

by low-income populations; the production and consumption patterns of goods and services and urban expansion compatible with the limits of environmental sustainability; and the protection, preservation and recovery of the natural and built environment, cultural, historical, artistic, landscape and archaeological heritage.

Ensuring rights to sustainable cities is a major milestone that embodies the principle of a right to an ecologically balanced environment. This principle unfolds in seven other rights: the right to a) urban land, b) housing, c) environmental sanitation, d) urban infrastructure, e) transportation and public services, f) labor and g) leisure, for present and future generations. several instruments are proposed to achieve this right:

- Municipal planning instruments: a) master plan; b) regulations for the parceling, use and occupation of the land; c) environmental zoning; d) multi-annual plan; e) budget guidelines and annual budget; f) participatory budget management; g) sectoral plans, programs and projects; h) plans for economic and social development;
- Tax and financial instruments: a) taxes on built property and urban land - IPTU; b) contribution of improvement; and c) incentives and tax and financial benefits;
- Legal and political instruments: a) expropriation; b) administrative servitude; c) administrative limitations; d) seizing ownership of real estate or urban fixtures; e) establishment of conservation units; f) establishment of special social interest zones; g) concession of effective right of use; h) granting a special use for housing purposes; i) compulsory subdivision, construction or use; j) special adverse possession of urban property; l) surface right; m) right of preemption; n) onerous grant for the right to build and change usage; o) transfer of the right to build; p) urban consortium operations; q) landholding regularization; r) free technical and legal

assistance to disadvantaged communities and social groups; s) popular referendum and plebiscite; t) urban demarcation for land regularization purposes; u) legitimation of tenure, and VI - previous environmental impact study (EIA) and prior study of neighborhood impact (EIV).

These instruments contribute to water protection through prescribing urbanization planning and allowing restrictions to be enacted on the use and occupation of sensitive areas like water sources, the regularization of areas that do not have adequate infrastructure, especially pertaining to sanitation; directing the city to more consolidated areas, removing the pressure from rural or environmentally sensitive areas, or further conditioning new developments to comply with specific obligations for environmental protection. As can be seen, several environmental instruments were inserted as urban policy instruments, such as environmental zoning, conservation units and prior environmental impact studies. One environmental instrument that is not included in this list but has become mandatory for urban property after the publication of Law 12.651/2012 is the maintenance of permanent preservation areas (Art. 4).

These instruments are available to municipalities to incorporate the water issue into their municipal land use plans. Municipal urban policy can positively or negatively transform the relationship between water resources and land use planning. Video 17 demonstrates how the urbanization process for the city of São Paulo significantly contributed to the degradation of water resources.

Watch:

Video 17: “Entre Rios”

(Between Rivers)

Directed by: Caio Silva Ferraz.

As a constitutional entity in charge of territorial planning, the municipality plays a prominent role in protecting water resources. So much so that SINGREH and the State Water Resources Management Systems and the Federal District must support them in adopting the guidelines contained in the basin plans (see Art. 6 of CNRH Resolution 15/2001).

Adopting City Statute instruments can contribute to this mission. As a counterpoint to the *Entre Rios* Documentary, the new master plan of São Paulo sought to include some instruments that seek to have a more harmonious relationship with the waters.

For more information on the master plan’s potential for water resource protection, watch:

Video lesson 6:

*The São Paulo Master Plan
and the instruments to promote
water management in the city
by Prof. Kazuo Nakano.*

Lastly, although the Metropolis Statute does not specifically mention water resources, it does bear the concept of interdepartmental governance, which is defined as the “sharing responsibilities and measures between Federal entities in terms of organizing, planning and executing public functions that have a common interest” (Art. 2, IV). The coordinated and joint efforts between states and metropolitan areas is vital for implementing the basin plan recommendations, as well for confronting the challenges related to water management in these areas. Supplying water to high concentrations of the population and managing the sewage that is generated are particularly sensitive in metropolitan areas.

4.5 Basic Sanitation and Water Resources

Basic sanitation in Brazil is handled by the National Sanitation Policy (Law No. 11.445/2007) and its regulation, Decree 7.217/2010. Article 2, I of Law No. 11.445/2007 defines sanitation as a set of services, infrastructures and operational facilities that:

a) supply drinking water and comprising the activities involved in the availability, maintenance, infrastructure and facilities required for the public supply of drinking water, from the catchment to connections to buildings and their instruments for measuring;

b) provide sewage systems and comprising the activities involved in the availability and maintenance of the proper infrastructure and operational facilities for the collection, transportation, treatment and providing the proper disposal of sanitary sewage, from the land connections to its final disposal for producing reusable water or its final discharge into the environment;

c) urban cleaning and solid waste management, and comprising the activities involved in the infrastructure and operational facilities for the collection, transportation, transshipment, treatment and final destination of household solid and urban cleaning waste;

d) drainage and management of urban rainwater, and comprising the activities involved in the infrastructure and operational facilities for draining rainwater, the transportation, holding or retention in order to absorb flood flows, the treatment and final disposal of drained rainwater, including the cleaning and preventive monitoring of systems.

Water resources are not part of the public basic sanitation services (Art. 4 of Law 11.445/2007 and Art. 18 of Decree No. 7.217/2010), so its use depends on the concession of water resources (Art. 4, single paragraph in Law No. 11.445/2007 and Art. 20 of Decree No. 7.217/2010). The urban supply sector is considered to be a sector that uses water resources and should be set in the Basin Committees and Councils of Water Resources (Art. 14, line “a” of CNRH Resolution No. 5/2000). Work carried out for this service should take the sustainable use of water into account (Art. 18, single paragraph of Decree No. 7.217/2010).

The supply of drinking water and sanitary sewage are directly related to the water: the supply accounts for one of the major usages of water, while the discharge of waste is one of the primary causes of its pollution. The physical losses of supply systems for drinking water are a challenge that need to be confronted by service providers in order to ensure water security for the population. The numbers in

Brazil related to losses reach 70% and reach up to 80%, while levels that are considered appropriate vary between 10% and 15%. With the scarcity of water that threatens many regions, there is no point in failing to maintain networks and waste treated water. On the other hand, sewage system losses are unknown and can compromise the water quality of aquifers, resulting in serious environmental damage.

The drainage and management of urban rainwater is critical to preventing floods, and can become a source of diffuse pollution, especially if there are irregular sewage connections in the system. Urban clean-up and adequate solid waste management contribute to avoiding water pollution from solid waste and tailings.

The fundamental principles of basic public sanitation services that are listed in Art. 3 of Law No. 11.445/2007 expressly convey the idea of the linkage between water and sanitation, as can be deduced from items III, VI, XII and XIII:

III – water supply, sewage networks, street cleaning and solid waste management performed in a manner that attends to public health and environmental protection;

VI – coordination with urban and regional development, housing and poverty eradication policies, environmental protection, health promotion and other relevant social interest policies aimed at improving the quality of life, for which basic sanitation is a determining factor;

XII – integration of infrastructures and services with the efficient management of water resources; and

XIII – combating water loss while encouraging its rational consumption by users and promoting energy efficiency, the reuse of sanitary effluents and the use of rainwater.

Therefore, the National Sanitation Policy acknowledges the relationship between sanitation and the environment, sanitation and water, and the need to further coordination between these policies, as well as integrating their infrastructures and services with water management. Also, in Title I - Preliminary Provisions, Chapter IV of Decree

No. 7.217/2010 provides terms for the relationship between public services involving basic sanitation and water resources and expressly acknowledges the convergence between these systems (see Arts. 18 to 21).

For more information about the relationship between water resources and sanitation, watch:

Video lesson 7:

*The connection between
Water Resources and Basic
Sanitation: Economic
Impacts and Governance
by Prof. Maria Luiza Machado Granziera.*

Article 45 requires urban buildings to be connected to a public water supply and sewage systems, and that they be subject to pay for the service. The second paragraph of that article establishes that “the building water system connected to the public water supply network can not be supplied by other sources”. The lack of a concession and the prohibition brought by this article have served as a basis for capping several illegal wells in the States located in the urban area equipped with a water network infrastructure. By contrast, this Article could encourage the already high illicitness of well users in urban areas.

Article 46 of Law No. 11.445/2007 and Art. 21 of Decree No. 7.217/2010 deal with rationing situations caused by water shortages or contamination declared by the water resources management authority. Art. 46, single paragraph, allows ANA, regardless of domain, to recommend a restriction or interruption in the use of water resources, and the priority of use for human consumption and for animals. These articles allow the regulator to adopt contingency tariff mechanisms, in a way that ensures the financial stability of the service, or to manage demand.

Basic sanitation is the responsibility of the Municipalities and the Federal District (Art. 8, A),

and this service can be provided directly by the Government or delegated to the a private party through an administrative contract that is preceded by a bidding process, except in cases outlined in Art. 10, § 1 of Law 11.445/2007. The duties of the sanitation service provider include:

- I – drafting plans for sanitation, under the terms of this Law;
- II – directly providing or delegating the provision of services;
- III – establishing the entity responsible for the regulation and surveillance of public sanitation services and the procedures for its functioning, subject to the provisions of § 5 of Art. 8, A;
- IV – defining the parameters that will be adopted for ensuring essential services to public health, including the minimum per capita volume of water for public supply, according to national standards for the quality of drinking water;
- V – establishing the rights and duties of users;
- VI – setting mechanisms and procedures in place for social control, as outlined in section IV of the *caput* in Art. 2;
- VII - implementing an information system about public sanitation services, in conjunction with the National Information System for Basic Sanitation - SINISA, the National Information System for Solid Waste Management - SINIR and the National Water Resources Management System, observing the methodology and frequency established by the Ministry of Cities; and
- VIII – intervening and resuming operations of the delegated services when indicated by the regulatory entity, in the cases and under the conditions set forth in the legislation and in the contracts.

Sanitation plans should be compatible with water resources plans (Art. 19, § 3 of Law No. 11.445/2007 and Art. 19 of Decree No. 7.217/2010). Its minimum content is prescribed in Art. 19 of Law No. 11455/2007 and in Art. 25 of Decree No. 7.217/2010. In addition to this, information on sanitation services must be coordinated with the National Information System for Basic Sanitation - SINISA, the National Information System for Solid

Waste Management - SINIR, and the National Water Resources Management System.

The National Information System on Basic Sanitation is a database that contains information and suggestions on the provision of Water and Sewage services, Urban Solid Waste Management and Drainage and Urban Rainwater Management. This information is submitted annually by the service providers of water, sewage, municipal solid waste, and urban rainwater. It is divided into three components: Water and Sewage (SNIS-AE), Solid Waste (SNIS-RS), and Rain Water (SNIS-AP). For further information, click on the site: <http://www.snis.gov.br/>.

The National Information System for Solid Waste Management, SINIR is one of the instruments for the National Solid Waste Policy (PNRS) established by Law No. 12.305 of August 2, 2010, and regulated through Decree No. 7.404 of December 23, 2010. For further information, visit the site at: <http://sinir.gov.br/>.

Articles 48 and 49 of Law No. 11.445/2007 established the guidelines and objectives in the Federal Sanitation Policy. These guidelines point out that planning for sanitation measures should adopt the river basin as a reporting unit and strive to improve environmental and health conditions. The objectives also include the mitigation of environmental impacts related to the sector. One of the primary instruments in the Federal Policy is the National Sanitation Plan, the National Plan for Basic Sanitation (Plansab), which was published in December of 2013, with the approval of seven state ministries (Cities, Farm, Civil House, Health, Planning, Environment and National Integration). Interministerial Ordinance No. 571 institutes basic sanitation guidelines, goals and measures for the country over the upcoming 20 years (2014-2033).

Plasab is available to be reviewed

ONLINE

4.6 Agriculture and Water

Water is a key element in agricultural productivity, and a lack of this vital resource compromises or limits agriculture. Therefore, the Federal Constitution, the Land Statute (Law no. 4.504/1964), the Agrarian Policy (Law no. 8.171/1991), the National Irrigation Policy (Law 12.787/2013) and the Forestry Code (Law No. 12651/2012) were all put in place to establish points of convergence between the output of agricultural activity and the conservation of natural resources that assure production.

The concern for the environment within rural properties received constitutional forms. Article 186 placed conditions on fulfilling the social role of rural property to complying with the following requirements:

- I – rational and appropriate use;
- II – appropriate use of the available natural resources, and preservation of the environment;
- III – compliance with the provisions governing labor relations;
- IV – utilization which favors the well-being of the proprietors and laborers.

Hence, the proper use of natural resources (which include water) and environmental preservation are prerequisites for the social purpose of the property. Failure to comply with these criteria allows the property to be seized for agrarian reform purposes (Art. 184 of the Federal Constitution).

Requirements for the proper use of natural resources, as an integral component of the social purpose of property, were already covered in Art. 2 of Law No. 4.504/1964:

Art. 2 Everyone is entitled to the opportunity to have access to land ownership, conditioned by their social purpose in the manner provided in this Law.

§ 1. Land ownership fully carries out its social function when, simultaneously:

- a) it favors the welfare of the owners and laborers who work there, as well as of their families;

- b) it maintains satisfactory levels of productivity;
- c) it ensures the conservation of natural resources.

Art. 20, III, of the Land Statute allowed the expropriation of properties that refused to put into practice the norms of conservation of natural resources. The importance of access to water or related infrastructure construction was brought up as one of the concerns in the colonization projects (Art. 61, § 4, b) and in the national and regional agrarian reform plans (Art. 89).

Law No. 8.171/1991, which provides for agricultural policy, included an interest in managing natural resources in its preconditions and objectives. This provision is based on the assumption that natural resources are used and managed by agriculture and “tied to the provisions and principles of public interest, so that the social and economic role of property is fulfilled” (Art. 2, a). Art. 3, section IV, determines that the agricultural policy is intended “to protect the environment, ensure rational use, and stimulate the recovery of natural resources.”

This policy set a specific chapter for the protection of the environment and the conservation of water resources (chapter VI). In this sense, Article 19 states that:

Art. 19. The Public Authority must:

- I – incorporate in the preservation of the environment and conservation of natural resources at the level of the Federal Government, the States, the Federal District, the Territories, the Municipalities and the communities;
- II – discipline and supervise the rational use of land, water, fauna and flora;
- III – implement agro and ecological zoning to establish criteria for regulating and planning the spatial occupation by various productive activities, as well as for installing new hydroelectric plants;
- IV – promote and/or encourage the revival of areas in the process of desertification;
- V – develop both formal and informal environmental education programs directed to population;
- VI – promote the production native species of seeds and seedlings;

VII – coordinate programs that motivate and encourage the preservation of water sources and the environment, along with the use of animal waste for conversion into fertilizers.

Single Paragraph. The control and rational use of the natural resources from the environment is also the responsibility of the rightful owners, the beneficiaries of the agrarian reform and the temporary occupants of the rural properties.

Art. 19, single paragraph, included rural landowners in the duty to control and supervise over natural resources. The holder or owner of rural property is obliged to comply with the environmental provisions related to the rational use of natural resources, which includes water. Combating desertification is also a joint obligation of the owners and the State (Art. 21), along with erosion control (Art. 102, single paragraph), because the land was considered to be part of the country’s natural heritage. Art. 23 is responsible for the companies or concessionaires of electric energy that exploit dammed water through environmental changes that cause and impose the obligation to remedy any damages.

As is the case with water and sanitation policy, agricultural policy also adopted the river basin as the basic planning unit for the use, conservation and recovery of natural resources (Art. 20). To have environmental protection reinforced, the Public Authorities must include it as criteria for granting services or resources, as well as implementing multi-annual programs and annual operational plans for this purpose (Art. 22 and 26).

Agricultural policy measures and instruments specifically refer to the need for agricultural planning (Art. 4, I); protection of the environment, conservation and recovery of natural resources (Art. 4, IV) and irrigation and drainage (Art. 4, XV). When discussing water, irrigation and drainage are also important aspects. They are regulated by Art. 84 and 85 of Law 8.171/1991 and by Law No. 12.787/2013, which establishes the National Irrigation Policy.

Law No. 12.787/2013 revoked the following Laws Nos. 6.662/1979 and 8.657/1993 and Decree Laws 2.032/1983 and 2.369/1987. Interaction with waters is covered several times. In this respect, the National Irrigation Policy adopted the following principles: the sustainable use and management of soils and water resources for irrigation (Art. 3, I); integration with sectoral policies on water resources, the environment, energy, environmental sanitation [...], prioritizing projects that permit multiple uses of water resources (Art. 3, II); and the prevention of rural water-borne endemic diseases (Art. 3, V). Its objectives include an incentive to expand the irrigated area and increase productivity on an environmentally sustainable basis.

In addition, the following National Irrigation Policy instruments should be mentioned: Irrigation Plans and Projects (Art 5, I), the National Information System on Irrigation (Art. 5, II) and the certification of irrigation projects (Art 5, VIII).

Irrigation Plans and Projects were devised to “serve as guidance for the planning and implementation of the National Irrigation Policy, in line with the Water Resources Plans” (Art. 6). As such, these plans must follow the guidelines of the water resources plans when the contents of these plans are prepared. They should include information on, for example, water availability, prioritization of river basins for implementing these projects; designation of crops and recommended irrigation systems according to the particularities of the basin, etc.

The National Information System on Irrigation, outlined in articles 8, 9 and 10, is a computerized database “for the collection, processing, storage and retrieval of information on irrigated agriculture” (Art. 8). This system must register, for example, “irrigated areas, harvested crops, the irrigation methods used and the technological level of activity” (Art. 8, I); “the inventory of water resources and hydrological information of river basins” (Art. 8, II); and data on agro-climatology (Art. 8, IV).

The law does not expressly state that it must be coordinated with the SNIRH. However, considering

that its basic principles include institutional cooperation and unified coordination, there is an urgent need to tighten communication between these systems. ANA has even published an Irrigation Atlas as a way to provide technical grounds with information on irrigated agriculture and its interface with water resources. Video 18 offer more information on the topic.

Watch:

Video 18: *The Irrigation Atlas: Water Use in Irrigated Agriculture.*

Production: ANA

Certification for Irrigation Projects (Art. 19) involves the certification of public and private irrigation projects and parceled out units of Public Irrigation Projects regarding the quantitative and qualitative aspects associated with water and irrigation technology. The Federal Executive Branch establishes the authorized public agency and certification criteria. This instrument has not yet been regulated.

Certification for water related projects comes from the Sustainability Assessment of the Project Certificate, issued by the National Water Agency (ANA), established in Decree No. 4.024/2001, for water infrastructure projects that have a value equal to or greater than R\$ 10,000,000.00 (ten million reais).

Irrigation projects are subjected to environmental licensing when required by specific federal, state, district or municipal legislation (Art. 22) and the use of water resources depends on receiving prior grants for the rights to use water, conceded by the authorized federal agency or state, according to the domain of the water to be exploited.

4.6.1 Forest Code and Agricultural Properties

In addition to maintaining and restoring permanent preservation areas and legal reserves, the Forest Code placed an obligation on rural landowners to register in the Rural Environmental Registry

and, if the property has environmental liabilities, to adhere to the Environmental Regulation Programs (PRAs). Moreover, the Support and Incentive Programs for the Preservation and Recovery of the Environment had been established in order to encourage environmentally responsible behavior.

4.6.1.1 The Rural Environmental Registry – CAR and Environmental Regularization Programs

The Rural Environmental Registry is associated with the National Environmental Information System – SINIMA, and managed by the Rural Environmental Registration System - SICAR (Art. 3 of Decree 7.830/2012). SICAR and CAR, according to Art. 2 of Decree 7.830/2012, can be defined as follows:

I – The Rural Environmental Registration System – SICAR – a nationwide electronic system for managing environmental information on rural properties;

II – Rural Environmental Registry - CAR - a nationwide electronic registration linked to the relevant environmental agency under the National Environmental Information System – SINIMA. It is required for all rural properties in order to integrate environmental information on rural properties and possessions, forming a database for control, monitoring, environmental and economic planning and combating deforestation.

Registration is regulated through Arts. 29 and 30 of Law No. 12.651/2012 and Arts. 5 to 8 of Decree No. 7.830/2012. This is an obligatory instrument for all rural properties, and is one of the conditions for the legalizing ownership and granting a series of benefits provided by law, such as: implementing aquaculture activities in the APP area (Art. 4, paragraph 6, IV); dispensing the registration of the legal reserve in the real estate registry (Art. 18, § 4); computing the APP area in the legal reserve (Art. 15); transacting the legal reserve surplus (Art. 15, § 2) or adhere to the PRAs (Art. 59, § 2), which are fundamental for the environmental legalization of the property.

In addition to being illegal, non-compliance with the CAR can result in several issues for the owner.

These include: revoking access to rural credit (Art. 78-A), blocking access to vegetation suppression authorizations and other licenses (Art. 12, § 3), as well as restrictions on joining support programs and payments for governmental environmental services (Art. 41, § 3). A lack of registration could also be considered an administrative infraction by state regulations.

The Environmental Regularization Programs were addressed in Arts. 59 and 60 of Law No. 12.651/2012 and Arts. 9 to 19 in Decree No. 7.830/2012 and regulated by Decree No. 8.235/2014. These programs include “the set of actions or initiatives that are to be carried out by rural land holders and owners in order to adapt and promote environmental regularization” in permanent preservation areas, a Legal Reserve or a restricted use area, which can be done through recovery, recomposition, regeneration or compensation measures (Arts. 2 and 9 of Decree 8.235/2014). The owners who adhere to the PRAs by signing the Term of Commitment can take advantage of a series of benefits related to environmental responsibility, like having administrative sanctions and punishments for crimes related to the unlawful suppression of vegetation in Permanent Preservation, Legal Reserve and restricted use areas suspended. Once the terms of the commitment are fulfilled, punishment is repealed and administrative fines are converted into environmental services. If they are implemented well, the CAR and PRAs have the potential to be used as way to promote the compatibility of agricultural activity with the environment, which will provide obvious benefits to water resources, especially since many of the APPs are connected to water resources.

4.6.1.2 Support and Incentive Program for Environmental Preservation and Recovery

This program is provided for in art. 41 of Law No. 12.651 and is aimed at encouraging best practices in the field and reducing environmental impacts. Three strategies are defined to make this happen: payment for environmental services, compensation and incentives for commercialization and innovation, and the acceleration of vegetation recovery measures.

Payment for environmental services is defined as a compensation instrument where environmental service providers are paid by the beneficiaries of these services (Guedes and Seehusen, 2011). The law (Art. 41, I) defined it as an instrument to provide monetary retribution for actions dedicated to the conservation and improvement of ecosystems and that manage the following environmental services:

- a) the sequester, conservation, maintenance and increase of the stock and decrease of carbon flow;
- b) the conservation of natural scenic beauty;
- c) the conservation of biodiversity
- d) the conservation of water and water services;
- e) regulating the climate;
- f) cultural appreciation and traditional ecosystem awareness;
- g) the maintenance and improvement of the soil;
- h) maintaining Permanent Preservation Areas, Legal Reserves and restricted use areas;

As seen above, water conservation was expressly included among the environmental services to be protected. The recovery of Permanent Preservation, Legal Reserves and restricted use Areas can benefit from these programs, as well as the owners located in the buffer zones of Fully Protected Conservation Units (Art. 41, § 4 and 6). These programs must show preference to family farmers.

Video 19 explains the idea of environmental services, also known as ecosystem services, and how they are valued in order to permit payments for environmental services. Video 20 illustrates an initiative from an environmental services program related to the recovery of water resources, organized by ANA.

Watch:

Video 19: *Valuation of Ecosystem Services: Class of Values.*

Production: Conservation Strategy Fund

Watch:

Video 20: *Water Producer Program.*

Production: ANA.

The compensation instrument (Article 41, II) is based on attaining special conditions, like: securing credit and agricultural insurance in improved market conditions; a deduction in Permanent Preservation, Legal Reserve and restricted use Areas based on the calculation of the Tax on Rural Territorial Property – ITR; lines of financing for preservation; and tax exemptions for raw materials and equipment. In addition to this, Art. 41, II, line “d”, establishes that part of the funds collected from charging a fee for the use of water must be earmarked to the maintenance, recovery or recomposition of the Permanent Preservation, Legal Reserve and restricted use Areas within the basin where the revenue is generated.

Finally, Art. 41, III, establishes the incentives for commercialization, innovation and acceleration of the recovery, conservation and sustainable use of forests and other forms of native vegetation, which include preferential participation in programs to support agricultural production sales and allocating resources for scientific and technological research and rural extension.

4.7 Energy and Water

The National Energy Policy is regulated by Law No. 9.478/1997, but the provision is focused on the oil sector at the expense of the power complex that makes up the Brazilian energy grid. Figure 25 shows the domestic supply of electricity in Brazil. As can be seen, the electric grid in Brazil comes predominantly from renewable sources, emphasized by hydropower, which accounts for 65.2% of the supply (EPE, 2018). Therefore, problems related to water shortages can compromise the country’s energy security, either due to lack of water for the turbines or by jeopardizing the production of biomass.

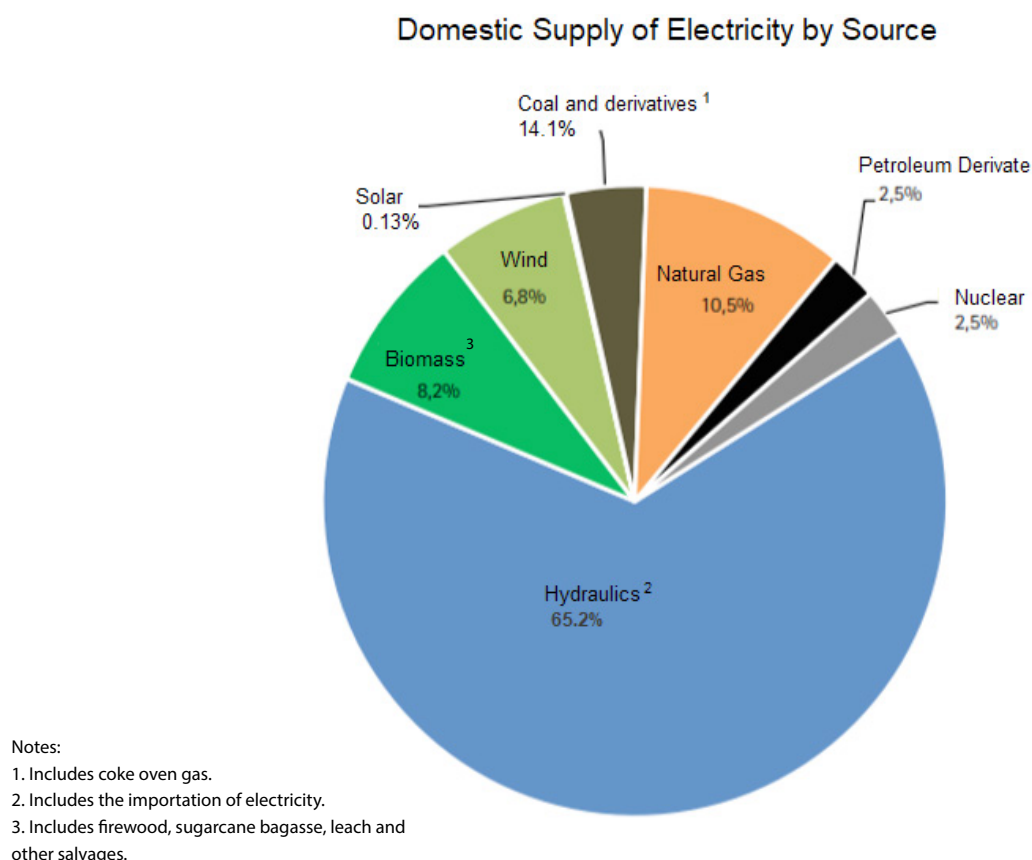


Figure 25: Domestic Supply of Electricity by Source

Source: EPE, 2018, 16

The energy policy includes environmental protection (Art. 1, IV), along with incentives for alternative energy generating sources, particularly biofuels and biomass (Art. 1, VIII, XII, XIII and XIV).

Also, part of the energy sector is required to pay compensation or interests to the Union, State, Federal District and Municipalities, arising from the use of water resources for generating electric energy and mineral resources (Art. 20, §1, of the Federal Constitution, Art. 1 of Law No. 7.990/1989, Arts. 48, 49 and 50-F of Law No. 9.478/1997).

In addition to distributing interests to States or Municipalities who produce, are confronted by or are affected by the loading and unloading of fuel, the petroleum sector is required to allocate part of the royalties from production to the Ministry of Science

and Technology to finance programs that support scientific research and technological development, which includes the prevention and recovery of damages caused to the environment as a result of this industrial sector (Art. 49, items I and II, lines “d” and “f” respectively, and Art. 50-F). In the case of the pre-salt areas contracted under the concession system, a portion of the royalties that is the direct responsibility of the Union will be earmarked for a fund that includes environmental protection and mitigation and adaptation efforts pertaining to climate change (Art 49, § 3 and Art. 50-F).

Hydroelectric generation is required to pay a Financial Compensation for the Use of Water Resources (CFURH) as restitution for the use of river water and for the expropriation of areas needed to form reservoirs (Law No. 7.990/1989). The National

Electric Energy Agency (ANEEL) manages the collection and distribution of revenue among the beneficiaries: States, Municipalities and agencies under the Direct Administration of the Union.

The hydroelectric plants collect 7% of the value of energy produced as Financial Compensation (FC). The total amount to be paid is calculated using a standard formula: $FC = 7\% \times \text{power generated in the month} \times \text{Current Reference Rate} - \text{TAR}$. The TAR is set annually through an ANEEL Resolution. The 0.75% percentage is transferred to the MMA to implement the National Water Resources Policy and the National Water Resources Management System. The remaining 6.25%, as established by Law No. 8.001/1990, as amended by Laws No. 9.433/97, No. 9.984/00, No. 9.993/00, No. 13.360/16 and No. 13.661/18, are allocated in the following manner: 65% of the funds earmarked for municipalities affected by the reservoirs from the hydroelectric plants, and 25% to the States. The Union receives the remaining 10%, divided between the Ministry of the Environment (3%); the Ministry of Mines and Energy (3%) and the National Fund for Scientific and Technological Development (4%), administered by the Ministry of Science, Technology and Innovation. Hydroelectric ventures categorized as Small Hydropower Plants are exempted from the collection of Financial Compensation under Law No. 9.427, dated December 26, 1996 (ANEEL, 2018).

A portion of the funds from the CFURH are directly applied to the management of water and environmental resources, contributing to the implementation of the National Water Resources Policy.

In addition to these impacts, the energy sector is broadly regulated by environmental legislation, energy facilities, especially those related to the oil and gas, thermoelectric and hydroelectric power chain, are subject to the environmental licensing process (Annex I of CONAMA Resolution No. 237/1997) and are on the list of activities that require an Environmental Impact Study and Environmental

Impact Report be completed (EIA/RIMA) (Art. 2 of CONAMA Resolution 1/1986).

Another provision that should be pointed out is Law No. 12.334/2010, which established the National Policy for Dam Safety targeted at the accumulation of water for any use, the final or temporary disposal of tailings and the accumulation of industrial waste, and created the National Information System on Dam Safety. This policy applies directly to the hydroelectric and mining activities that have tailings ponds. Video 21 shows the uses of dams, and their impacts and risks, as well as institutional responsibilities.

Watch:

**Video 21: Dam Safety
in Brazil.**

Production: ANA.

Article 5 determines the jurisdiction for monitoring the safety of dams to the following entities:

- I – to the entity that granted the right to use water resources, subject to the area of the body of water, when the purpose is water accumulation, except for hydroelectric generation;
- II – to the entity which granted or authorized the use of the hydraulic potential, in the case of a predominant use for the purpose of hydroelectric generation;
- III – to the entity granting mining rights for the purpose of final or temporary disposal of tailings;
- IV – to the entity that provided the environmental license for the installation and operation intended for disposing industrial wastes.

ANA and the state water resources management agencies have the authority to monitor the dams related to section I. ANEEL is responsible for the inspection of dams for hydroelectric generation purposes. The ANM/DNPM will be responsible for oversight in the case of tailings ponds from mining. In case of item IV, IBAMA or the environmental agency responsible for the licensing will hold jurisdiction.

These powers do not preclude monitoring activities by the environmental agencies that are part of SISNAMA.

Faced with the potential risk for a rupture or leakage in these structures, the supervisory agency (Art. 5) is required to immediately report “to the National Water Agency (ANA) and the National Civil Defense System (SINDEC) any non-compliance involving an immediate safety risk or any accident that occurs in dams” (Art. 16, § 1). CNRH Resolution No. 143/2012 is responsible for establishing the overall criteria for classifying dams via risk status, associated potential damage and reservoir volume.

The National Information System on Dam Safety (SNISB), instituted through Article 13 of Law No. 12.334/2010, was established in order to collect, store, treat, manage and provide information related to dam safety throughout Brazil. The supervisory agencies and the entrepreneurs will submit data on the dams under their jurisdiction to ANA, who must aggregate this information in order to prepare an Annual Report on Dams, as well as to facilitate the unified management of Brazilian dams. The SNISB was regulated by Resolution No. 144/2012 CNRH.

For further information on the topic, see:

Neves, L. P. Segurança de Barragens – ONLINE
**Legislação federal brasileira em segurança
de barragens comentada. Brasília, 2018.**

In addition to these requirements, the Agricultural Policy (Law No. 8.171/1991) decides on the responsibility of electric power utilities for environmental changes. In this sense, Article 23 states that:

Art. 23. Companies that economically benefit from exploiting accumulated waters and electric power

utilities will be responsible for the environmental changes they cause and are required to restore the environment in the area covered by their respective river basins.

Hydropower generation triggers environmental impacts in the river basin. This includes impacts on its geomorphology, the water quality and normal ecosystem conditions, affecting local fauna and flora (Guerra and Carvalho, 1995). These damages appear at the time of construction, but also arise when the energy system is running. As such, several hydroelectric plants have sought to compensate for these damages through monitoring and campaign programs.

For example, there is the Itaipu Binacional’s Cultivating Good Water Program, which was awarded by the UN to incorporate and apply Sustainable Development Goals (SDGs) in the Paraná hydrographic basin, in a comprehensive and integrated manner, with the participation of a broad network of partners. Video 22 offers more details on this program. The Itaipu Hydroelectric Plant is located on the Paraná River, and its construction became feasible after the signing of the Treaty of Itaipu in 1973 between Brazil and Paraguay. This treaty permitted the Hydroelectric usage of Water Resources on the Paraná River, jointly belonging to both Countries, from and including the Salto Grande de Sete Quedas or Salto de Guaíra to the Foz do Rio Iguaçu. Figure 26 shows the Sete Quedas region, which was flooded during the construction of the plant.

Watch:

**Video 22: Cultivating Good Water
Program.**

Production: ITAIPU



Figure 26: Salto de Sete Quedas Region
Source: Images courtesy of Maria de Lourdes Souza Badona.
Date: 1/26/1975

All energy production has some impacts, but hydropower and other alternative renewable sources have been recognized as more sustainable than fossil fuels, especially because of greenhouse gas emissions, which are responsible for the phenomenon of climate change. The National Policy on Climate Change, regulated by Decree 7.390/2010, emphasizes that investments in the expansion of renewable energy are one of the strategies employed to increase energy efficiency and to meet targets for reducing these gases.

4.8 Climate and Water

Climate change is defined as a significant statistical variation in an average climatic benchmark (including its natural variability) that persists over an extended period (typically a few decades or longer). In abstract terms, climate change can be caused by natural processes, and there were in fact major variations in the Earth's climate in the past, such as the glacial periods. However, there is increasing acceptance that the recent change in temperature patterns is caused by human activities that release greenhouse gases and have interfered in

the equilibrium of the climate. (IPCC, 2014). Video 23 explains the phenomenon of the greenhouse effect, while video 24 and 25 present the natural and anthropogenic causes that contribute to the greenhouse effect.

Watch:

Video 23: *Greenhouse Effect.*

Production: Brazilian Space Agency (AEB) and National Institute for Space Research (INPE).

Watch:

Video 24: *Global Environmental Change.*

Production: AEB and INPE

Watch:

Video 25: *Natural Climate Change*

Production: AEB and INPE

Shifting climatic conditions are directly linked to waters. Climate change generally tends to change the global rainfall system, as well as generating a boost in extreme phenomena such as floods and droughts that cause serious impacts to water-dependent sectors and territories. Videos 26 and 27 put these issues into context and depict scenarios related to climate changes, while video 28 presents their effects on water sources.

Watch:

Video 26: *Future Climate Change Scenarios.*

Production: AEB and INPE.

Watch:

Video 27: *Impacts of climate change in Brazil and Worldwide.*

Production: AEB and INPE.

Watch:

Video 28: *Water and climate change.*

Production: ANA.

As a way to address this scenario, the National Policy on Climate Change (PNMC), instituted by Law No. 12.187/2009 and regulated by Decree No. 7.390/2010, provides support to the National Environmental Policy. This policy was enacted after the end of the COP 15 – the 15th Session of the Conference of the Parties, held by the UNFCCC – United Nations Framework Convention on Climate Change in Copenhagen, Denmark. The PNMC is directly related to the commitments made by Brazil in the international instruments on the subject: the United Nations Framework Convention on Climate Change, the Kyoto Protocol and, more recently, the Paris Agreement.

For more information on the Paris Agreement and its developments in the field of energy and water, watch:

Video lesson 8:

Paris Agreement, Renewable Energy and Water Security by Prof. Sara Gurfinkel Marques de Godoy.

The PNMC's goals are established in Art. 4 of Law 12.187/2009 as follows:

I – to reconcile economic and social development with the protection of the climate system;

II – to reduce the anthropogenic emissions of greenhouse gases in relation to their distinct sources;

III – [\(VETOED\)](#);

IV – to strengthen the anthropogenic removals by sinks of greenhouse gases in the national territory;

V – to set measures for promoting climate change adaptations through the three spheres of the Federal Government, with the participation and collaboration of economic and social actors or beneficiaries, particularly those vulnerable to their adverse effects;

VI – to preserve, conserve and recover environmental resources, with particular attention paid to the major natural biomes considered to be National Heritage;

VII – to consolidate and expand legally protected areas and encourage reforestation and to restore vegetation cover in damaged areas;

VIII – to induce the development of the Brazilian Emission Reduction Market – MBRE.

With regard to its guidelines, Art. 5 lists them as:

I – the commitments made by Brazil to the United Nations Framework Convention on Climate Change, the Kyoto Protocol and other documents on climate change to which it has undersigned;

II – the actions taken to mitigate climate change that are aligned with sustainable development, which are, wherever possible, measurable for their proper quantification and verification afterwards;

III – the adaptation measures for reducing the adverse effects of climate change and the vulnerability of environmental, social and economic systems;

IV – the integrated strategies for mitigating and adapting to climate change at the local, regional and national levels;

V – the stimulus and support to the federal, state, district and municipal governments participation, including the productive sector, academia and organized civil society, for developing and implementing policies, plans, programs and actions related to climate change;

VI – the promotion and development of scientific and technological research, and the diffusion of technologies, processes, and practices aimed at:

a) mitigating climate change through a reduction of anthropogenic emissions via sources and strengthening of anthropogenic removals by sinks of greenhouse gases;

b) reducing uncertainties in future national and regional climate change projections;

c) identifying vulnerabilities and taking appropriate adaptation measures;

VII – to use financial and economic instruments for encouraging climate change mitigation and adaptation actions, complying with the provisions of Art. 6;

VIII – the identification, and its connection with the Policy provided for in this Law, of established governmental instruments that are capable of contributing to protecting the climate system;

IX – supporting and promoting the activities that effectively reduce emissions or promote removals by sinks of greenhouse gases;

X – the promotion of international bilateral, regional and multilateral cooperation for the financing, training, development, transfer and diffusion of technologies and processes for setting up mitigation and adaptation actions, including scientific research, systematic observation and exchanging information;

XI – improving the accurate and system-wide observation of the climate and its manifestations in the national territory and nearby ocean areas;

XII – publicizing information, education, training and public awareness on climate change;

XIII – encouragement and support for the maintenance and promotion of:

a) practices, activities and technologies to lower emissions of greenhouse gases;

b) sustainable patterns of production and consumption,

The PNMC, as seen above, establishes the planning standards for mitigating and adapting to the phenomenon of climate change. To fulfill the

proposed goals and guidelines, Art. 6 established the following instruments:

I – the National Plan on Climate Change;

II – the National Fund on Climate Change;

III – the Action Plans for Deforestation Prevention and Control in the biomes

IV – Brazil's National Communication to the United Nations Framework Convention on Climate Change, according to the criteria established by this Convention and its Conferences of the Parties;

V – resolutions by the Interministerial Commission on Global Climate Change;

VI – tax policies to encourage a reduction in emissions, and the removal of greenhouse gases, including differentiated tax rates, exemptions, compensations and incentives, to be established in a specific law;

VII – specific lines of credit and financing of public and private financial agents;

VIII – the development of a research pipeline by funding agencies;

IX – specific appropriations for measures on climate change in the Federal Government's budget;

X – financial and economic mechanisms for mitigating climate change and adapting to the effects of climate change that exist under the context of the United Nations Framework Convention on Climate Change and the Kyoto Protocol;

XI – national financial and economic mechanisms relating to mitigation and adaptation to climate change;

XII – existing or future measures that boost the development of processes and technologies contributing to the reduction of emissions, adaptation and removal of greenhouse gases, among which is establishing preference criteria in public bids and competitions, including public-private partnerships and the authorization, permission, grant and concession for the exploitation of public services and natural resources for proposals that provide more energy, water and other natural resources savings and reduce the emission of greenhouse gases and waste;

XIII – registries, inventories, estimates, assessments and any other studies on greenhouse gas emissions and their sources, based on information and data provided by public and private entities;

XIV – promotional, educational and awareness-raising measures;

XV – national climate monitoring;

XVI – sustainability indicators;

XVII – the establishment of quantifiable and verifiable environmental standards and targets for the reduction of anthropogenic emissions by sources, and removals by sinks of greenhouse gases;

XVIII – an evaluation of environmental impacts on the microclimate and macroclimatea.

The National Climate Change Plan was introduced in 2008 in order to serve as an incentive for mitigation measures aimed at reducing greenhouse gas emissions, as well as for creating conditions to cope with the impacts of global climate change (adaptation). The Plan is structured around four themes: mitigation opportunities; impacts, vulnerabilities and adaptation; research and development; and education, training and communication. Its contents can be found in:

The National Plan on Climate Change

ONLINE

The mission of the National Fund on Climate Change is to finance projects, studies and projects dedicated to reducing greenhouse gas emissions and adapting to the effects of climate change. The plan is managed by a Steering Committee chaired by the MMA Executive Secretary. Further information and public bidding notices can be found on the MMA website.

In the case of the Action Plans for the Prevention and Control of Deforestation in the biomes, the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) was launched in 2004 and was drafted by the Interministerial Permanent Working Group (GPTI), and the Action Plan for the Prevention and Control of Deforestation and Forest Fires in the Cerrado (PPCerrado), which was first released in 2009.

The PPCDAm, introduced in 2004, was drafted by the Interministerial Permanent Work Group (GPTI), constituted in 2003 through Decree s/n of July 3 in order to contain an increase in Amazon deforestation. The document and the phases of these plans can be found at:

The document and the phases of these plans can be found at:

ONLINE

Following the experience gained through the development of the PPCDAm, the first version of the PPCerrado was released in 2009.

The base document can be found in:

*Action Plan for the Prevention
and Control of Deforestation and
Forest Fires
in the Cerrado - PPCerrado*

ONLINE

In 2010, the Action Plan for the Prevention and Control of Deforestation in Caatinga (PPCaatinga) was published.

The base document can be found in:

*The Action Plan for the Prevention and Control
of Deforestation in Caatinga (PPCaatinga)*

ONLINE

Article 7 of Law 12.187/1997 also established the following institutional instruments:

- Interministerial Committee on Climate Change: created through Decree No. 6.263/2007, and its duties are outlined in Art. 1 of the above mentioned law. Its primary role is to guide the preparation, implementation, monitoring, evaluation and dissemination of the National Plan on Climate Change.
- Interministerial Commission on Global Climate Change: instituted through a Presidential

Decree dated July 7, 1999, with the purpose of coordinating the actions of government under the United Nations Framework Convention on Climate Change and its subsidiary instruments ratified by Brazil. Its bylaws were published by Ordinance No. 533/2000.

- **Brazilian Forum on Climate Change:** a space for raising awareness and mobilizing actors to discuss the issues arising from climate change. It was established through Presidential Decree No. 3.515/2000, which was amended by Decree No. 9.082/2017. The Forum has representatives from civil society, businesses and the Public Authority.
- **Brazilian Research Network on Climate Change (Climate Network):** instituted by the Ministry of Science and Technology in 2007 with the intention of generating and publicizing awareness on climate change.
- **Coordinating Commission for Meteorological, Climatology and Hydrology Activities - CMCH:** enacted by Decree No. 6.065/2007, it corresponds to a collegiate body that is part of the basic structure of the Ministry of Science and Technology. Its attributions were defined in art. 1 of that decree. Its duties include putting together a proposal of the National Policy of Meteorology and Climatology and the National System of Meteorology and Climatology, and linking meteorology, climatology and hydrology activities with the National Water Resources Management System and the environment, seeking to share the uses of infrastructure, resources and databases.

In its Article 12, the PNMC set a goal for reducing gases that cause global warming. Thus, the country has adopted a voluntary commitment to reduce between 36.1% and 38.9% its projected emissions by 2020. The projected emissions for 2020 were regulated by Decree No. 7.390/2010. The article 5 specifies that this projection is of 3,236 million tonCO₂eq which are distributed among the sectors as follows:

I - Land Use Change 1,404 million tonCO₂eq;

II - Energy: 868 million tonCO₂eq;

III - Farming and Ranching: 730 million tonCO₂eq; and

IV - Industrial Processes and Waste Treatment: 234 million tonCO₂eq.

To meet this goal, Decree No. 7.390/2010, Article 6, § 1, details the following actions:

I - eighty percent reduction in annual deforestation rates in the Legal Amazon in relation to the average between 1996 and 2005;

II - eighty percent reduction in annual deforestation rates in the Cerrado Biome in relation to the average between 1999 and 2008;

III - expansion of hydroelectric supply, supply of alternative renewable sources, notably wind power plants, small hydropower plants and bioelectricity, biofuels supply, and increased energy efficiency;

IV - recovery of 15 million hectares of degraded pastures;

V - expansion of the crop-livestock-forest integration system in 4 million hectares;

VI - expansion of non-till practice in 8 million hectares;

VII - expansion of biological nitrogen fixation in 5.5 million hectares of cultivated areas, replacing the use of nitrogen fertilizers;

VI - expansion of forest plantations in 3 million hectares;

IX - expansion of the use of technologies to treat 4.4 million m³ of animal waste; and

X - increase in the use of charcoal from planted forests, in the steel industry, and improvement of the efficiency of the carbonization process.

Note that these actions are focused on combating deforestation, increasing the share of renewable energy in the Brazilian energy grid, and interventions in agricultural practices. The monitoring for fulfilling these goals can be found in a document titled Annual Estimates of Greenhouse Gas Emissions in Brazil. The latest version of the document is available at:

*Annual Estimates of Greenhouse Gas
Emissions in Brazil.*

4.9 The Challenges of Building Water Governance in the Light of Integrated Water Resources Management

Water plays a central role in human activities and ecosystems. Policies for the environment, urban land use, sanitation, agriculture, energy and climate are all linked to water policy. In some cases this interrelationship manifests itself directly, as in the case of the environmental policy. In others, it takes place in a diffuse way and depends on specific regulations, like urban planning policies.

Because it is a key element in these sectors, the building of nexus need is necessary for achieving governability and governance. The Government has been facing some difficulties in coordinating these multiple institutional systems and their instruments. The institutional arrangements and public policies still have a very sectorized character, and this can be seen even in the water policy that has not yet fully integrated surface, underground and coastal waters. The edition of the National Water Resources Policy marks an effort to seek initiatives for the building of integrated management, but there is still much to do, either in the sense of consolidating it or integrating it with other policies.

The creation of participatory spaces between the various sectors needs to be expanded. Water, environmental and urban policies have established participatory forums, but these do not exist in other sectors, such as the energy sector.

The regulation and implementation of public policies related to water present difficulties. One example is the Rural Environmental Registry and the Environmental Regularization Programs, which face delays and problems in their implementation. These two instruments can transform the environmental reality of the countryside and benefit water resources. The institutions and instruments of the National Water Resources Policy are not yet fully operational, several basins have not yet defined their committees and agencies, or have fully applied the tools provided by law.

The national environmental, agricultural, water, energy and sanitation information systems are not working in a fully cooperative manner, although it is recognized that progress has been made in systematizing and integrating the data and information produced by each of the sectors.

Institutional coordination between the scales of governance also needs to be improved. The protection of water resources often requires the coordination of the Union, States and municipalities in order to build a management that truly encompasses the basin area. A classic example of this lack of coordination is in the integration of urban and water policy, many municipalities have not included the guidelines of water resources plans in their territorial planning norms.

The last decades have marked representative advances in the management of water resources, but the growing demand for the resource, climate variability and degradation of sources will require closer relations between water policies and the policies of the sectors that use them or are responsible for their degradation.

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