



WATER USE CHARGING IN WATER RESOURCES MANAGEMENT: A COMPARATIVE ANALYSIS BETWEEN BRAZIL AND FRANCE¹

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Abstract: The growing pressure on water resource uses has increased the importance of the economic instruments established under the Brazilian National Water Resources Policy (PNRH) as drivers of sustainable water management. Among these instruments, water use charges stand out as a mechanism aimed at recognizing water resources as an economic good, encouraging their rational use, and generating revenues for investments in water management. This article presents a comparative analysis of the water use charging systems implemented in Brazil and France. The study adopts an institutional comparative approach, using indicators such as legal and institutional dynamics, territorial coverage, planning scales, user sectors subject to charges, charging mechanisms, and revenue generated from water use charges according to the purpose of water use. The results indicate that the French model has greater institutional maturity, broader territorial coverage, and significantly higher revenue-generating capacity, as it concentrates its revenue generation on the use of water resources for effluent dilution, whereas in Brazil, charging is predominantly associated with the volume of water abstracted. The findings suggest that Brazil has significant potential to increase the effectiveness of water use charges. Strengthening governance institutions, expanding the territorial coverage of the instrument, as well as improving and broadening pollution-related indicators, are measures that could increase revenue-generating capacity and strengthen the role of water use charges as an instrument for sustainable water resources management.

Keywords: Water governance; Water resources; Economic instruments; Water use charges.

O INSTRUMENTO DA COBRANÇA PELO USO DOS RECURSOS HÍDRICOS: ANÁLISE COMPARATIVA ENTRE BRASIL E FRANÇA

Resumo: A crescente pressão sobre os usos dos recursos hídricos ampliou a importância dos instrumentos econômicos previstos na Política Nacional de Recursos Hídricos (PNRH) como indutores para a gestão sustentável da água. Entre esses instrumentos, destaca-se a cobrança pelo uso dos recursos hídricos, que busca reconhecê-los como bem econômico, incentivar seu uso racional e gerar receitas para investimentos em gestão da água. Este artigo apresenta uma análise comparativa entre os sistemas de cobrança implementados no Brasil e na França. O estudo adota uma abordagem comparativa institucional, utilizando indicadores como dinâmica legal e institucional, abrangência territorial, escalas de planejamento, setores usuários sujeitos à cobrança, mecanismos de cobrança e a arrecadação com a cobrança segundo a finalidade de uso dos recursos hídricos. Os resultados indicam que o modelo francês apresenta maior maturidade institucional, ampla cobertura territorial e capacidade arrecadatória significativamente superior, visto que concentra sua capacidade arrecadatória associada ao uso para a diluição de

¹ This article is one of the products of the Research Project linked to Call for Proposals 032/2022 of the Foundation for Research and Innovation Support of the State of Santa Catarina (Fapesc)

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efluentes, ao passo que no Brasil predomina a cobrança associada ao volume captado. Os resultados sugerem que o Brasil apresenta potencial para ampliar a efetividade da cobrança pelo uso da água. O fortalecimento das instituições de governança, a expansão territorial do instrumento, bem como, o aperfeiçoamento e a ampliação dos indicadores relacionados à poluição, constituem medidas capazes de aumentar a capacidade arrecadatória e fortalecer o papel da cobrança como instrumento de gestão sustentável dos recursos hídricos.

Palavras-chave: Governança da água; Recursos hídricos; Instrumentos econômicos; Cobrança pelo uso da água.

1 Introduction

The comparison between the French and Brazilian models of water use charging holds scientific and political relevance, as it enables an understanding of the inherent challenges involved in policy transfer across different institutional contexts. Environmental governance studies demonstrate that adopting models inspired by international experiences does not, in itself, guarantee equivalent outcomes, since factors such as administrative capacity, institutional culture, and federal structure directly influence policy implementation (Dolowitz; Marsh, 2000; Lanna, 2000; Jacobi; Sinisgalli, 2009).

Given this scenario, the following research question emerges: To what extent has water use charging in Brazil, despite being inspired by the French model, achieved levels of financial and operational consolidation equivalent to those observed in France?

Addressing this question involves analyzing multiple factors, including cultural aspects, legal and institutional differences, charging mechanisms and calculation formulas, applied unit values, instrument coverage, economic conditions of user sectors, and the institutional capacity of entities responsible for water resources management.

The objective of this article is to perform a comparative analysis of the implementation of water use charging in Brazil and France, identifying legal, institutional, economic, and operational differences that influence the effectiveness of this instrument. Specifically, the study seeks to examine the legal and institutional evolution of water resources policy and the institution of charging in both countries; compare the scope of the instrument and the user sectors subject to charges; analyze the indicators used for charging; evaluate revenue generation and its relationship to population, Gross Domestic Product (GDP), and water use purposes; and point out measures aimed at strengthening water use charging in Brazil.

2 Literature Review

Environmental economics provides an important theoretical foundation for formulating economic instruments targeted at natural resource management, particularly in situations involving common-pool resources such as water, air, and biodiversity. The absence of adequate regulatory mechanisms fosters negative externalities, resulting in inefficient use and environmental degradation (OECD, 2024).



In the case of water resources, the need to reconcile multiple uses within a context of limited supply vulnerable to pollution has driven the adoption of economic instruments in several countries, especially in Europe (Larrue; Richard, 2017; OECD, 2011). Among these experiences, a prominent example is the reform promoted by the 1964 French Water Act, which established river basin management and created the Water Agencies (*Agences de l'Eau*). The system began collecting revenue through charges on water abstractions and effluent discharges, directing these funds toward financing sanitation, environmental restoration, and improvements in water quality and availability. By combining decentralized governance, public participation, and self-sustaining financing, the French model established itself as an international benchmark and influenced reforms in numerous countries (Larrue; Richard, 2017).

In Brazil, the institutionalization of this model occurred with the creation of the National Water Resources Policy (PNRH) and the National Water Resources Management System (SINGREH), incorporating the river basin as the planning unit and water use charges as a management instrument (Brasil, 1997; OECD, 2011; Abers; Keck, 2013).

In this regard, water use charging constitutes an instrument designed to attribute an economic value to water, promote greater consumption efficiency, reduce pollution loads, and encourage the adoption of more sustainable technologies (ANA, 2014), in addition to contributing to management financing by supporting investments in sanitation, monitoring, environmental restoration, and institutional strengthening.

3 Material and Methods

This study was developed based on secondary data retrieved from official sources and specialized literature. Documents and information were gathered from French governmental institutions—including the Water Agencies and official state publications—as well as Brazilian entities such as the National Water and Sanitation Agency (ANA), delegated entities, and river basin committees, alongside national and international academic literature.

The research adopts a mixed-methods approach of a qualitative and quantitative nature, grounded in a comparative analysis of the water use charging systems in France and Brazil. This strategy allows for examining similarities and differences in the application of the same economic instrument within distinct legal and institutional contexts.

The analysis encompasses both legal and institutional aspects related to water resources management and charging implementation in both countries, as well as the practical effectiveness of the instrument. To this end, analytical indicators were grouped into three dimensions: i) water governance, covering legal and institutional aspects; ii) technical and operational aspects of



charging, including users subject to the instrument, water abstraction, and effluent dilution; and
iii) economic aspects, comprising charging mechanisms and revenue collection according to purpose and mode of use.

4 Results and Discussion

4.1 The Water Management System in France and Brazil – Synthesis of Legal and Institutional Dynamics

France is internationally recognized as a pioneer in utilizing economic instruments applied to water resources management. The legal and institutional framework of this model was established by the 1964 Water Act, which created large river basin districts corresponding to the country's main basins and established institutions responsible for management and policy financing. Under this arrangement, river basin management was consolidated alongside financial mechanisms targeted at protecting and restoring water bodies (Tucci; Hespanhol; Cordeiro Netto, 2001; Lanna, 1995).

From the 1990s onward, French water policy underwent further transformations due to European Union integration and environmental policy harmonization. A significant milestone was the Water Framework Directive adopted in 2000, which established common principles for water management across member states (Porto; Porto, 2008). Since then, the French system has been progressively refined through the incorporation of new environmental guidelines and the strengthening of water policy financing mechanisms.

In Brazil, the institutionalization of integrated water resources management occurred later and more gradually (Abers; Jorge, 2005; ANA, 2020). Beginning in the 1980s, growing concerns over environmental degradation intensified academic debates and international influences, prompting state-level reforms and policy adoption inspired by river basin management. The central legal and institutional framework in this process was Law No. 9,433/1997 (Brasil, 1997), which instituted the National Water Resources Policy (PNRH) and created the National Water Resources Management System (SINGREH).

This process was reinforced by the creation of the National Water Agency—currently the National Water and Sanitation Agency (ANA)—under Law No. 9,984/2000 (Brasil, 2000). Nevertheless, the practical implementation of statutory instruments, particularly water use charging, depended on consolidating institutional structures at both national and state levels. For this reason, unlike in France, the realization of the Brazilian model has proceeded more slowly and unevenly.



This temporal gap contributed to distinct levels of institutional maturity. While France possesses a system consolidated for over half a century, the Brazilian model remains in a phase of resistance and gradual understanding of the instrument; nonetheless, ongoing refinement and expansion are observable.

Regarding institutional dynamics in France, the National Water Council (*Conseil National de l'Eau*) stands out as a consultative body responsible for advising the government on defining water policy guidelines and fostering dialogue among various management sectors. At the major basin level, the system is structured primarily around River Basin Committees (*Comités de Bassin*) and Water Agencies (*Agences de l'Eau*) (Rogers; Hall, 2003; OIEAU, 2018).

As described in OIEAU (2018), River Basin Committees in France gradually established themselves as central policy bodies in each basin, playing a major role in defining charge rates and intervention programs for the Water Agencies. The latter perform administrative and financial functions, including revenue collection, funding environmental protection and recovery actions, and preparing and implementing the Master Plan for Water Development and Management (SDAGE). At a local scale, the 1992 Water Act provided for Local Water Commissions (*Commissions Locales de l'Eau* - CLE), tasked with developing and implementing Water Development and Management Schemes (*Schéma d'Aménagement et de Gestion des Eaux* - SAGE), which serve as local water planning instruments.

In Brazil, water governance is likewise organized as a multi-level system in which the National Council on Water Resources (CNRH) exercises normative and deliberative roles at the national level, and ANA acts as the federal agency responsible for implementing the PNRH. At the state level, State Councils on Water Resources (CERH) operate, while River Basin Committees and Delegated Entities manage decentralized governance within basins. This contrasts with the French model, where Water Agencies simultaneously fulfill administrative and financial duties, including collecting charges directly from water users.

The implementation and territorial coverage of charging represent another core axis of comparison. In France, charges cover virtually all major river basins under the administration of six Water Agencies. In Brazil, despite the PNRH being established in 1997, effective implementation of charges has occurred incrementally over subsequent decades, contingent upon creating and consolidating committees, water permit systems, and executive support entities.

Among the earliest Brazilian experiences is the State of Ceará, which introduced state-level charging mechanisms back in the 1990s, managed by the Ceará Water Resources Management Company (COGERH) (Ceará, 2025). According to ANA (2026), in rivers under federal domain, water use charges have been initiated in the following river basins: Paraíba do Sul River (2003),



Piracicaba, Capivari, and Jundiaí Rivers – PCJ (2006), São Francisco River (2010), Doce River (2011), Paranaíba River (2017), Verde Grande River (2017), Grande River (2024), and Piancó-Piranhas-Açu River (2025).

In rivers under state and federal district domains, charging implementation has been similarly uneven. It began across entire territories in Ceará, Rio de Janeiro, São Paulo, Minas Gerais, Paraíba, Espírito Santo, Goiás, Rio Grande do Norte, Sergipe, Piauí, Alagoas, and the Federal District. In Tocantins, charging was initiated solely in the Formoso River Basin; in Paraná, only in the Upper Iguaçu and Upper Ribeira Tributaries basins. In other states, such as Bahia, Amapá, Pará, and Santa Catarina, distinct legal instruments were implemented—such as raw water tariffs, inspection fees, or monitoring charges—reflecting the diversity of subnational arrangements across the country.

As observed, despite vast territorial dimensions, unlike France and despite federal statutory mandates, water use charging in Brazil is not yet comprehensively implemented—it is not universalized—exhibiting heterogeneity across both federal and state river domains. Its application remains selective and concentrated in basins with higher institutional organization, technical capacity, and user consensus. In state-domain rivers, non-universalization stems from a combination of institutional weaknesses, political negotiation hurdles, technical limitations, and economic constraints.

Nonetheless, despite differences in water domain ownership, implementation timelines, and administrative and legal setups, significant convergences exist between both models: both adopt the river basin as the management territory, foster multi-stakeholder participatory decision-making through collegiate bodies comprising public authorities, users, and civil society, and employ water use charges to incentivize rational water use (Porto; Porto, 2008; Rogers; Hall, 2003; OIEAU, 2018).

4.2 Objectives, User Sectors, and Purposes of Use Subject to Charges

Regarding objectives, the French model was conceived primarily as a financing tool for river basin water management policies. Water agencies were authorized to levy charges on public and private users whose activities require or benefit from water management interventions, allocating these revenues to fund common-interest actions such as sanitation, pollution control, and environmental restoration. Total collected revenue is determined based on projected expenditures in the agencies' multi-year intervention programs. Although original legislation did not explicitly assign an incentive function to charging, an indirect incentive effect occurs—especially regarding pollution—because payments are proportional to pollutant loads discharged.

However, this economic incentive is typically complemented by financial aid and regulatory instruments, as policy effectiveness also depends on institutional factors, enforcement mechanisms, and user cooperation at the basin scale (OECD, 2017).

In Brazil, the objectives of water use charging are defined by Law No. 9,433/1997 as part of the PNRH (Brasil, 1997). Under Article 19, charging pursues three main purposes: recognizing water as an economic good and indicating its real value to users; encouraging rational water use; and generating revenue to finance programs and interventions specified in water resources plans. Consequently, the incentive effect of charging tends to be limited, as is its financing capacity, since collected revenues represent only a small fraction of overall water policy budgets. Nevertheless, charging plays a pedagogical and institutional role, reinforcing the perception of water as an economic resource and supporting basin management and environmental improvement programs.

Regarding user sectors subject to charges—qualified as permitted water users and purposes of use—notable differences exist between France and Brazil, as outlined in Table 1.

Table 1 – User sectors and purposes of use subject to water resources charges in France and Brazil

USER SECTOR	PURPOSE OF USE	FRANCE	BRAZIL
HUMAN CONSUMPTION	Public water supply	Yes	Yes
	Consumption or consumptive use	Yes	Yes
	Sanitation services – effluent dilution	Yes	Yes (partial)
	Modernization of sanitation services	Yes	No
INDUSTRY	Surface and groundwater abstraction	Yes	Yes
	Non-domestic pollution	Yes	Yes
AGRICULTURE	Diffuse pollution from phytosanitary products	Yes	No
	Diffuse pollution from animal waste	Yes	Yes (partial)
	Agricultural uses – irrigation, livestock, aquaculture	Yes (broad coverage)	Yes (partial)
ENERGY	Hydroelectric generation – abstraction and cooling	Yes (limited)	Yes (specific mechanism)
ECOSYSTEM PROTECTION OTHER USES	Fishing and hunting licenses	Yes	No
	Interbasin transfer	No	Yes
	Mining	Yes	Yes
	Canal feeding and drought storage (Dams)	In some cases	No

Source: Prepared by the authors based on websites of French Water Agencies and Brazilian river basin committees and management bodies.

Data in Table 1 indicate that in both countries, charges apply to water abstraction and effluent discharge mechanisms, aligning with the user-pays and polluter-pays principles. However, the French model displays broader sector coverage and category diversification, whereas the Brazilian model exhibits a more restricted and heterogeneous application across river basins.



In France, charging covers a wide array of uses. In Brazil, while major user sectors are included, charges apply only partially to certain activities—particularly agriculture, irrigation, aquaculture, and livestock—reflecting implementation disparities among basin committees. In several state-domain basins in São Paulo, for example, charging remains focused primarily on urban and industrial uses (São Paulo, 2026).

In the agricultural sector, the French system demonstrates broader scope by charging for diffuse pollution from phytosanitary products, a mechanism non-existent in Brazil. In the electricity sector, the two countries use distinct mechanisms. In France, charges form part of the river basin management system administered by Water Agencies, calculated based on turbinated volume and hydraulic head. In Brazil, hydroelectric water use is governed by a specific mechanism under Law No. 9,984/2000 (Brasil, 2000), which allocates 0.75% of generated power value to ANA, without mandating reinvestment in the originating basin. Furthermore, Small Hydropower Plants (SHPs) under 30 MW are exempt (Brasil, 2000; OIEAU, 2018).

Additionally, three categories exist in France but not in Brazil: modernization of sanitation services, water storage during drought periods, and protection of aquatic ecosystems, as mandated by the French Environmental Code (France, 2025).

In summary, France employs a more comprehensive and diversified charging system covering a greater range of sectors and use categories. In Brazil, although charges apply to key economic sectors, implementation remains more limited and uneven across river basins.

4.3 Charges for Water Abstraction in Brazil

Analyzing Unit Public Prices (PPUs) for water abstraction in Brazil involves examining implementation across both federal (interstate) and state river basins. While operating under the same legal instrument, state-domain river basin committees exhibit a wider diversity of institutional, economic, and hydrological contexts. This results in varied additional coefficients and criteria (institutional, normative, and methodological differences), creating significant disparities among states and committees. This heterogeneity complicates establishing a uniform comparative baseline, particularly when making international comparisons.

It is worth noting that despite these variations and state committees' autonomy, many implementation processes were inspired by federal basin experiences structured with ANA's guidance. Therefore, for comparative purposes between Brazil and France, federal river basin data are prioritized, as their standardized parameters allow for a more consistent comparison with French Water Agency models.

Table 2 summarizes charging rates applied to water abstraction and consumption (user-pays) across federal river basins, reflecting PNRH guidelines and basin-specific circumstances.

Table 2 – Water abstraction and consumption charges in federal river basins in Brazil – Base Year 2026

RIVER BASIN	USER SECTOR / PURPOSE OF USE	RAW WATER ABSTRACTION (BRL/M ³)	RAW WATER CONSUMPTION (BRL/M ³)	INTERBASIN TRANSFER (BRL/M ³)
PARAÍBA DO SUL RIVER	All uses	0.0338	0.0676	—
PCJ RIVERS	All uses	0.0226	0.0455	0.0341
SÃO FRANCISCO RIVER	All uses	0.0173	0.0347	—
DOCE RIVER	All uses	0.0687	—	0.0917
PARANAÍBA RIVER	Public supply, human consumption, industry, mining, others	0.0457	—	—
	Irrigation, livestock, excavated pond aquaculture	0.0060	—	—
VERDE GRANDE RIVER	Public supply, other purposes	0.0364	—	—
	Agriculture and livestock	0.0057	—	—
GRANDE RIVER	Public supply, human consumption	0.0381	—	—
	Industry, mining, others	0.0416	—	—
	Agriculture (irrigation, aquaculture, livestock)	0.0057	—	—
PIANCÓ-PIRANHAS-AÇU RIVER	Public supply, human consumption	0.0100	—	—
	Industry, mining	0.4500	—	—
	Thermoelectric power generation	0.4500	—	—
	Agriculture (irrigation, livestock, aquaculture)	0.0030	—	—
	Other uses	0.0350	—	—

Source: ANA (2026).

Data in Table 2 demonstrate differentiated charging structures according to basin, sector, and purpose. Methodologically, ANA (2014) defines "abstraction" as total water withdrawn from a source, whereas "consumption" refers to the fraction consumed that is not returned to the water body.

Basins with mature tariff structures—such as Paraíba do Sul, PCJ, and São Francisco—differentiate between abstraction and consumption. The absence of this distinction in other basins



highlights variations in implementation models. Furthermore, charges for interbasin transfer in PCJ and Doce River basins internalize costs related to hydrological regime alterations between basins. In the Paranaíba, Verde Grande, and Grande basins, sector-specific rates align with PNRH principles of accounting for specific impacts.

Across sectors, agricultural charges (irrigation and livestock) are significantly lower than urban and industrial rates—roughly 7 times lower in Paranaíba and Grande basins, and 6 times lower in Verde Grande.

From an institutional perspective, Finkler et al. (2015) note that water charging in Brazil extends beyond pure economics, functioning as a policy tool negotiated among stakeholders within committees. Godecke (2014) emphasizes the gradual, inductive nature of charging, noting that lower initial rates for large agricultural users serve to facilitate implementation and stakeholder acceptance.

ANA considers tariff differentiation consistent with PNRH principles, balancing equity, economic efficiency, and sustainability while mitigating negative socioeconomic impacts on users.

4.4 Charges for Water Abstraction in France

Under French water legislation, abstraction charges are calculated based on actual withdrawn volumes, measured via user-installed metering devices. Lacking direct metering, standard activity coefficients are applied—typically set at higher rates to induce meter installation. Unit values are established by Water Agencies and River Basin Councils based on location, source (surface vs. groundwater), and purpose, reflecting local resource availability and stress.

Table 3 outlines average unit values across France's six Water Agencies for the 12th multi-year intervention program (2025–2030).

Table 3 – Summary of average water abstraction charges across France's six water agencies (2025–2030)

PURPOSE (ABSTRACTION CATEGORY)	VALUE IN EUROS (€/M ³)	CONVERTED VALUE IN REAIS (BRL/M ³) ⁷
DRINKING WATER CONSUMPTION	€ 0.30 to € 0.46	R\$ 1.89 to R\$ 2.90
PUBLIC SUPPLY – RAW WATER	€ 0.05 to € 0.09	R\$ 0.32 to R\$ 0.57
DRINKING WATER NETWORK MODERNIZATION	€ 0.085 to € 0.15	R\$ 0.54 to R\$ 0.95
INDUSTRY	€ 0.00197 to € 0.0311	R\$ 0.012 to R\$ 0.196
AGRICULTURE – IRRIGATION	€ 0.0013 to € 3.50	R\$ 0.008 to R\$ 22.08
ENERGY – HYDROELECTRIC POWER	€ 0.71 to € 1.10 (per million m ³ /m drop)	R\$ 4.48 to R\$ 6.94 (per million m ³ /m drop)

⁷ Values converted from Euro (€) to Real (R\$), to be used hereinafter, considering an average exchange rate of R\$ 6.31 per Euro (€), based on the parity relation of the 2025 macroeconomic data.



**WATER STORAGE DURING
DROUGHT PERIODS
CANAL FEEDING**

€ 0.0056 to € 0.0060

R\$ 0.035 to R\$ 0.038

~ € 0.00015 to € 0.00032

R\$ 0.00095 to R\$ 0.0020

Source: Prepared by the authors based on data from French Water Agencies (Seine-Normandie, Loire-Bretagne, Rhône-Méditerranée-Corse, Adour-Garonne, Artois-Picardie, Rhin-Meuse) for the 2025–2030 tariff cycle.

Abstraction charges apply to both surface and groundwater, with higher coefficients assigned to groundwater. Table 3 illustrates a structured, diversified tariff system. For example, two distinct rates apply to human consumption: drinking water consumption applies to treated water paid by end consumers, while raw water public supply applies at abstraction by utility operators.

Irrigation charges range widely from €0.0013/m³ to €3.50/m³ (R\$ 0.008 to R\$ 22.08/m³), depending on irrigation methods (gravity vs. pressurized), water source, basin zoning, and economic incentives for efficient water management.

For hydroelectricity, rates range from €0.71 to €1.10 per million m³ per meter of head (R\$ 4.48 to R\$ 6.94), reflecting regional management decisions across French river basins.

Storage during drought and canal feeding categories do not exist in Brazil. Drought storage fees apply to facilities exceeding 1 million m³ capacity storing river flow during low-flow periods.

4.5 Charges for Effluent Discharge in Brazil

Effluent discharge charges in Brazil aim to incentivize pollution control and improve water quality (polluter-pays). Implementation remains nascent and heterogeneous across basins, contingent upon institutional arrangements and technical criteria set by basin committees.

Table 4 details federal basin discharge charges, highlighting varying parameters: BOD⁸ (Biochemical Oxygen Demand), discharge volume (m³), and mass pollutant load (kg).

⁸ BOD - Biochemical Oxygen Demand. Is the amount of oxygen required to decompose biodegradable organic matter in water through the action of aerobic microorganisms. It is the primary indirect parameter used to quantify organic pollution and the polluting potential of sewage and effluents (Von Sperling, 2014)

Table 4 – Effluent discharge charges in federal river basins in Brazil (Base Year 2026).

RIVER BASIN	PURPOSE / SECTOR	BOD DISCHARGE RATE (BRL/KG DBO)	VOLUME RATE (BRL/M ³)	MASS LOAD RATE (BRL/KG)
PARAÍBA DO SUL RIVER	All uses	0.2365	—	—
PCJ RIVERS	All uses	0.2271	—	—
SÃO FRANCISCO RIVER	All uses	—	0.0017	—
DOCE RIVER	All uses	—	—	0.3665
PARANAÍBA RIVER	Public supply, human consumption, industry, mining, others	0.2433	—	—
	Irrigation, livestock, excavated pond aquaculture	—	—	—
VERDE GRANDE RIVER	All uses	0.1820	—	—
GRANDE RIVER	All uses	0.2920	—	—
PIANCÓ- PIRANHAS-AÇU RIVER	Public supply, human consumption	0.2700	—	—
	Industry, mining	—	—	—
	Agriculture (irrigation, livestock, aquaculture)	—	—	—
	Other uses	—	—	—
	Thermoelectric power generation	—	0.4500	—

Source: ANA (2026).

Table 4 illustrates that federal basin committees utilize different discharge indicators. While some apply uniform rates across all uses, others differentiate by purpose. BOD remains the predominant indicator representing organic load and pollution potential.

4.6 Charges for Effluent Discharge in France

In France, effluent discharge charges are structured according to water use purpose, distinguishing between domestic uses (urban sanitation) and non-domestic uses (industrial, commercial, agricultural activities). This aligns charge mechanisms with specific pollution levels under the polluter-pays principle (France, 2026).

The system incorporates charges for aquatic ecosystem protection and sewer network modernization, integrating financing and incentive functions. Multi-year planning (2025–2030) provides financial predictability and alignment with agency intervention programs.

Table 5 summarizes average discharge charges across France's six Water Agencies for 2025–2030.

Table 5 – Summary of average effluent discharge charges across French water agencies (2025–2030).

PURPOSE / CATEGORY	AVERAGE VALUE (€)	CONVERTED VALUE IN BRL
MODERNIZATION OF COLLECTIVE SANITATION SYSTEMS	€ 0.10 – € 0.29 / m ³	R\$ 0.63 – R\$ 1.83 / m ³
DOMESTIC WATER POLLUTION	€ 0.20 – € 0.40 / m ³	R\$ 1.26 – R\$ 2.52 / m ³
INDUSTRIAL POLLUTION (SUSPENDED SOLIDS)	€ 0.14 – € 0.19 / kg	R\$ 0.88 – R\$ 1.20 / kg
LIVESTOCK POLLUTION (ANIMAL BREEDING)	€ 3.00 / LSU	R\$ 18.93 / LSU
AQUATIC ECOSYSTEM PROTECTION (FISHING)	€ 1.00 – € 8.80	R\$ 6.31 – R\$ 55.53

Source: Prepared by the authors based on French Water Agency data (2025–2030 cycle). Note: LSU = Livestock Standard Unit (UGB).

Table 5 shows a differentiated tariff structure. Domestic pollution charges generate significant revenue for French Water Agencies (OIEAU, 2018). Under the French Environmental Code, livestock diffuse pollution charges apply per Livestock Standard Unit (LSU / UGB), while phytosanitary product sales charges are levied on vendors based on chemical mass and toxicity categories (France, 2026). Fishing licenses also incur ecosystem preservation fees. Table 6 details pollutant-specific charges and mandatory measurement thresholds for 2026.

Table 6 – Average pollutant charges and threshold limits in French water agencies (2026 Cycle).

POLLUTANT	TARIFF (€/UNIT)	TARIFF (BRL/UNIT)	MANDATORY MEASUREMENT THRESHOLD
SUSPENDED SOLIDS (PER KG)	0.20 / kg	1.26 / kg	5,200 kg
COD ⁹ – CHEMICAL OXYGEN DEMAND (PER KG)	0.16 / kg	1.01 / kg	9,900 kg
BOD – BIOCHEMICAL OXYGEN DEMAND - 5 DAY (PER KG)	0.27 / kg	1.70 / kg	4,400 kg
REDUCED NITROGEN (PER KG)	0.70 / kg	4.42 / kg	880 kg
OXIDIZED NITROGEN, NITRITES AND NITRATES (PER KG)	0.25 / kg	1.58 / kg	880 kg
TOTAL PHOSPHORUS, ORGANIC OR MINERAL (PER KG)	1.70 / kg	10.73 / kg	220 kg
METOX (PER KG)	3.60 / kg	22.72 / kg	200 kg
METOX IN GROUNDWATER (PER KG)	6.10 / kg	38.49 / kg	200 kg
HIGHLY TOXIC SUBSTANCES (PER KILOEQUITOX - KEQ) ¹⁰	15.00 / kEq	94.65 / kEq	50 kEq
HIGHLY TOXIC SUBSTANCES IN GROUNDWATER (PER KEQ)	30.00 / kEq	189.30 / kEq	50 kEq

⁹ COD - is the Chemical Oxygen Demand, an indirect parameter used to measure the organic matter content present in water or sewage. It quantifies the total amount of oxygen required to chemically oxidize the organic matter contained in the sample.

¹⁰ Kiloequitox is a unit used to measure water pollutants—mineral or organic—that possess enough toxicity to inhibit the growth and/or activity of aquatic organisms (França, 2021).



ADSORBABLE ORGANIC HALOGENS - AOX (PER KG)	8.00 / kg	50.48 / kg	50 kg
HALOGENATED COMPOUNDS IN GROUNDWATER (PER KG)	18.00 / kg	113.58 / kg	50 kg
HAZARDOUS SUBSTANCES IN SURFACE WATER (PER KG)	9.00 / kg	56.79 / kg	9 kg
HAZARDOUS SUBSTANCES IN GROUNDWATER (PER KG)	16.50 / kg	104.12 / kg	9 kg
DISSOLVED SALTS (M³·S/CM)	0.15 / (m ³ ·S/cm)	0.95 / (m ³ ·S/cm)	2,000 m ³ ·S/cm
THERMAL DISCHARGES IN SEA (MEGATHERMAL ENERGY - MTH)	5.00 / Mth ¹¹	31.55 / Mth	100 Mth
THERMAL DISCHARGES IN RIVERS (MEGATHERMAL ENERGY - MTH)	60.00 / Mth	378.60 / Mth	10 Mth

Source: Prepared by the authors based on French Water Agency data (2025–2030 cycle) and France (2026).

Table 5 shows a differentiated tariff structure. Domestic pollution charges generate significant revenue for French Water Agencies (OIEAU, 2018). Under the French Environmental Code, livestock diffuse pollution charges apply per Livestock Standard Unit (LSU / UGB), while phytosanitary product sales charges are levied on vendors based on chemical mass and toxicity categories (France, 2026). Fishing licenses also incur ecosystem preservation fees. Table 6 details pollutant-specific charges and mandatory measurement thresholds for 2026.

Table 6 – Average pollutant charges and threshold limits in French water agencies (2026 Cycle)

POLLUTANT	TARIFF (€/UNIT)	TARIFF (BRL/UNIT)	MANDATORY MEASUREMENT THRESHOLD
SUSPENDED SOLIDS (PER KG)	0.20 / kg	1.26 / kg	5,200 kg
COD – CHEMICAL OXYGEN DEMAND (PER KG)	0.16 / kg	1.01 / kg	9,900 kg
BOD – BIOCHEMICAL OXYGEN DEMAND - 5 DAY (PER KG)	0.27 / kg	1.70 / kg	4,400 kg
REDUCED NITROGEN (PER KG)	0.70 / kg	4.42 / kg	880 kg
OXIDIZED NITROGEN, NITRITES AND NITRATES (PER KG)	0.25 / kg	1.58 / kg	880 kg
TOTAL PHOSPHORUS, ORGANIC OR MINERAL (PER KG)	1.70 / kg	10.73 / kg	220 kg
METOX (PER KG)	3.60 / kg	22.72 / kg	200 kg
METOX IN GROUNDWATER (PER KG)	6.10 / kg	38.49 / kg	200 kg
HIGHLY TOXIC SUBSTANCES (PER KILOEQUITOX - KEQ)	15.00 / kEq	94.65 / kEq	50 kEq
HIGHLY TOXIC SUBSTANCES IN GROUNDWATER (PER KEQ)	30.00 / kEq	189.30 / kEq	50 kEq
ADSORBABLE ORGANIC HALOGENS - AOX (PER KG)	8.00 / kg	50.48 / kg	50 kg

¹¹ Mth stands for Million Therms. It is a unit of thermal energy that does not belong to the International System of Units (non-SI). One Mth is approximately equivalent to the energy contained in 100 million cubic feet of commercial natural gas (Moran; Shapiro, 2018).



HALOGENATED COMPOUNDS IN GROUNDWATER (PER KG)	18.00 / kg	113.58 / kg	50 kg
HAZARDOUS SUBSTANCES IN SURFACE WATER (PER KG)	9.00 / kg	56.79 / kg	9 kg
HAZARDOUS SUBSTANCES IN GROUNDWATER (PER KG)	16.50 / kg	104.12 / kg	9 kg
DISSOLVED SALTS (M³·S/CM)	0.15 / (m ³ ·S/cm)	0.95 / (m ³ ·S/cm)	2,000 m ³ ·S/cm
THERMAL DISCHARGES IN SEA (MEGATHERMAL ENERGY - MTH)	5.00 / Mth	31.55 / Mth	100 Mth
THERMAL DISCHARGES IN RIVERS (MEGATHERMAL ENERGY - MTH)	60.00 / Mth	378.60 / Mth	10 Mth

Source: Prepared by the authors based on French Water Agency data (2025–2030 cycle) and France (2026).

Comparing discharge models highlights major differences in technical detail and cost internalizing capacity. France employs sophisticated multi-parameter pricing (organic matter, nutrients, toxic/hazardous substances, thermal load), whereas Brazil relies primarily on simplified BOD metrics to maintain operational feasibility (ANA, 2011; Hartmann, 2010; Lanna; Laigneau, 2011). Population scale also influences revenue potential. Table 7 presents comparative indicators for both countries.

Table 7 – Comparative indicators of water use charging in Brazil and France (Base Years 2024–2025).

INDICATOR	BRAZIL	FRANCE (€)	FRANCE (CONVERTED TO BRL)
ANNUAL CHARGING REVENUE	R\$ 781.5 million	€ 2.35 billion	R\$ 14.83 billion
POPULATION (2025)	213.4 million hab.	68.4 million hab.	68.4 million hab.
PER CAPITA REVENUE	R\$ 3.66 / hab / year	€ 34.36 / hab / year	R\$ 216.81 / hab / year
GDP (2025)	R\$ 13.44 trillion (€2.13 T)	€ 2.96 trillion	R\$ 18.68 trillion
REVENUE AS % OF GDP	0.0058% of GDP	0.079% of GDP	0.079% of GDP

Source: Prepared by the authors based on data from French Water Agencies, ANA (2026), Datasmacro (2025), and IBGE (2026).

Table 7 reveals that France generates substantially higher revenue both in absolute and relative terms. In 2025, France collected €2.35 billion (R\$ 14.83 billion) across 68.4 million inhabitants, compared to Brazil's R\$ 781.5 million across 213.4 million inhabitants. Per capita revenue in France reached R\$ 216.81 (€34.36) versus R\$ 3.66 in Brazil. Revenue relative to GDP reached 0.079% in France compared to 0.0058% in Brazil. Table 8 breaks down revenue composition by water use purpose.

Table 8 – Share of charging revenue by water use purpose in Brazil and France.

BRAZIL: PURPOSE OF USE	BRAZIL: % SHARE	FRANCE: PURPOSE OF USE	FRANCE: % SHARE
ABSTRACTION	38.46%	Residential pollution	72.09%
INTERBASIN TRANSFER	38.07%	Abstraction – all uses	12.32%
CONSUMPTION	15.87%	Agricultural diffuse pollution	8.91%
EFFLUENT DILUTION	7.60%	Industrial pollution	3.85%
—	—	Fishing licenses	2.83%
TOTAL	100.00%	Total	100.00%

Source: ANA (2019); Agence de l'Eau Seine-Normandie (2026).

Table 8 exposes a stark contrast: in Brazil, 92% of revenue stems from quantitative uses (abstraction, interbasin transfer, consumption) and only 8% from qualitative uses (effluent dilution) (ANA, 2019). Conversely, in France, 87.68% of revenue derives from pollution, diffuse loads, and ecosystem protection, while abstraction accounts for only 12.32% (Agence de l'Eau Seine-Normandie, 2026).

These results reinforce, in the Brazilian case, the need to expand and strengthen the collection of charges, both in terms of territorial scope and in broadening the mechanisms for charging for the pollutant load discharged into water bodies.

5 Conclusions

The comparative analysis between water use charging systems in Brazil and France demonstrates that while both nations share similar core governance principles (user-pays and polluter-pays), significant disparities exist regarding institutional evolution, territorial coverage, and revenue capacity.

Regarding legal and institutional evolution, France established a consolidated basin management system supported by financially autonomous Water Agencies. In Brazil, despite adopting French-inspired principles under the PNRH, implementation has been gradual and uneven due to federal and institutional complexities.

Regarding scope and user sectors, the French model exhibits broader sector coverage. In Brazil, charging applies partially across activities—especially agriculture, irrigation, and aquaculture—with marked variations between basins.

Regarding technical mechanisms, France employs multi-parameter pollution indicators allowing extensive cost internalization. Brazil relies on simplified indicators (e.g., BOD) to ensure operational viability.



Regarding revenue performance, per capita and GDP metrics demonstrate that charging plays a much larger role in financing water policy in France. Furthermore, French revenue is heavily concentrated on effluent discharge and pollution control (87.68%), whereas Brazilian revenue relies overwhelmingly on quantitative abstraction (92%).

These findings confirm that performance differences stem not from normative design, but from institutional capacity, territorial reach, and tariff levels.

Finally, Brazil possesses significant potential to enhance charging effectiveness. Strengthening governance institutions, expanding territorial coverage, and refining pollution parameters represent key measures to increase revenue capacity and reinforce water charging as a tool for sustainable water resources management.

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