Chapter 2

Water charges in Brazil — The state of play

This chapter describes how water charges currently operate in Brazil. It presents the legal and institutional framework for water charges and reviews the experience of federal and state governments, grouping them in five clusters: pioneers; followers; inspirational; newcomers; and aspirants. The chapter highlights several common challenges in terms of setting clear objectives for water charges, developing plans that can drive decisions, putting in place an adequate information system and making the most of collected revenues for the benefit of water users.

The legal and institutional framework

What is a cobrança*?*

The water charge (*cobrança*) is a price for the use of a common-pool resource, set within the basin committees in a participative manner by water users, civil society, and public authorities (ANA, 2014). The main objective is to point out the economic value of water, while encouraging its rational use and preserving its quality. It is levied on users who abstract raw water or discharge effluents directly into water bodies. Established by the Federal Water Law 9433 of 1997 (Box 2.1), water charges are one of the water management instruments included in the National Water Management System (Sistema Nacional de Gerenciamento de Recursos Hídricos, SINGREH), together with water resources plans; water quality classification of water bodies; water permits; and water resources information system (art. 5).

The *cobrança* is neither a tax (*imposto*), a fine (*multa*), nor a tariff *(tarifa*), such as the tariff for water supply (ANA, 2014). It can be seen as an *economic compensation for using the share of the water "commons"* (Braga et al., 2005). It does not relate to services or investments and it is subject to implementation rules for public revenues (Canali, 2010). From a perspective, two different branches of law regulate taxes (tax law) and public prices (financial law) (Pompeu, 2000) (Table 2.1).

Table 2.1. Differences between water charges and other instruments in Brazil

		Fee (*taxa*)	Tariff (*tarifa*)	Special assessments (*contribuição de melhoria*)	Public price (preço publico)
Instrument		Fiscal	For public services	Fiscal	Patrimonial
Calculation basis		Basic public service	Public service through concession or permission	Projects promoting equity gains for third parties	Use of the public good or service through authorisation
Measurement of use or service	**Yes**		X	X	X
	No	X			
State of use or service	**Effectively provided**	X	X	X	X
	Mandatory	X			
Implementation instrument		Law	Executive Decree	Law	Contract or Normative Resolution
Competent authority for collection		Public authorities	Service provider	Public authorities	Public authorities
Possibility of delegation		Only to a public body	To private providers	Only to a public body	Only to a public body
Validity		From January 1st	From the validity of the decree	From 1 January	From the validity of a contract
Practical examples		Inspection fee (taxa de fiscalização)	Water and Sewage Services	Asphalt road services	Water charges

Source: ANA (2014), "Cobrança pelo uso de recursos hídricos, Capacitação em Gestão de Recursos Hídricos", Vol. 7, Brasília.

Box 2.1. The relevant legal framework for water charges in Brazil: A synthetic overview

- **Civil Code, 1916**: Allows for a charge on the use of a public good, according to the federal, states and municipal law (art.68)
- **Water Code, 1934**: Allows for a charge on the use of water resources (art. 36). It considered water as private property when situated on private land
- **Federal Constitution, 1988**: Exclusion of water as private property and consolidation of the double dominion
- **National Environment Policy, 1981 (Act 6938/81)**: Obligation for the polluters to compensate for environmental damages and pay for the exploitation of environmental resources with economic purposes
- **Water Law No. 9 433/ 1997**: Establishment of water charges
- **Law No. 9 984/ 2000:** Creation of the National Water Agency (Agência Nacional de Águas, ANA) and definition of its roles including implementing, together with the river basin committees, the water charges for the use of water in the federal domain
- **Law No. 10881/2004**: Regulation of management contracts between ANA and delegated water agencies
- **CNRH Resolution No. 48/ 2005**: General criteria establishing mechanisms and rates of water charges
- **State legislations**: Replication of the objectives established by the Water Law No. 9 433/ 1997

Recently, the National Water Resources Council (Conselho Nacional de Recursos Hídricos, CNRH) has started discussing how to improve the Resolution No. 48/2005 establishing general criteria for water charges in Brazil. The Technical Chamber for water charges (Câmara Técnica de Cobrança pelo Uso de Recursos Hídricos, CTCOB) of the CNRH has already held seminars with stakeholders from several states, water use representatives and civil society to investigate challenges and hear proposals for improvement. Various stakeholders share the view that water charges should incorporate issues of local interest. The discussion could potentially take into account issues such as general criteria for defining clear objectives of charges at basin level; the financial sustainability of river basin committees and agencies; the updates of water charges' levels; lower bounds for rates, the automatic adjustment of water charges based on inflation and procedures for efficiently using revenues. It is expected that findings from this OECD report will contribute to future debates on the topic, building on the fruitful exchanges and dialogue with the representatives from the CNRH and the CTCOB during the seminars held by the OECD delegation and the ANA in Brazil in September 2016, February 2017 and June 2017.

Source: ANA (2016), "Background report on setting and governing economic instruments for water policy in Brazil", Brazil.

Water charges: What for?

The Federal Water Law 9433/1997 attributes a double role to *cobrança:* an *economic* one, aiming to send signals for rationalising water uses and internalising environmental costs; and a *financial* one, as revenues can be used to finance interventions foreseen by the river basin plans, such as recovery and preservation of water bodies. More specifically, art. 19 of the Water Law identifies three objectives of the *cobrança*: i) to recognise water as an economic good[1] and to give users an indication of its real value;

ii) to encourage a rational water use; iii) to raise resources to finance programmes or interventions included in the plans. Clearly, charging does not privatise the use of water that is an inalienable public domain good (Bronzatto and Amorim, 2012). The Water Law implies that water is a good belonging to the public domain and a *limited natural resource* endowed with economic value (art.1). The logics behind is that water is a scarce good (economically scarce in relative terms) by definition, reflecting both water depletion due to anthropogenic and natural causes, as well as multiple, alternative competitive uses, respectively in water scarce and water abundant contexts.

Revenues from water charges should be used in the watershed where they are generated. The 1997 Federal Water Law established that 7.5% of revenues should cover implementation and administrative costs of the National Water Resources Management System (Sistema Nacional de Gerenciamento de Recursos Hídricos, SINGREH). The remaining 92.5% should be devoted to studies, programmes and projects included in the river basin plan. According to the *Water Pays for Water* principle, inspired by the French system, water charges originally sought to create a financially autonomous water management system (ANA, 2014). Earmarked revenues represent an incentive for stakeholders, gathered in the river basin committees, to build consensus on the needs and actual use of water charges. The rationale is that water users or polluters would be more willing to pay if they could see concrete benefits in return; however, currently, one of the most important issues is that the "service" that the charge buys is not evident and benefits are not immediate.

Who pays the cobrança*?*

According to the 1997 Federal Water Law, those holding permits (*outorgas)* for using water for economic purposes are subject to water charges (art. 20). Permits are granted for: i) freshwater and groundwater withdrawal for final consumption or production processes; ii) effluent discharge into water bodies from sewage and other liquid for the purpose of dilution, transportation or final disposal; iii) hydropower generation; iv) other uses that alter water quantity or quality of water bodies. There are also exemptions, such as in the case of negligible abstraction and storage of water to meet the needs of small population groups in rural areas (art. 12). River basin committees establish the thresholds below which users are exempt from requesting the permits (and thereafter, exempt from paying the *cobrança*), which are approved by the National Water Resources Council (Conselho Nacional de Recursos Hídricos, CNRH) (Box 2.3).

In practice, sectors subject to water charges are: water supply and sanitation, manufacturing, hydropower and agriculture. The Government grants permits, according to the priorities established in the water resources plans for preserving multiple water uses (art.13), while controlling water quality and quantity (art.11). The integrated approach between permits (*outorga*) and charges (*cobrança*) formalises the link between command and control and economic instruments (ANA, 2014).

Box 2.2. Water abstraction charges for small users: International examples

In **France**, below established water volume thresholds, water users are exempt from paying abstraction charges. These thresholds vary according to the water agency, the type of resource (groundwater/ surface water) and the scarcity of water. For example, in the Rhône-Méditerranée-Corse River basin, water users abstracting less than 10 000 m3 per year are exempted from paying abstraction charges. The threshold is reduced to 7 000 m3 in areas facing water scarcity problems.

Box 2.2. Water abstraction charges for small users: International examples (*cont.*)

In **England** and **Wales**, some classes of small user have been exempted from charging (and in some cases, regulation) entirely, e.g. a borehole for household use only. For small volume users the charge below a de minimis exclusion would in any case be too small to be seen as any sort of incentive, and is only viewed as a mere bureaucratic exercise. A charge should also reflect a service, and most small users will get little or no service other than knowing that their abstraction has been registered. They will not be inspected (or should not be — enforcement should be risk-based and small users will almost always be low risk) and so the perception of the charge is negative. The same applies for diffuse (as opposed to point-source) pollution — the high variability in time and space makes attribution of sources of pollution complex; the high transaction costs associated with dealing with a large number of heterogeneous polluters call for other sorts of incentives or regulation, such as nutrient trading, or payment for ecosystem services for reducing pesticide use.

In **Portugal**, the abstraction charge for surface and groundwater water is applied regardless of the purpose of the water use and public or private nature of users. However, there is a threshold related to the means of extraction. If the abstraction is done by a pumping system with a power of less than 5 HP, no payment is required, unless otherwise established in the river basin plan and justified by the special sensitivity of the affected area. This exemption essentially contemplates small farmers.

In **Spain**, at the central level, the competent authority (Ministry of Agriculture, Fisheries and the Environment, Central Government of Spain) may include some exemptions. River basin authorities shall issue within three months, in a mandatory way, and prior to the resolution to be adopted, a motivated report to provide the rationale for whatever exemption.

In **Latin American countries**, very often, several water users are exempted from paying abstraction charges. However, when calculating what actually has to be paid, that exemption should be effective at taxable event level, not at base level. This distinction is relevant: as per the former, anyone withdrawing or polluting water should be subject to the levy; as per the latter, this does not imply everyone has to pay, but it will depend on other decisions (allowances, etc.). As per the new groundwater management, Peru is currently discussing a service tariff (not a use tariff) that levies those water users with a well of their own and excludes agricultural groundwater users.

Source: Ian Barker, Peer-Reviewer, Water Policy International Ltd (England and Wales); Gonzalo Delacámara, Peer-Reviewer, IMDEA Water Institute (Spain and Latin America); Francisco Nunes Correia, Peer-Reviewer, Technical University of Lisbon (Portugal); Arnaud Reynaud, Expert, Toulouse School of Economics (France).

Calculating water charges

The calculation of water charges in Brazil is basically similar across river basins where charges are applied. In a simplified formula, three variables are multiplied (ANA, 2016):

- The basis of calculation includes each type of use: abstraction, consumption and discharge. The annual volume of water *abstracted* is quantified by the licensed annual volume or through a weighed sum of the licensed annual volume and the metered annual volume; the water *consumed* is calculated as the difference between the volume abstracted and discharged; the *discharge* takes into account the pollutant load in the discharged wastewater effluent;
- The unit price, which is generally based on investment programmes contained in the river basin plans and operational costs of water agencies;

- The coefficients take into account specific goals and adjustments to the formula. They include, for instance: water quality classification of water bodies, according to their main category of water uses; volume of water actually used in relation to the permitted volume; water loss ratio in the sanitation sector; and payment capacity of the agricultural sector.

In interstate river basins, water abstraction charges' calculation is based on the volumes specified both through the permits and the volumes measured by the users themselves. The latter are declared to the ANA by means of the Annual Declaration of Water Resources Use (Declaração Anual de Uso de Recursos Hídricos, DAURH), available online. Users are subject to inspections by the ANA, done it usually through water samplings in the most critical basins. The calculation of the annual charges from water volumes reflecting the permits is conceived as a means to potentially encourage users to request lower volumes of entitlements, which could reduce the pressure on water resources in the medium and long term. Leakage rates are also self-reported by users. The ANA has the prerogative of checking and disregarding the data.

This system suffers from some limitations: First, water charges set on self-reported water abstraction can be considered as a viable option only if inspections and audits of reported water abstraction are conducted and if fines and penalties are in place and enforced. Second, the calculation of annual charges based on permits may create some perverse effects. Since users know they will be charged based on their permits and not on their actual water use, they may have no incentive to reduce water abstraction below permitted values. Although in the medium or long term, there may be a beneficial effect if the user requests decrease in their permitted values, depending on the level of charges.

Choosing the volume of water abstracted as the basis for charging is a usual approach. However, abstractions should be measured against a standard that gives confidence that the measurements can be used as a basis for charging. Therefore, a meter or other measurement device is required to measure the volume of water that is abstracted: meters should be calibrated and sites routinely monitored for compliance. The accuracy of the volumetric information should be submitted as the basis for billing.[2] This is not the case in Brazil. Meters are not always installed, especially in the agricultural sector. Instead, a strategic use of metering (e.g. for large users, in case of water scarcity) can help monitor water abstraction. If abstracted water cannot be metered, then authorities must rely on other mechanisms to approximate water use. Examples include charging irrigated surfaces on a per hectare basis or hydroelectricity production on a per megawatt-hour basis. Another issue is when part of the water abstracted is returned to the environment. If the water that is returned is of the same quality, and if it is returned close to where it was abstracted, then the charge should reflect return flows and be based on the volume of water used (and not returned to the environment in the catchment). This, however, may be difficult to quantify since it could require a meter to measure water abstraction and a meter to measure water that is returned to the environment. In some cases, such as industrial uses, it may be possible to reach agreement about the proportion of water incorporated in the product, or lost through evaporation.

Pollution charges are generally based on the volume of discharged water. This volume is rarely monitored, except for industries and hydropower generation. For households, it is often approximated by the volume of water used. The pollution load is often estimated on the basis of the control of a limited set of pollutants. Even though water charges are based on polluter-pay principles, in practice, there are can be difficulties in implementing these principles (see Chapter 3). Currently, in Brazil, the only

charged pollutant load is the organic load related to the Biochemical Oxygen Demand ($BOD_{5,20}$). However, it is a poor proxy for pollution load for many discharges since other pollutants in effluent streams increasingly cause damages to the environment and human health, whilst increasing the cost of water treatment. Therefore, monitoring BOD should gradually be supplemented by monitoring a range of other substances to be included in the terms of discharge permits and within the basis for charging. Incorporating new parameters would require an adequate monitoring system, reliable knowledge and registration of sources of pollution, all of which are linked to information systems.

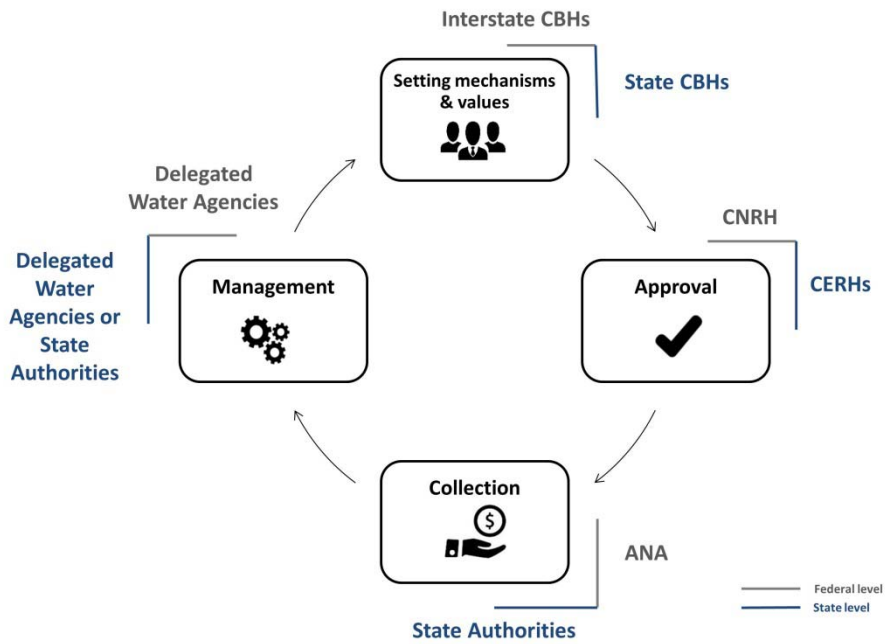
Further attention should be devoted to the capacity of different users to pay (poor households, farmers, selected industries) and to the economic, social and environmental consequences of high or low water charges, which are rather poorly documented. These factors make a difference in some instances, e.g. when cheap water diverts a valuable resource from valuable uses, or leads to costly supply augmentation measures; or when poorly designed pollution charges fail to minimise pollution and lead to higher treatment costs for users downstream. Additional considerations apply to how abstraction and pollution charges are used for specific uses — hydropower, water supply and sanitation, industry, and agriculture —, which are discussed in Chapter 4.

Who does what in setting, collecting and operationalising water charges in Brazil

The water charge implementation cycle represented in Figure 2.1 shows key steps and responsible authorities at federal and state level. The process for setting and operating water charges at federal and state level is similar. In most cases, the river basin committees (interstate or within states) submit water charge values for approval to the Federal (CNRH) or State (CEHRs) Water Resources Councils. National (ANA) or state agencies (e.g. executive bodies of State Secretariats for water resources and the Environment) are in charge of billing and collection. The funds raised are then managed by delegated water agencies (in the form of private organisations, associations, foundations, consortia) that in principle allocate spending in the basin according to the actions foreseen in the river basin plans.

Setting a water charge is the outcome of both a *political* and *technical* process within the river basin Committees (ANA, 2014). It is a political decision to start implementing water charges in the river basin, but the level of charges should be backed up by technical analyses. The Federal Water Law foresees that the delegated water agencies would propose the values of charges to the river basin Committee; however, in practice, a technical group within the river basin committee carries out this function. The proposal is then discussed with the stakeholders within the river basin committee and finally submitted to the national or state water councils. This system has the advantage of the bottom-up, consensus-based and participatory drive for what remains a very sensitive area in water management. But it also has some drawbacks that hinder its effectiveness and efficiency: even though charges are proposed *in primis* through technical analyses, eventually the decision on the level of charges is predominately political, as it is the result of a negotiation (*pacto*-agreement) amongst stakeholders. Given that the stakeholders involved are also water users who at the end will pay the charge there is a risk that vested interests may prevail. Another issue concerns the robustness of technical analyses: in some situations, economic assessment is at best based on a calculation, *ceteris paribus*, of the impact of the charge on water users' costs, while no assessment of the wider impacts on competitiveness is carried out, nor on the savings for the users that this is likely to stimulate.

Figure 2.1. The water charge implementation cycle



Notes: State Water Resources Council, Conselho Estadual de Recursos Hídricos – CERHs; National Water Resources Council, Conselho Nacional de Recursos Hídricos – CNRH; National Water Agency, Agência Nacional de Águas - ANA; River Basin Committees, Comitê de Bacia Hidrográfica - CBHs.

Source: Authors' elaboration.

Resolution CNRH No. 48/2005 establishes general rules for mechanisms and prices that should apply at federal or state levels alike. However, each river basin committee is allowed to propose alternative mechanisms to better reflect local circumstances. Mechanisms and prices for water charges proposed by the (interstate or state) Basin Committees are then submitted for approval to the (national or state) water councils.

The (national or state) water council is in charge of reviewing proposals on water charges. In practice, the approval process of water charges is seldom challenged and councils endorse the proposals they receive, whether at federal or state levels. At the federal level, the ANA evaluates proposals submitted by the interstate river basin committees, providing a technical analysis of the proposal, which is subsequently submitted to the Technical Board of Water charges (Câmara Técnica de Cobrança pelo Uso de Recursos Hídricos, CTCOB) within the CNRH. Legal aspects are then analysed by the Board of Legal Affairs (Câmara Tecnica de Assuntos Legais e Institucionais, CTIL). Approval is given following a plenary discussion in the CNRH. Historically, most proposals made by the interstate river basin Committees have been backed up by the technical notes provided by ANA. At state level charges are proposed by state river basin committees and approved by state water resources councils. Executive water and environmental agencies at state level can support the decision by the Council with technical analyses (ANA, 2016). Box 2.3 illustrates the experience of National Water Councils in France and in Spain.

Box 2.3. The role of National Water Councils in France and Spain

In **France**, the National Water Committee was created in 1964 as a consultative body of the Ministry of Environment by the first Law on water (Law No. 1245/ 1964). Recent Laws in 2006 and 2007 have amended its compositions. It is composed by 156 members, including representatives of various levels of government (central, regional, local), presidents of river basin committees, water user members and experts. The National Water Committee provides its view on water policies, laws and regulations, as well as on water infrastructure projects at national level of major regional infrastructure projects. It is also consulted on the price of water charged to users and the quality of public water and sanitation services. The National Water Committee has played an important role in proposing and in setting national guidelines to river basin committees on who has to be charged and on the maximum threshold to be applied.

In **Spain** the National Water Council was established in 1985 by the Regulation of the Public Administration of Water and Hydrological Planning (amended by the Royal Decrees 117/1992 and 1383/2009). It is mainly a consultative body composed by the Ministry of Agriculture, Food and Environment, as well as by regional, basin and local authorities. Water users and professional associations are also represented. The 1992 Decree suggested the inclusion of professional organisations representing the agricultural sector. The role of the Council is to produce mandatory reports on national and basin water resources plans; on issues concerning water uses by interstate basins; plans and projects of common interest on agrarian, urban, industrial and energy management or land use planning, before the approval of the Government and also to make proposals to various levels of government relatively to innovation technology in water conservation, treatment and recovery. Some inconsistencies were flagged in the approval of the national water plan after the approval of plans at basin levels. In fact the role of the national plan is to provide internal consistency to all the river basin management plans. The National Water Council does not provide guidance to river basin committees.

Source: Arnaud Reynaud, Expert, Toulouse School of Economics (France); Gonzalo Delacámara, Peer-Reviewer, IMDEA Water Institute (Spain); Hispagua Sistema Español de Información sobre el Agua (n.d.), Consejo Nacional del Agua, http://hispagua.cedex.es/instituciones/consejo_nacional_agua (accessed August 2017); Comité national de l'eau (n.d.), Le rôle du Comité national de l'eau, www.comitenationaldeleau.fr/role (accessed August 2017).

The ANA and state authorities are in charge of collecting revenues from water charges, respectively at federal and state levels. At state level, water charges are collected by the Company for Water Resources Management of the State of Ceará (Companhia de Gestão de Recursos Hídricos, COGERH), the State Institute of Environmental of Rio de Janeiro (Instituto Estadual do Ambiente do Rio de Janeiro, INEA), the Institute for Water Management of the State of Minas Gerais (Instituto Mineiro de Gestão das Águas, IGAM), the Paraná Water Institute (ÁguasParaná-Instituto das Águas do Paraná, Paraná), the Executive Agency for Water Management of the State of Paraíba (Agência Executiva de Gestão das Águas do Estado da Paraíba, AESA) or by the Department of Sanitation and Water Resources of the State of São Paulo (Departamento de Águas e Energia Elétrica, DAEE of the Secretaria de Saneamento e Recursos Hídricos do Estado de São Paulo-SSRH). Since charges are linked to the permit system, a comprehensive and up-to-date users' registry is key to accurately billing states according to their water use. This data must be properly synchronised with the National Registry for Water Resources (Cadastro Nacional de Usuarios de Recursos Hidricos, CNARH) to cross-check the relevant information for interstate basins. The charge is calculated and billed after obtaining data from users and receiving final approval of the mechanisms and values.

Delegated water agencies are designated by river basin committees to manage revenues. Revenues from water charges are considered as public resources and subject to the same controls as for managing public assets and funds. Non-refundable financing is

the only model adopted by the delegated water agencies to disburse the funds. Even if the Federal Water Law does not exclude it explicitly, delegated water agencies cannot grant funds to private entities even if when their projects match activities foreseen by the river basin plans.

At federal level, such agencies are non-profit institutions charged by the CNRH to provisionally act as competent water agencies (Box 2.4). The ANA charges, collects and transfers the full amount to such agencies via a management contract signed with the delegated water agencies (contracted parties) and the river basin committees (consenting parties). The delegated water agency is then expected to disburse the resources as foreseen by the interstate river basin committee. Management contracts are also signed at state level between state institutions collecting revenues and delegated water agencies in charge of disbursing them according to river basin plans.

Regulation of delegated water agencies differs across states (Box 2.4), e.g. they are foreseen by the legislation in the States of Rio de Janeiro, Minas Gerais and Bahia, but not by the States of Ceará, Paraná and Paraíba. In the latter cases, the same functions are carried out by state authorities responsible for water management (see below further description of each state). In the State of São Paulo, water agencies were created in the form of foundations or where water agencies do not exist, the functions are carried out by the state authority responsible for water management, which is the DAEE. Until 2011, delegated water agencies disbursed revenues directly to municipalities; however, perceived lack of capacity on the part of the part of the municipalities triggered the delegated water agencies to spend funds directly.

Box 2.4. The delegated water agencies

According to the art. 44 of the 1997 Federal Water Law, water agencies are in charge of:

- implementing water charges through delegation;
- analysing and issuing opinions on the projects and works to be financed with resources generated by the collection of water charges and sending them to the financial institution responsible for the administration of these resources;
- monitoring the financial administration of the resources collected with the collection for the use of water charges;
- proposing to the respective river basin committees the plan for applying the resources collected.

Art. 43 establishes that the creation of a water agency is subordinated, among others, to the financial viability guaranteed by the collection of water charges. Even though art. 53 established that the Federal Government would, within one hundred and twenty days from the publication of the Law, submit to Congress a bill regarding the institution of water agencies, in practice they have never been created. However, the 1997 Federal Water Law foresaw for the National Water Council the possibility of temporarily delegating to no-profit organisations the functions of water agencies. These organisations could take the form of: consortia and river basin associations of municipalities; regional, local or sectorial associations of water users; technical, educational and research organisations interested in the field of water resources; NGOs whose objectives are the defence of diffuse and collective interests; other organisations recognised by the National Water Council or by the State Water Resources Councils (art. 47).[1] Consequently the Law 10 881/2004 regulated the management contracts between ANA and the delegated water agencies, through which ANA was able to fully transfer to them the revenues collected from water charges. The CNRH Resolution 48/2005 established that water charging is conditioned to the existence of a (delegated) water agency, in charge of managing the revenues collected from water charges. At state level, when delegated water agencies are not foreseen by the Law the same functions are carried out by state authorities.

Box 2.4. The delegated water agencies (*cont.*)

Delegated water agencies in interstate and state river basins

Interstate River Basin	Name of delegated water agencies[2]	Comment
Paraíba do Sul	Pro-Management Association of the Paraíba do Sul River Basin (Associação Pró-Gestão das Águas da Bacia Hidrográfica do Rio Paraíba do Sul, AGEVAP)	In this basin, waters are shared among the States of São Paulo, Minas Gerais, Rio de Janeiro and the federal government. AGEVAP acts as delegated water agency for the whole basin at federal level. At state level, the AGEVAP is a delegated water agency only for the States of Rio de Janiero and Minas Gerais, but not for São Paulo, in which the same functions are carried out by the DAEE, within the State Secretary for Sanitation and Water Resources.
Piracicaba, Capivari, Jundiaí (PCJ)	PCJ Foundation Agency (Fundação Agência PCJ das Bacias Hidrográficas dos Rios Piracicaba, Capivari e Jundiaí: Agência das Bacias PCJ)	In the basin, waters are shared among States of São Paulo, Minas Gerais and the federal government. The Agência das Bacias PCJ is the agency with foundation status to the State of São Paulo and acts as delegated water agency for the Federal Government and for the rivers basins's portions that belong to the State of São Paulo. It does not act as delegated water agency for the State of Minas Gerais, in which the same functions are carried out by the IGAM.
São Francisco	Peixe Vivo Executive Association for the Support of Water Management (Associação Executiva de Apoio à Gestão de Recursos Hídricos Peixe Vivo, Agência Peixe Vivo)	In the basin, waters shared between the federal government and the Federal District, the States of Minas Gerais, Goias, Bahia, Pernambuco, Alagoas and Sergipe. The Agência Peixe Vivo acts as delegated water agency for the Federal Government and the State of Minas Gerais (the only state in which water charges are implemented so far).
Doce	BioAtlântica Institute (Instituto BioAtlântica, IBio AGB Doce)	In this basin, waters are shared among the States of Minas Gerais and Espiritu Santo. IBio AGB Doce acts as delegated water agency for the federal government and the State of Minas Gerais.
Paranaiba	Multisectoral Association of Water Resource Users of the Araguari River Basin (Associação Multissetorial de Usuários de Recursos Hídricos da Bacia Hidrográfica do rio Araguari, ABHA)	In this basin, waters are shared among the States of Goias, Minas Gerais, Mato Grosso do Sul and the Federal District. ABHA acts as delegated water agency for the federal government and the State of Minas Gerais.
Verde Grande	Peixe Vivo Executive Association for the Support of Water Management (Associação Executiva de Apoio à Gestão de Recursos Hídricos Peixe Vivo, Agência Peixe Vivo)	In this basin, water management is shared between the Federal Government and the States of Minas Gerais and Bahia. The Peixe Vivo agency acts as a delegate water agency for the federal government. The basin committee, which in this case is a single one for both the states, has submitted the proposal for collection to the water councils of both states, but it has not been approved yet.

Box 2.4. The Delegated water agencies (*cont.*)

State	Name of Delegated Water Agencies	Comment
Rio de Janeiro	• Associação Pró-Gestão das Águas da Bacia Hidrográfica do Rio Paraíba do Sul, AGEVAP • Consórcio Intermunicipal para Gestão Ambiental das Bacias da Região dos Lagos, do Rio São João e Zona Costeira, CILSJ	Currently, there is no movement in the State of Rio de Janeiro towards the creation of water agencies.
Minas Gerais	• Associação Executiva de Apoio à Gestão de Bacias Hidrográficas Peixe Vivo, Agência Peixe Vivo • Associação Multissetorial de Usuários de Recursos Hídricos da Bacia Hidrográfica do Rio Araguari, ABHA Gestão de Águas • Instituto BioAtlântica, IBio AGB Doce • Associação Pró-Gestão das Águas da Bacia Hidrográfica do Rio Paraíba do Sul: AGEVAP	Currently, there is no movement in the State of Minas Gerais towards the creation of water agencies.
São Paulo	• Fundação Agência das Bacias Hidrográficas dos Rios Piracicaba, Capivari e Jundiaí: Agência das Bacias PCJ • Fundação Agência da Bacia Hidrográfica do Alto Tietê: FABHAT • Fundação Agência da Bacia Hidrográfica do Rio Sorocaba e Médio Tiete	The State of São Paulo created three agencies with foundation status. For the other river basins, the DAEE, within the State Secretary for Sanitation and Water Resources carries out some water agency functions.
Ceará	No delegated water agency	The COGERH is responsible of the use of revenues from water charges
Paraná	No delegated water agency	The State Law 16242/2009 does not foresee water agencies, whose functions became part of the legal competencies of the state water resources management authority, *Instituto das Águas do Paraná.*
Paraíba	No delegated water agency	The State Law does not provide for the establishment of water agencies. Functions are carried out by the State Executive Agency of Water Management, *Agência Executiva de Gestão das Águas do Estado da Paraíba* (AESA).

Notes: 1. According to ANA (2016): "This temporary delegation model has been perpetuated and the establishment of a real water agency has not materialised yet. It is possible that the main reason is the fear that the water agency will be an institution governed by public law rather than private law".

2. All the delegated agencies operating in interstate river basins have management contracts with ANA.

Source: ANA (2016), "Background report on setting and governing economic instruments for water policy in Brazil", Brazil.

Water charges in practice: The state of play under federal and state domains

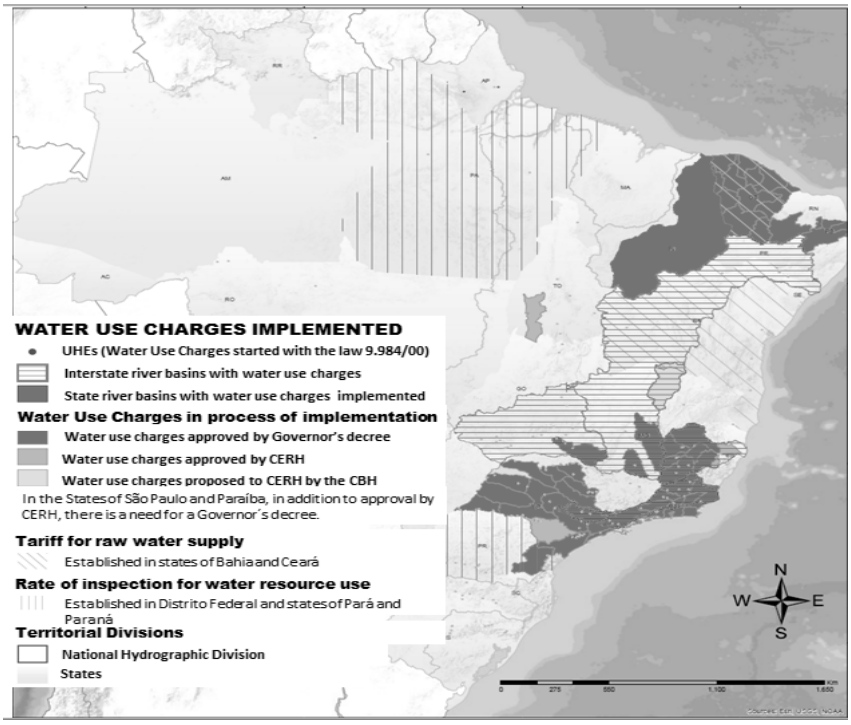
Water charges may not be needed everywhere in Brazil. They require a place-based approach depending on states and basins' exposure to water-related risks. However, irrespective of risks, they represent a source of revenue to cover costs of management and monitor the effects of anthropogenic activities on water resources quality and quantity. When taking stock of the current implementation of water charges, only a limited number of jurisdictions[3] have experience in that area (Figure 2.2):

- At federal level, water charges have been instituted in the Paraíba do Sul River basin (since 2003), the most important source of water for the State of Rio de

Janeiro; the Piracicaba, Capivari and Jundiaí (PCJ) River basin (since 2006), which supplies the metropolitan region of São Paulo through the Cantareira System, as well as the municipalities of the Piracicaba river basin, located downstream of the Cantareira System itself; the São Francisco River basin (since 2010), which covers seven states with contrasted hydrological, demographic and economic features; the Doce River basin (since 2011), located in the region with the largest complex of steel production in Latin America; finally, water charges were implemented in the Paranaíba and Verde Grande River basins in 2017 (Figure 2.3 shows the timeline of water charges implementation).

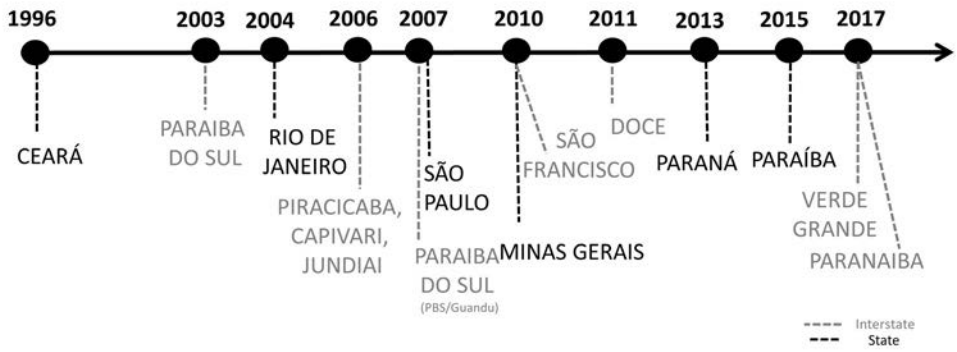
- At state level, water charges are applied in six states: the State of Ceará was the first one to implement water charges in 1996 and today water charges are implemented in the all management units. Revenues have been used to recover the costs of operation, maintenance and administration of water infrastructure. Rio de Janeiro was one of the pioneering states in issuing water permits and charges. Water charges have been implemented by law since 2004 in all management units. The State of São Paulo endorsed a specific law providing for water charges. Implementation began in 2007 and now concerns 9 out of 22 management units. In the State of Minas Gerais, water charges started in 2010 and they are currently established in 12 out of 36 management units. In the State of Paraná, water charges started in 2013 in one of the 11 management units. The State of Paraíba started operating water charges in 2015 in the management units of Litoral Norte, Paraíba e Litoral Sul, not included in the Piancó Piranhas Acu River Basin, in which discussions about water charges have just started (Table 2.1).

Figure 2.2. Water charges at federal and state level



Source: ANA (2017), "Cobrança pelo Uso de Recursos Hídricos no Brasil", http://arquivos.ana.gov.br/institucional/sag/CobrancaUso/Cobranca/CobrancaPeloUsodeRecursosHidricosnoBrasil.pdf.

Figure 2.3. Timeline of water charges implementation



Source: Authors' elaboration.

The hydrological complexity of the area in which water charges are applied and the institutional framework is in place affect the technical and political choice of implementing them. Brazil is a diverse country in terms of institutional capacity, performance, hydrological characteristics and level of economic development, amongst others. In 2014, the ANA clustered the 27 states that adhered to the National Water Management Pact in four classes (from A to D), according to their respective degree of complexity in water management and the corresponding institutional model. For the 27 states, these clusters reflect different degrees of complexity – from low to very high – according to the scope, intensity, number and dispersion of conflicts. They also involve different degrees of institutional complexity and required management actions that range from basic to advanced. It is worth noting that the implementation of water charges was featured only in the "most advanced" class (OECD, 2015).

Geographically speaking, water charges have been implemented in the Southeast and in the Northeast of Brazil (Table 2.1). The Southeast is the richest region in the country and hosts 13% of the total available water sources and 57% of the population. It suffers from water pollution, especially in urbanised and industrialised metropolitan areas, which has increased since the drought of 2014. The Northeast is a poor region hosting 3% of total available water sources and 29% of the total population. It is characterised by a high level of water scarcity. It shows low rates of sewage collection and treatment, respectively 6.5% and 14.7% (ANA, 2015). Since 2012, the region has been facing the most severe drought ever registered.

Table 2.2. Status of implementation of water charges in interstate and state basins

Intestate River Basin	Status of water uses charges	States within the River Basin (*in bold where the charges have been applied for state waters*)	Degree of implementation of charges in the State[1]	Typology from the National Water Management Pact (Class)	Geographical area
Paraíba do Sul	Implemented	**São Paulo**	41%	D	Southeast
		Minas Gerais	33%	D	Southeast
		Rio De Janeiro	100%	D	Southeast
Piracicaba, Capivari and Jundiaí	Implemented	**São Paulo**	41%	D	Southeast
		Minas Gerais	33%	D	Southeast
Doce	Implemented	**Minas Gerais**	33%	D	Southeast
		Espirito Santo	0%	C	Southeast
Rio Grande	Not implemented	**Minas Gerais**	33%	D	Southeast
		São Paulo	41%	D	Southeast
Paranapanema	Not implemented	**São Paulo**	41%	D	Southeast
		Paraná	9%	C	South
Paranaíba	Implemented	Goiás	0%	B	Central-West
		Mato Grosso do Sul	0%	B	Central-West
		Minas Gerais	33%	D	Southeast
		Distrito Federal	0%	C	Central-West
São Francisco	Implemented	**Minas Gerais**	31%	D	Southeast
		Bahia	0%	C	Northeast
		Pernambuco	0%	C	Northeast
		Alagoas	0%	B	Northeast
		Sergipe	0%	B	Northeast
		Goiás	0%	B	Central-West
		Distrito Federal	0%	C	Central-West
Verde Grande	Implemented	**Minas Gerais**	33%	D	Southeast
		Bahia	0%	C	Northeast
Piancó-Piranhas-Açu	Not implemented	Rio Grande do Norte	0%	B	Northeast
		Paraíba	75%	C	Northeast

Notes: 1. Percentage (%) of management units where the charge is implemented on the total number of units.

The State of Ceará, where water uses charges are applied since 1996 does not belong to an interstate river basin and therefore it is not reported in this table. Classes are: Class A: Low water conflicts; basic institutional framework; Class B: Medium water conflicts-Intermediate institutional framework; Class C High water conflicts – Developed institutional framework; Class D Very high water conflicts – Advanced institutional framework.

Source: ANA (2016), "Background report on setting and governing economic instruments for water policy in Brazil", Brazil; OECD (2015), *Water Resources Governance in Brazil*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264238121-en.

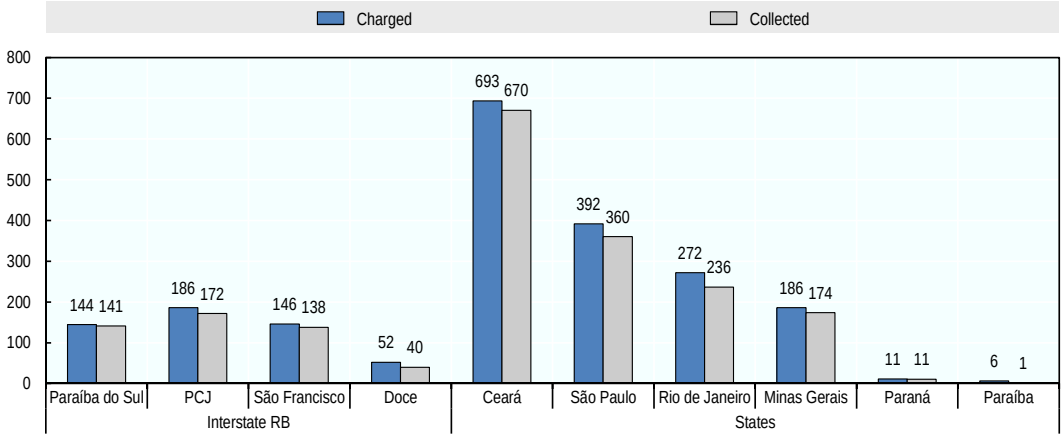
The average rates currently in use by interstate river basins[4] are BRL 0.02/m³ for water abstraction, BRL 0.02/m³ for water consumption and BRL 0.11/ kg BOD for discharge of organic loads. These rates are not automatically adjusted for inflation. After the initiation of water charges in Brazil (Paraíba do Sul River basin, 2003), unit prices

have basically remained at the same levels and were adopted for the Piracicaba, Capivari, Jundiaí (PCJ) (from 2006) and for the São Francisco River basins (from 2010). In the Doce River basin (from late 2011), slightly higher prices were adopted. Due to the double dominion, there may be more than one price in place within a given basin: one for federal waters and another (if not several others) for state waters. However, in practice, although established by different committees and councils, water charges in Brazil are overall similar in terms of their values.

Until 2016, about BRL 548 million were raised by charging for the use of water resources under federal domain[5] and around BRL 1.5 billion under state domain (Figure 2.4). At federal level, these revenues are able to cover about 10-15% of the financing need to implement actions foreseen in water resources plans, such as studies, projects or construction works. As a consequence, additional financial resources are needed to fill financing gaps (ANA, 2016). It is estimated that at federal level, 5% of users charged (large users) contributed 92% of the total charged. This scenario is similar to other countries (e.g. France), where focusing on big users allows to reduce transaction costs for collection, monitoring and enforcement of small users activities. In most cases, the gap between the amount collected and charged was below 10% with the exception of the State of Paraíba where the gap was 90%.

Figure 2.4. Total amount charged and collected in interstate river basins and states

BRL million; from the first year of implementation in each basin* to 2016



Notes: Water charges starting date: Ceará, November 1996; São Paulo, January 2007; Rio de Janeiro, January 2004; PCJ, January 2006; Minas Gerais, March 2010; Paraíba do Sul (excluding Guandu major diversion project), March 2003; São Francisco, July 2011; Doce, November 2011; Paraná, September 2013; Paraíba, January 2015.

Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

A tentative typology of water charges at federal and state level

River basins at federal and state levels have different experience vis-à-vis water charges in Brazil. However, they share some characteristics that allow the following classification synthesised in Table 2.3. A schematic view of the typology is provided below at macro level and more developments are detailed for each cluster. This typology also reflects the level of maturity in the institutional framework, which was captured by the management map carried out by the ANA for the implementation of the National Pact

for water management mentioned above. Table 2.3 matches the clustering of states done for the implementation of the National Pact for Water Management and that for water charges.

Table 2.3. Clusters of interstate and state river basin vis-à-vis their experiences with water charges

Cluster	Interstate RB Water charges applied for water under federal domain	States Water charges applied for water under state domain
Pioneers	Paraíba do Sul PCJ	Rio de Janeiro
Inspirational		Ceará
Followers	São Francisco	São Paulo Minas Gerais
Newcomers	Doce Paranaíba Verde Grande	Parana Paraíba
Aspirants	Piancó-Piranhas-Açu	Rio Grande do Norte

Source: Authors' elaboration.

Table 2.4. Clustering of states: Institutional framework and water charges

States	Typology from the National Water Management Pact (Class)	Typology according to the implementation of water charges
Rio De Janeiro	D *very high complexity, advanced institutional framework*	Pioneer
Ceará		Inspirational
São Paulo		Follower
Minas Gerais		Follower
Paraná	C *high complexity, developed institutional framework*	Newcomer
Paraíba		Newcomer
Rio Grande do Norte	B *medium complexity, intermediate institutional framework*	Aspirant

Source: Authors' elaboration based on OECD (2015), *Water Resources Governance in Brazil*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264238121-en.

- The **pioneers** are the Paraíba do Sul River basin, the PCJ River basin and the State of Rio de Janeiro. The Paraíba do Sul River basin was the first pilot for water charges implementation in Brazil, which provided insight into how to fill important legislative and operational gaps. In the PCJ River basin, a Consortium of 40+ municipalities and major water users applied a water charge voluntary scheme (*cobrança voluntária pelo uso da água)* as a pilot experience that paved the way for the implementation of water charges in 2006. The State of Rio de Janeiro was the first state, after Ceará, to implement water charges as foreseen by the SINGREH.
- The **followers** are the São Francisco River basin and the States of São Paulo and Minas Gerais. In these cases, debates on the implementation of water user charges

started way ahead their actual implementation. The double dominion is particularly important for these three cases: São Francisco is a huge basin involving the Federal Government, the Federal District and the States of Minas Gerais, Goias, Bahia, Pernambuco, Alagoas and Sergipe; the State of Minas Gerais cuts across by several interstate river basins, each of them having their own delegated water agencies; the State of São Paulo, whose legal framework for water management dates back to 1991 – namely before the 1997 Federal Water Law – is part of the Paraíba do Sul and the PCJ River Basins.

- The **inspirational** case refers to the State of Ceará, characterised by a longstanding experience and sophisticated centralised institutional framework for water charges, where river basin committees have less deliberative functions than in other states. This centralised system was put in place given the need for the redistribution of financial resources among basins in the state. Water charges are used to finance both administrative costs and the operation and maintenance of the water infrastructure. It is a model for other states, although conceptually different and difficult to replicate.
- The **newcomers** are those that only recently started implementing water charges, namely the Doce, Paranaíba and Verde Grande River basins and the States of Parana and Paraíba. Their experience is relatively limited and some bottlenecks still have to be dealt with. In Paranaiba and Verde Grande, water charges started to be operative respectively in March and April 2017. In both cases, billing will start in 2018.[6]
- The **aspirants** are those where discussions for implementing water charges in the future are currently taking place (Piancó-Piranhas-Açu River Basin and the State of Rio Grande do Norte).

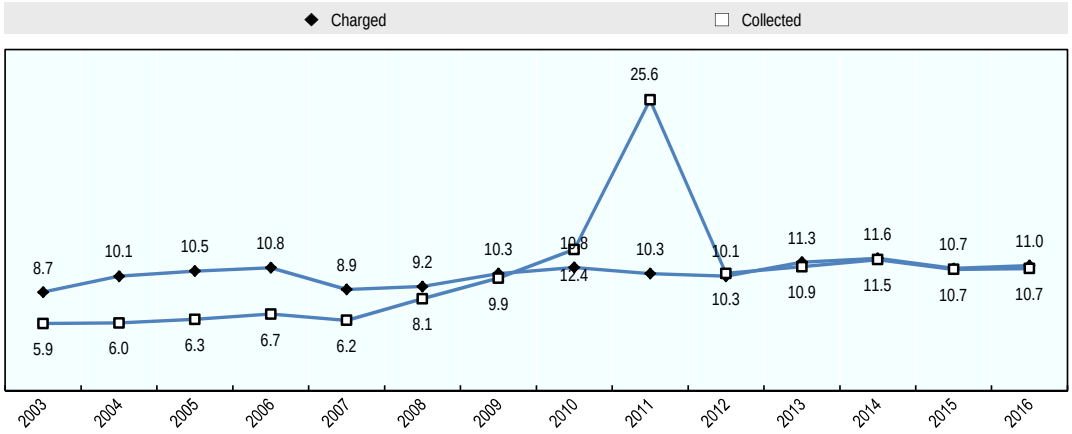
The pioneers

Paraíba do Sul River Basin

The Paraíba do Sul River basin was the first one implementing water charges under federal domain in 2003. It represented a benchmark for river basins at state and interstate level, which have followed relatively similar methodologies and rates. From 2007, the Paraíba do Sul River basin employed the methodology developed by the PCJ River basin in 2006. Since 2003 to 2016, the Paraíba do Sul River basin has collected about BRL 141 million (excluding revenues from the Guandu transfer) (Figure 2.5). However, according to the average annual revenues and the investment programmed in the river basin water resources plan to 2020 (COPETTEC, 2007), 470 years would be needed for meeting the overall investment needs (Bernardes and Broch, 2015). In 2016, abstraction and consumption (quantitative use) represented 83% of the total charged, while BOD (qualitative use) accounted for the remaining 17%. As per users, about 98% of the revenues collected come from sanitation and industry users. Other sectors, including agriculture, contribute to 2%. Over a period of ten years (since 2003), the number of payers increased from 186 to 417 (ANA, interview 2017).

Figure 2.5. Water charges in the Paraíba do Sul River basin

(BRL million, 2003-2016)



Notes: The higher volume collected in 2011 is explained by the fact that the ANA was able to transfer to the AGEVAP an additional BRL 14.5 million, due to the a judicial decision, which made the National Steel-maker Company (Companhia Siderúrgica Nacional,CSN) pay what was due from 2003 to 2009.

Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

The Interstate River Basin Committee of the Paraíba do Sul River basin (Comitê da Bacia Hidrográfica Interestadual do Rio Paraíba do Sul, CEIVAP) was created in 1996. It has responsibilities on federal rivers across the States of Rio de Janeiro, São Paulo and Minas Gerais. Regarding the institutional organisation for water charges, roles are allocated as follows: the CEIVAP sets water charges, the ANA collects them, and the AGEVAP manages and disburses revenues according to the actions foreseen in the interstate river basin plan. The AGEVAP, the delegated water agency, was created in 2002 and is a non-profit organisation. Further information is provided in Annex A.

Beyond the CEIVAP, in the Paraíba do Sul River Basin, at state level there are other seven state committees: one in São Paulo, two in Minas Gerais and four in Rio de Janeiro. These river basin committees set the charges for water under state domains, then the Environmental State Institute (Instituto Estadual do Ambiente, INEA) in Rio de Janeiro, the Institute for Water Management (Instituto Mineiro de Gestão das Águas, IGAM) in Minas Gerais, and the Department of Water and Electricity (Departamento de Águas e Energia Elétrica, DAEE) in São Paulo collect the charges. Concerning the management of revenues at state level, the INEA and the IGAM have management contracts with the AGEVAP, as the delegated water agency. In the case of the State of São Paulo, water agency functions are carried out by the DAEE, within the State Secretary of Sanitation and Water Resources (Secretaria de Saneamento e Recursos Hídricos do Estado de São Paulo, SSRH). According to the management contract between INEA and AGEVAP, 10% of revenues from water charges collected through the implementation of water charges in the State of Rio de Janeiro are transferred to the AGEVAP, while the rest is transferred to the State Water Resources Fund (Fundo Estadual de Recursos Hídricos, FUNDRHI). In the case of the State of São Paulo, revenues are fully transferred to the State Water Resources Fund (Fundo Estaduao de Recursos Hidricos, FEHIDRO) (ANA, 2014).

The pilot experience of the Paraíba do Sul River basin provided an opportunity to solve ambiguities in the national legislation and to clarify the relationship across levels of government regarding management of revenues from water charges (Abers and Keck, 2013). Prior to the pilot, before water charges management was delegated to the AGEVAP for disbursement, the ANA had to fulfil that role, generating some concerns on the return to the basin of the revenues, once transferred to the National Treasury. This pioneering experience with water charges resulted in the identification of a number of new questions around water revenue management, for instance, how to avoid funds being used for other purposes than those related to water, specific to the basin, and stated in the river basin plan (ANA, 2016).

Piracicaba, Capivari, Jundiaí (PCJ) River Basin

The PCJ Interstate River basin is another pioneering experience in water charges implementation and interesting case for intermunicipal co-operation. The river basin includes the States of São Paulo and Minas Gerais. The PCJ Committee was inspired by the French system, in particular the experience of the Seine/Normandy Basin (Greater Paris) (see Chapter 5).

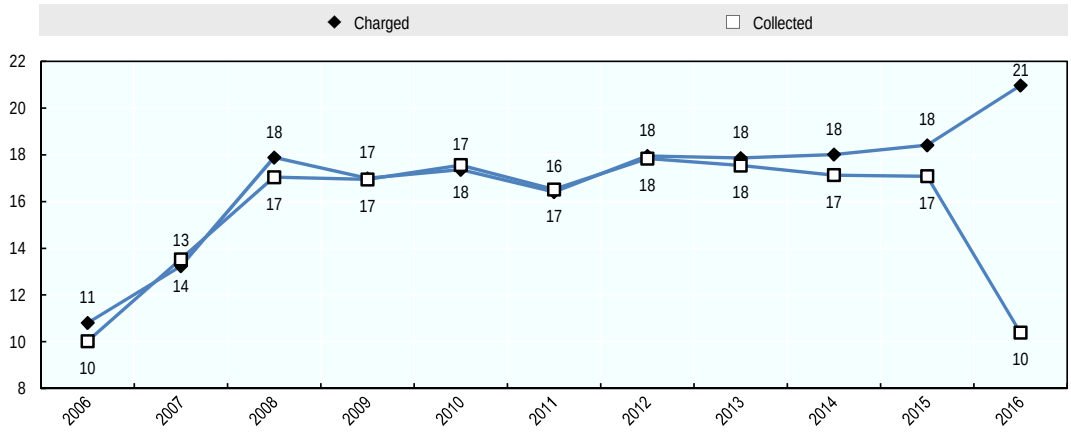
In 1989, municipalities in the Piracicaba and Capivari River basin created a consortium called Inter-municipal Consortium of the Piracicaba and Capivari Rivers basins. In 2000, it incorporated also the Jundiaí River basin, becoming the PCJ Consortium, which includes also large water users. The Consortium is a non-profit association, created to raise awareness and manage watershed protection funds to improve water quantity and quality. It is also responsible for determining river basin plans. Today, the consortium has 42 municipalities and 30 companies from the sanitation and industry sector as major water users.

In the late nineties, a discussion on water charges was initiated to rationalise the use of water and raise awareness. In 1999 the Consortium PCJ set a voluntary charging scheme, paving the way for the implementation of water charges in 2006. Although almost symbolic (BRL 0.01/m3 of abstracted water), the amount charged aimed to raise awareness over rational water use amongst members of the Consortium. This voluntary programme ended in 2005, a year before water charges were put in place.

As in the Paraíba do Sul and Doce River Basins, the implementation of water charges was gradual: water users paid 100% of the charged amount only after the third year of implementation (60% for the 1st year and 70% for the 2nd). The amount charged was BRL 0.01/m3 of abstracted water; BRL 0.02/m3 for not returned water and BRL 0.10/kg BOD. About 95% of revenues from water charges proceed from 19% of users. The major contribution (86%) came from the sanitation sector, followed by industry (14%). The first rates increase since their implementation in 2006 was eight years later in 2014. In 2007, the PCJ Committee modified mechanisms for agricultural uses, such as multiplier coefficients according to the irrigation technology adopted, as well as differentiated payment mechanisms (ANA, 2014).

Figure 2.6. Water charges in the PCJ river basin

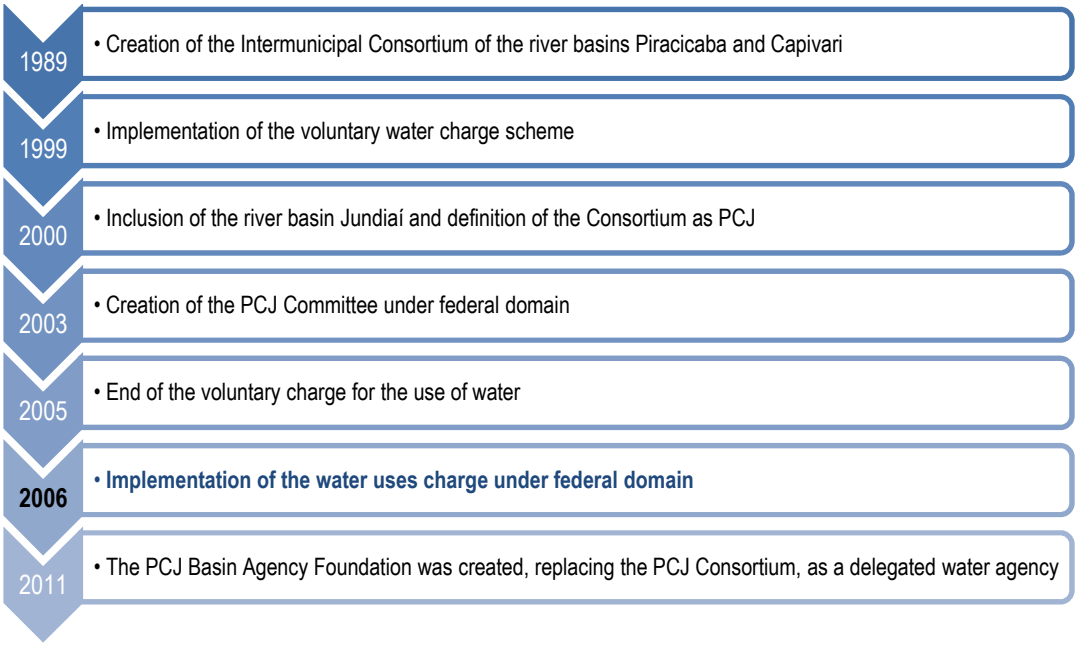
(BRL million; 2006-16)



Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

In 2005, the PCJ River basin committee nominated the PCJ Consortium to perform water agency functions for the rivers under federal domain (Figure 2.7). In five years a reduction by 40% the volumes of permitted water was achieved (PCJ Consortium, interview 2017). The PCJ basin agency foundation replaced the Consortium in 2011 as delegated water agency. The PCJ basin agency foundation is responsible for the implementation of water charges, according to programmes, projects and works foreseen in the river basin plan, approved by the PCJ Committee. The PCJ basin agency foundation[7] is the water agency for the river basin's portions of the States of São Paulo and delegated water agency for the federal government, but not for the State of Minas Gerais, in which the same functions are carried out by the IGAM. This implies that at state level, revenues collected through water charges in rivers in the State of São Paulo are transferred to FEHIDRO and administered by the PCJ Basin Agency Foundation, which receives 10% of this funding to cover its governance and operational costs. On the other hand, revenues collected through water charges in rivers under the domain of the State of Minas Gerais are fully transferred to the IGAM.

Figure 2.7. Timeline of the institutional framework for water charges in the PCJ River basin



Source: Authors' elaboration, based on ANA (2014), "Cobrança pelo uso de recursos hídricos, Capacitação em Gestão de Recursos Hídricos", Vol. 7, Brasília.

As it is the case in other basins, the PCJ Committee established a methodology for prioritising the use of funds. The methodology consists of scoring projects according to criteria developed by a technical group and available online. Projects are eligible if they cover one of the eight thematic groups foreseen by the river basin plan: database, records, studies and surveys; water resources management; programme for rational use of water resources; recovery of the quality of water bodies; multiple use of water resources; conservation and protection of water bodies; prevention and protection against extreme hydrological events; and technical training, environmental education and social communication. There are 11 technical chambers in PCJ involving more than 600 people. They represent platforms for dialogue to discuss best practices and build a common vision. Revenues annually collected within the PCJ basin are returned to the basin to implement these projects, excluding the administrative costs of the agency (the latter are covered by 7.5% of revenues at federal level and 10% from the State of São Paulo). The multi-year budgeting for disbursement, a common practice in basins, in PCJ runs currently from 2017 to 2020. The PCJ agency offers technical assistance to municipalities to compile their plans and get access to funds, which is a challenge especially for small municipalities.

The amount charged is not able to cover investment needs, or to truly trigger a behavioural change. The yearly collection is about BRL 16 million against an overall project investment need of BRL 4 billion (at current levels of charging, it would take 250 years to cover investment needs). On the one hand, progress has been made in terms of completed projects and reducing the volume of permitted water by 40%; although, not necessarily linked to the implementation of water charges. Conflicts over water uses are amongst the major challenges for the basin, which has been threatened by water scarcity. The area hosts the third largest industrial park in the country, generating one of the largest

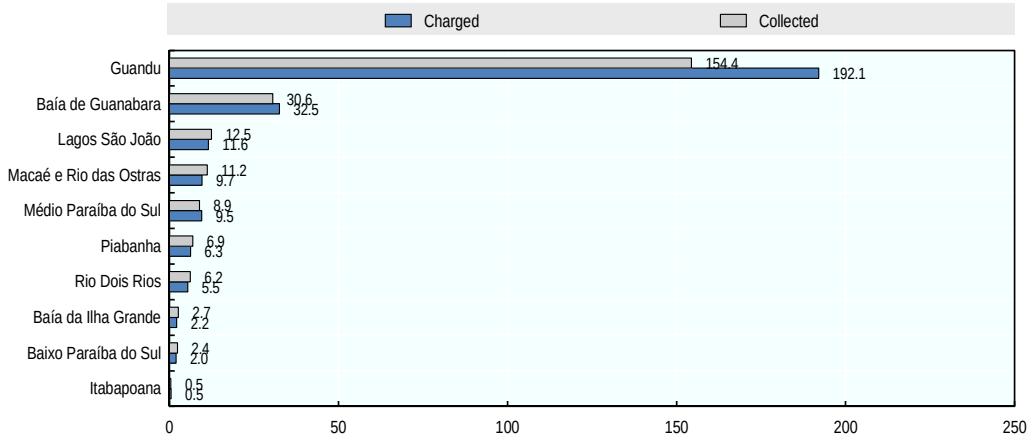
GDP; a significant irrigated area and a population of 5.5 million people. Regarding the sanitation gap, charges are not able to help reduce the investment liability for basic sanitation and they are actually not meant to do so. In fact, there is an unbalance between the (little) revenues from the water charges and the huge investment needs in the sanitation sector. In practice, revenues from water charges can be more effectively spent for other uses aiming at improving water management in the basin. The legislation itself advocates that water resources, sanitation and environment systems are interconnected; however, it is unclear how to allocate resources and responsibilities to make this happen in practice. The issue of investment backlogs can only be solved by an ambitious and sustainable national sanitation policy and sound enforcement mechanisms.

The State of Rio de Janeiro

Rio de Janeiro was one of the pioneering states in issuing water permits and charges. Water charges for state waters have been implemented by Law (No. 4 247/03) since 2004. In 2016, the annual collection was around BRL 24 million, which is below 2.5% of what it would take to meet the needs of the State Water Resources Plan (Plano Estadual de Recursos Hídricos do Estado do Rio de Janeiro, PERHI) (Acselrad et al., 2015) (Figure 2.8).The collection increased particularly after 2010 when the sanitation company (Companhia Estadual de Águas e Esgotos do Rio de Janeiro, CEDAE) started to pay for water use. The value of charges has stagnated from 2003 to 2016, when all the management units saw their charges doubled (Lagos São João being the exception). In 2016, the sanitation sector contributed to the collection of 83% of the total revenues collected, followed by industry (10%) and thermoelectric (4%), although there were relevant differences within the state (ANA Database, 2017).

Figure 2.8. Water charges in the State of Rio de Janeiro

by management unit; BRL million; 2007-2016



Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

The case of Rio de Janeiro presents some distinctive features. First, water charges were established by law (No. 4247/03) across the whole state even where river basin committees were not yet established. Second, there is a significant earmarking of the funds to the sanitation sector. In fact, the law foresees that at least 70% of the amount collected on urban water and sanitation services must be invested in urban wastewater

treatment systems until the achievement of a coverage of 80% in the river basin (see case study on the State of Rio de Janeiro in Annex B).

The institutional framework for water charges is defined as follows: the Secretary of State for the Environment (Secretaria de Estado do Ambiente, SEA) proposes and guides public policies related to the implementation of water charges. The INEA, the executive body of water resources is responsible for the collection; basin committees have the legal prerogative to define the methodology, criteria and rates, for a subsequent approval by the State Council for Water Resources (Conselho Estadual de Recursos Hídricos do Estado do Rio de Janeiro, CERHI). The INEA holds also monitoring and inspection powers. Revenues are managed by delegated water agencies, including the AGEVAP (ANA, 2016).

According to the 2003 Law, revenues collected from water charges for the use of water resources, recorded as FUNDRHI funds, should be implemented in the region or in the river basin where they were generated. The FUNDRHI is organised in sub-accounts, allowing the autonomous management of the financial resources by each river basin. Funds can be used in projects altering the quality, quantity or flow regime of water bodies only in the public interest and after approval by the respective river basins.

The economic crisis of the State of Rio de Janeiro has been posing serious challenges especially concerning the use of revenues for water management purposes. Even though the situation is gradually improving and the state has seen a recent doubling of the charges collected, it seems unlikely that significant additional state or federal funds for hard and soft infrastructure water-related needs will be available in the short to medium term. The state is a very urbanised and industrialised, as such presenting conflict over water uses. In the future, water charges can play a key role, as a water management instrument, to effectively achieve water security goals. Therefore, they should not systematically be geared to investments where they can realistically make no difference given the huge needs and backlogs, such as in the case of sanitation. According to the PERHI, investments need in sanitation amount at BRL 10 billion, which represents 64% of the total expenses foreseen by the Plan (e.g. the overall water management system costs, including for instance those for information and monitoring, represent 5% of the overall expenses foreseen by the Plan). Annex B explores further challenges and ways forward for the case of Rio de Janeiro.

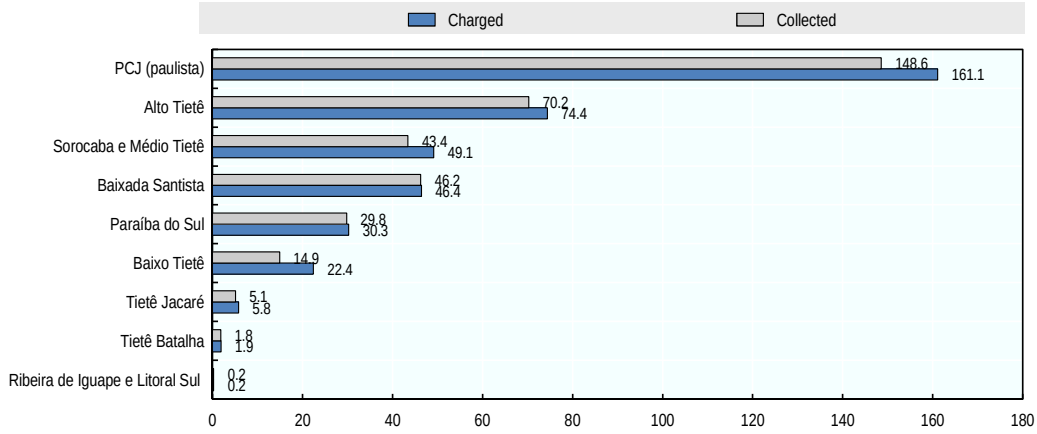
The followers

The State of São Paulo

The State of São Paulo was the first one to pass a Water Law in 1991 (No. 7663), before the national framework was put in place. The 1991 law identified bulk water charges as instrument of state policy (art. 14). In 2005, the state endorsed a specific law (No. 12 183/ 2005) providing for water charges, with features such as general criteria and upper limits to levels of charges. Water charges were gradually implemented: in Paraíba do Sul and PCJ from 2007; in Sorocaba e Médio Tietê from 2010; in Baixada Santista from 2012; in Baixo Tietê from 2013; in Alto Tietê from 2014 and in Tietê Batalha, Tietê, Jacaré and Ribeira de Iguape, Litoral Sul from 2016. In the other ten basins water charges have been proposed, but not yet implemented (SigRH, 2017a). Therefore, water charges implementation now concerns 9 out of 22 management units. Decree No. 50667/2006 regulates water charges for urban and industrial uses.

Figure 2.9. Water charges in the State of São Paulo

by management unit; BRL million; 2007*- 2016



Notes: Water charges implemented in Paraíba do Sul and PCJ from 2007; in Sorocaba e Médio Tietê from 2010; in Baixada Santista from 2012; in Baixo Tietê from 2013; in Alto Tietê from 2014 and in Tietê Batalha, Tietê / Jacaré and Ribeira de Iguape / Litoral Sul from 2016.

Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

As in other cases, revenues are too low to meet the needs of the river basins in São Paulo. A total of BRL 360 million has been collected in the state from 2007 to 2016 (Figure 2.9). Some concerns have arisen in terms of how resources are used and distributed. According to the Upper Tietê River Basin Agency Foundation (Fundação Agência da Bacia Hidrográfica do Alto Tietê, FABHAT), after two years of water charges implementation, members of the basin committee are showing concern about the issue of the allocations of revenues and adjustments might be needed in the future. Regarding the State Water Resources Plan (Plano Estadual de Recursos Hídricos, PERH), changes have been adopted as a consequence of the recent law No. 16 337/ 2016. The law clarifies competences of the State Water Resources Council, the Coordinating Committee of the State Water Resources Plan (Comitê Coordenador do Plano Estadual de Recursos Hídricos, CORHI) and the river basin committees. It calls for greater integration between the actions foreseen in PERH and in the Plurennial Plan (PPA) and includes the private sector as beneficiary of incentives for the implementation of projects in compliance with the PERH.

According to the 2005 Law, entities responsible for water charges are the granting authority DAEE or the water agencies. Revenues collected are accredited into the State Fund for Water Resources (FEHIDRO). The Law No. 10 020/ 1998 foresees the creation of water agencies in the institutional form of foundations. They should be created only in hydrographic basins when issues related to water resources justify so. Thus far, three water agencies were created (SigRH, 2017b) (Table 2.5):

- The Foundation of the Piracicaba, Capivari and Jundiaí River Basin Agency (PCJ Basin Agency) which manages FEHIDRO's financial resources in the corresponding river basin;

- The Upper Tietê River Basin Agency Foundation (FABHAT), which elaborates all the technical studies to support the river basin committee in the definition of the water charges, as foreseen by the law;
- The Sorocaba and Meio Tietê River Basin Agency Foundation (Fundação Agência da Bacia Hidrográfica dos Rios Sorocaba e Médio Tietê, FABH-SMT), which was established in 2003, and is responsible of managing water charges since September 2014. Before then, functions were carried out by the DAEE, which continues to support FABH-SMT when needed.

Table 2.5. Basin committees and agencies in the State of São Paulo

River Basin	Delegated water agencies
River Basin Alto Tietê (CBH-AT)	FABHAT
River Basin Piracicaba, Capivari e Jundiaí (PCJ)	Agência PCJ
River Basin Sorocaba e Médio Tietê (CBH-SMT)	FABH-SMT

Source: Authors' elaboration based on information accessible at: SigRH (2017a.), Agência de Bacia, http://www.sigrh.sp.gov.br/agenciadebaciaapresentação (accessed August 2017).

In absence of an official water agency, the functions are carried out by the DAEE within the State Secretariat of Sanitation and Water Resources of the State of São Paulo.

The State of Minas Gerais

In the State of Minas Gerais, water charges started in 2010 and are currently established in 12 out of the 36 management units. The state is located in seven interstate river basins, each with its own delegated water agency to manage revenues from water charges where they are applied: Paraíba do Sul, Piracicaba, Capivari and Jundiaí, Doce, Rio Grande, Paranaíba, São Francisco and Verde Grande. As it happens at Federal level and in the case of Rio de Janeiro, the Minas Gerais State Law No. 13199/1999 foresees the need of an institution to be allowed by the State Water Resource Council to temporarily act as a water agency. In this case, the State of Minas Gerais delegated the management to several entities: the Agência Peixe Vivo; the ABHA; the IBio AGB Doce; and the AGEVAP (Table 2.6).

Since 2010, more than BRL 173 million has been collected at state level (Figure 2.10). About 6% of users account for 90% of the amounts charged in the State of Minas Gerais. The implementation of water charges by the Doce River basin considered a milestone for the state water management system. Since then, charges have been applied in additional six river basin committees included in the Rio Doce Basin. Moreover, the integration of the river basin committees allowed the establishment of the IBio AGB Doce as delegated water agency. In fact, before the integration only two basin committees had the financial viability to do so. In 2014, 31% of small users were exempt from the payment. Inspections on illegal use of water led to estimate that about 40% of illegal users are small users, bringing no additional income due to the exemptions (GECOB/IGAM, 2016). In Minas Gerais, 92.5% of revenues are used for implementing the river basin plans, while 7.5% should cover the administrative and technical costs of water agencies. However, the amount generated by water charges is not sufficient for the agencies to properly execute their roles. One of the major concerns is the ability to use the collected revenues for more ambitious projects, e.g. beyond studies and planning, to improve water quality and control water quantity. In addition, the disconnect between city

master plans and river basin plans (as is often the case in Brazil given the low level of engagement of municipalities in water resources management as described in OECD 2015) also hinders synergies towards greater water efficiency.

Table 2.6. River basins, delegated water agencies implementing water charges in Minas Gerais

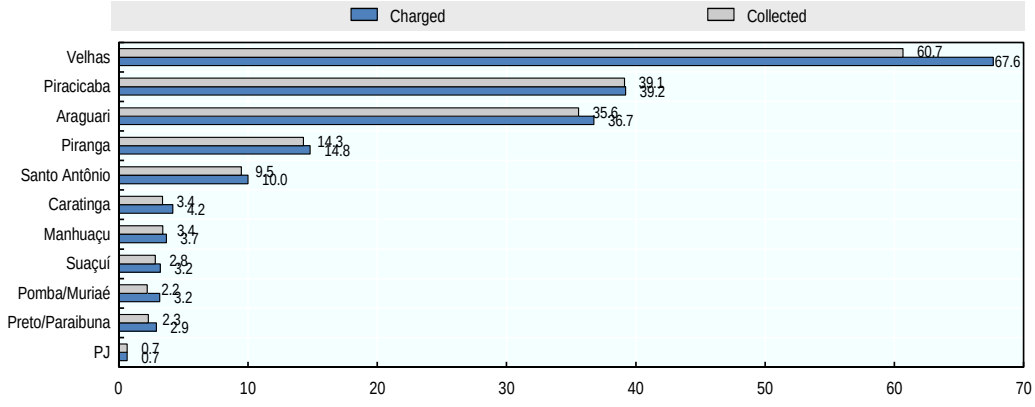
Federal basins	State basins	Delegated water agencies or state authorities carrying out functions of water agency
Rio Doce	Piranga	IBio
	Piracicaba	
	Santo Antonio	
	Suacui	
	Caratinga	
	Manhuacu	
Paranaiba	Araguari	ABHA
Paraíba do Sul	Preto e Paraibuna	AGEVAP
	Pomba e Muriae	
Piracicaba e Jaguari	Piracicaba e Jaguari	IGAM *
Sao Francisco	Para	Agência Peixe Vivo
	Rio das Velhas	

Note: * IGAM is a State Management Authority.

Source: IGAM (n.d.), Cobrança pelo uso de Recursos Hídricos, http://www.igam.mg.gov.br/gestao-das-aguas/cobranca-pelo-uso-de-recursos-hidricos (accessed August 2017).

Figure 2.10. Water charges in the State of Minas Gerais

by management unit; BRL million; 2010-15



Notes: Water charges implemented: in PJ, Velhas, Araguari in 2010; in Piranga, Piracicaba, Santo Antônio, Suaçuí, Caratinga, Manhuaçu in 2012; in Preto/Paraibuna and Pomba/Muriaé in 2014.

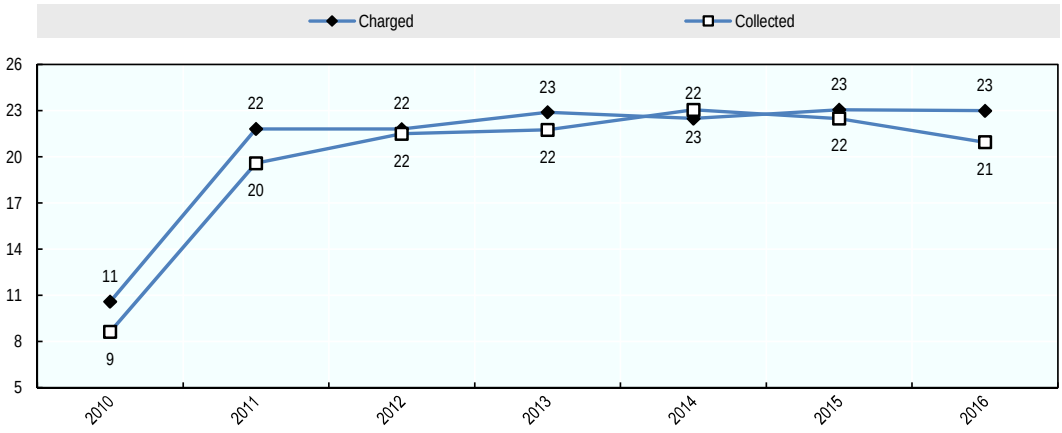
Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

São Francisco River Basin

Although actually applied in 2010, the São Francisco River basin committee (Comitê da Bacia Hidrográfica do Rio São Francisco, CBHSF) started considering the implementation of water charges in 2001, two years after its creation. From 2010 to 2016, the total amount collected was BRL 137 million (Figure 2.11). About 7% of the users represent approximately 95 % of the total revenue. About 66.7% of basin collection is concentrated in the transposition of the Sao Francisco River (Projeto de Integração do Rio São Francisco, PISF). Water charges rates in the São Francisco River Basin have remained the same since 2010; however, a review of rates is currently ongoing. The agricultural sector is charged 40 times less than other sectors. After seven years of implementation, there is no analysis of results of water charges implementation in this basin (ANA, 2016).

Figure 2.11. Water charges in the São Francisco River basin

BRL million; 2010-16



Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

The São Francisco River basin involves the federal government, the Federal District and the States of Minas Gerais, Goias, Bahia, Pernambuco, Alagoas and Sergipe. Unlike other interstate basins, there are two interstate river basin committees in the São Francisco River basin responsible for charging for the use of water resources under federal domain: the CBHSF and the Verde Grande River Basin Committee (Comitê da Bacia Hidrográfica do Rio Verde Grande, CBH Verde Grande). The São Francisco River Basin is shared amongst several states which made the debate on water charges challenging. Given this complexity, the basin determined that it would only charge for water in federal rivers, except for the Verde Grande River. The delegated water agency in charge of managing resources from water charges is the association Agência Peixe Vivo. Mechanisms approved for charging were the same used in other basins. Unit prices were the same as those adopted in the Paraíba do Sul River basin (ANA, 2014). Besides in the federal domain, water charges exist only in the State of Minas Gerais.

The inspirational case

The State of Ceará

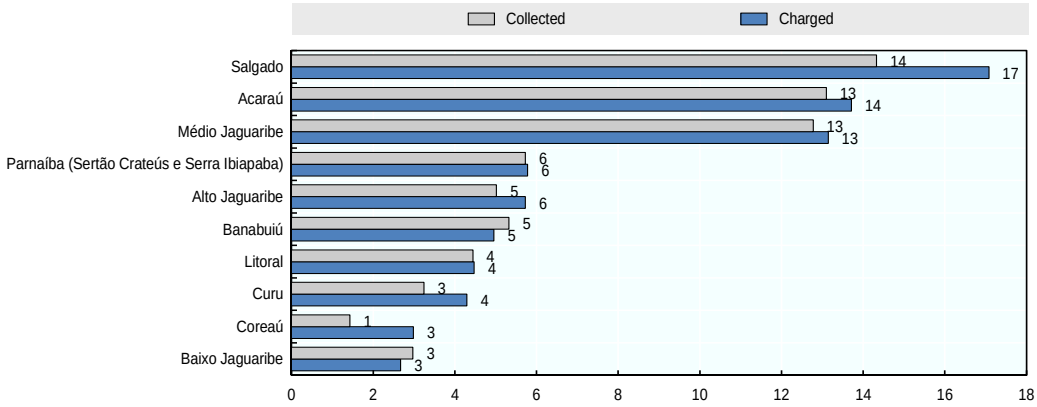
The State of Ceará was the first one to implement water charges in 1996. Its experience is unique, representing a model for other states, although difficult to replicate. Ceará, one of the poorest states in Brazil, adopted a centralised model for water charges management. The body responsible of water charges implementation is the Water Resources Management Company (Companhia de Gestão de Recursos Hídricos, COGERH), created in 1993. It is both a provider of raw water supply and holds water agency's functions (ANA, 2014; Formiga Johnsson and Kemper, 2005).

Water charges are used to finance both the COGERH's administrative expenses and the operation and maintenance of the water infrastructure for which it is responsible. This centralised system was put in place given the need for the redistribution of financial resources among basins in the state, which had not been easy to implement under a decentralised setting, except for the case of Fortaleza Basin. River basin committees have less deliberative functions than in other states: prices are not suggested by Committees but by the government. In fact, rates for water charges are defined through technical analysis from the COGERH and the State Council for Water Resources (Conselho Estadual de Recursos Hídricos, CONERH). The latter has seven regional offices (*gerencias interioranas*).

The objective of water charges is to recover the costs of operation, maintenance and administration of the hydraulic infrastructure. As such, they are not meant to remunerate investments. Water charges are applied for urban water, sanitation, industrial and agricultural uses. For irrigation, they are applied progressively. Charges are differentiated by type of users, considering their payment capacities, thus containing inter-sectoral and extra-sectoral subsidy mechanisms including subsidising agriculture by charges incurred to the industry. Charges are calculated on the actual volume but the amount charged varies yearly and according to the climate conditions, e.g. in period of drought, charges are greater to compensate for the increase in costs of pumping. The total collected since 1996 is BRL 670 million, most of which has been collected in the Metropolitana River basin (BRL 464 million), which is not included in Figure 2.12.

Figure 2.12. Water charges in the State of Ceará

by management unit; BRL million; from 2008 to 2016



Note: From 1999 to 2007 disaggregated data by river basins are not available.

Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

From 2012 to 2015 users billed increased by over 400%. Amongst the users, in 2016, the sanitation sector was the biggest contributor (55%) followed by industry (44%). Irrigation contributed only 1% of the total collected revenues (ANA Database, 2017). The result is that the degree of cross-subsidisation within the state for water management costs is enormous, both among user sectors (from industries to the domestic and irrigation sectors) and regionally (from the metropolitan basin to the other basins) (Formiga Johnsson and Kemper, 2005).

The state has been successful in raising revenues from water charges; however there much remains to be done for enhancing water security. The drought is raising new challenges, and opportunities such as: co-operation between the water and power sector through a contingency tariff; discussions on the update of possible water charges to enable future water reuse, on the allocation of tradable water rights and on cross-sectoral subsidy mechanisms (Interviews, Brasilia 2017). For the system to be resilient in the face of drought, water charges should be set in a way that does not overlook the achievement of "economic" objectives.

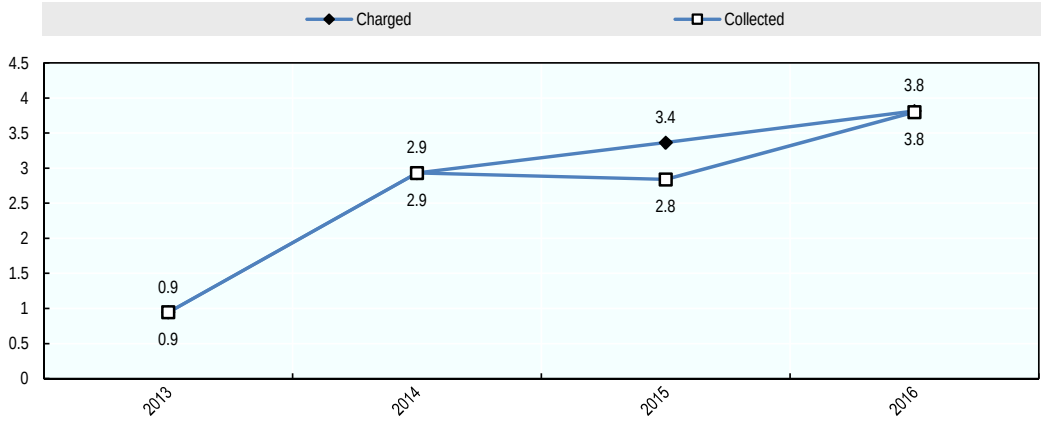
The newcomers

The State of Paraná

In the State of Paraná, water charges started in 2013 in one of the eleven management units. The Alto Iguaçu e Afluentes do Alto Ribeira basin, where charges have been applied, represents a pilot testing experience. The state counts about 4 000 users granted with permits for abstraction and discharge. When water charges are implemented in all the state units, revenues are projected to reach BRL 20 million/year. Total investments for the next 30 years would require an amount of BRL 2.92 billion, of which BRL 2.42 billion for environmental sanitation and the rest for tackling pollution of industrial origin. Most of the river basin committees have completed their plans or are near to completion.

The Water Institute of Paraná holds water agency's functions. A Water Resources State Fund (Fundo Estadual de Recursos Hídricos, FRHI/ PR) was created in 1999 and regulated through the Decree 9131 in 2010.[8] The Water Charges Technical Chamber within the river basin committee (COALIAR) created in 2007, monitors the implementation of the charges in the basins.[9]

Figure 2.13. Water charges in the State of Parana
BRL million, 2013-16



Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

In the Alto Iguaçu e Afluentes do Alto Ribeira basin, BRL 10 million was collected between 2013 and 2016. As in other states, the rates applied were almost symbolic: BRL 0.01 cent/ m3 of water captured directly from rivers; BRL 0.02 cent/ m3 for groundwater abstraction and BRL 0.10 / kg of BOD discharged in the river. The agricultural sector is exempt from payment. Since 2013, 70+ industries and large users have been charged for water use.[10]

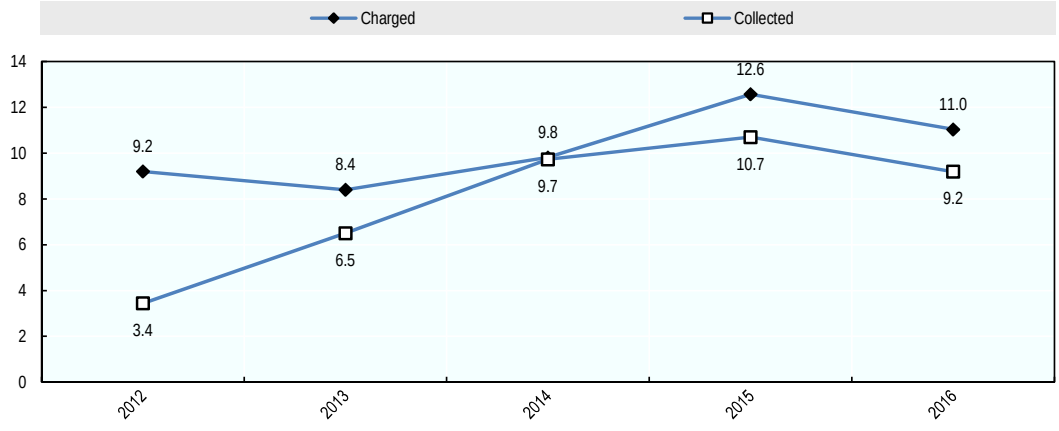
Doce River Basin

Under federal domain, the Doce River basin implemented water charges in 2011. Doce River basin encompasses the States of Minas Gerais and Espirito Santo. Technical analyses were carried out by the ANA to support the decision on mechanisms and prices within the committee. The study took into account different revenue scenarios in order to be able to meet the interventions needed for the water resources within the river basin plan. Nevertheless, the decision was eventually political and the unit prices were different from those proposed (ANA, 2016).

From 2012 to 2016, the total revenue was about BRL 39 million. As they stand, charges are able to cover less than 10 % of the needs. As for the São Francisco, in the Doce River basin, the volumetric charge for agricultural users is 40 times smaller than other sectors as well. The Bioatlântica Institute IBio holds delegated water agency's functions for the federal government and the State of Minas Gerais. Prioritised planning actions are foreseen in the multi-year implementation plan (2016-20). This initiative for multi-annual planning inspired by the CEIVAP, PCJ Committees and CBHSF aims to streamlining and improving the disbursement of raised funds.

Figure 2.14. Water charges in the Doce River basin

BRL million; 2012-16



Note: Data for the years 2011 and 2012 have been merged.

Source: ANA (2017), "Valores Cobrados e Arrecadados", www2.ana.gov.br/Paginas/servicos/cobrancaearrecadacao/cobrancaearrecadacao.aspx (accessed August 2017).

One of the main challenges is due to the double dominion and overlapping jurisdictions: IBio finds challenging to manage contracts with federal and state entities, which is costly and poses difficulties in terms of human capacities (Interviews, Brasilia 2017). State and federal governments have different approaches and *modus operandi* concerning how the funds should be spent and inspections should be carried out: e.g. the

State of Minas Gerais tends to apply much stricter inspections for disbursement. The imminent renewal of the contract will be an occasion to discuss the efficiency of this model and possible ways forward. In 2016, the collapse of a dam caused the release of 40 million tonnes of sediments into the river, with financial consequences.

The State of Paraíba

The State of Paraíba implemented water charges in 2015 in all management units except those located in the Pianco Piranha Acu River basin. Water charges are regulated by the state law (No. 6.308/ 1996), but as in the States of Ceará and São Paulo, they became operational only after a government decree (No. 33613/2012). The state law does not provide for the establishment of water agencies. The Executive Agency of Water Management of the State of Paraíba (Agência Executiva de Gestão das Águas do Estado da Paraíba, AESA) is the executive agency of the Basin Committees. For water quantity, the state depends on reservoirs funded through general taxation. Irrigators are the bigger water users; however, they may have greater exemptions depending on the region of the state where they are installed. The value of 100 cubic meters varies between BRL 0.3 and BRL 1.50 according to the use.[11] Irrigators pay a fee for the use of common infrastructure,[12] excluding dams.

Revenues are not sufficient to support operational costs of the river basins plan. Up to 2016, a total of BRL 1 million was collected against the BRL 6 million originally charged. Framework conditions are in place for water charges, but the drought made it politically and socially difficult to accept and then to collect revenues. The low levels of collection would require greater inspections and enforcement. Compared to the current charge of BRL 0.01/m, it is estimated that a charge of BRL 0.46/m³ would be needed to implement the water resources plan.[13] Possible next steps would foresee a revision of the current charge rates and the exemptions thresholds. Importantly, collection should be shielded from political interference. Exemptions should be public, based on robust analysis of affordability issues and liable of contestation (OECD, 2017, forthcoming).

Paranaíba River Basin

The Paranaiba River basin is shared amongst the States of Goias, Minas Gerais, Mato Grosso do Sul and the Federal District. Water charges were approved in 2016 by the CNRH and started in 2017. The amounts collected by the ANA will be fully transferred to the ABHA.[14] Some of the deadlocks for the implementation of the charges and items discussed within the river basin committee concerned the use of funds and where. One of the conditions for the Federal District to be in favour of water charges implementation was the possibility to have access to revenues generated. At present, 60% of the revenues to be collected from water charges are earmarked for priority actions located in the Federal District. However, this provision is to be revised in 2020. The Federal District is the largest representative in terms of population in the area, but the smallest in terms of territory of the river basin.

Verde Grande River Basin

In the Verde Grande River basin, a São Franciso river's tributary, billing will start in 2018 for waters under the federal domain. In this river basin, a single river basin committees (CBH Verde Grande) is responsible for suggesting proposals on mechanisms and values of water charges both under federal and state domains (States of Minas Gerais and Bahia). The basin committee has submitted the proposal for collection

to the water councils of both states, but it has not been approved yet. Water charges are operated by the public institution responsible for water management in each State: IGAM in the State of Minas Gerais and the Institute of Environment and Water Resources of the State of Bahia, Instituto do Meio Ambiente e Recursos Hidricos da Bahia-INEMA) and by the ANA at federal level. The legal framework in States of Minas Gerais and Bahia allows the delegation of water agency's functions to a single entity, which, however, should be subject to the *modus operandi* of each of these units of the federation (ANA, 2016). The CNRH appointed the Peixe Vivo Agency, the same agency that operates for the São Francisco River basin committee, as the delegate entity of the Verde Grande River Basin.

The aspirants

Piancó-Piranhas-Açu River Basin

Water charges are not yet implemented in the Piancó-Piranhas-Açu (PPA) interstate river basin. Since 2015, water charges have been implemented only for the water uses under the domain of the State of Paraíba, although not in the Piancó-Piranhas Açu River basin area, and not yet in the State of Rio Grande do Norte, where technical and legal studies on the subject are currently under preparation. Uncertainties of water availability and intermittent rivers have been the main obstacles to the implementation of the water charges so far. However, the project of water transfer from the Sao Francisco River to the Piancó-Piranhas Açu River basin opened up the discussion about paying for water. Additional details are reported in Annex C.

The State of Rio Grande do Norte

In the State of Rio Grande do Norte, the legal and institutional framework for water charges is in place. However, they have not been applied yet. The 1996 State Law (No. 6 908, modified in 2003) includes economic instruments for water. Currently, a technical and legal chamber within the Executive Agency (Instituto de Gestão das Águas do Estado do Rio Grande Do Norte, IGARN) is working towards the future implementation of water charges.

During the last five years of drought, IGARN concluded that technical solutions were not enough to solve all the problems and that strong institutions and management instruments were needed as a response to the water crisis and for greater water security. Infrastructure construction represented a key response for mitigation, allowing people and economic activities to be supplied with water during water scarcity periods. However, issues remain especially regarding the financing of infrastructure (*who pays for what?*) and the democratic access to water (*who has the right to access the water?*). Since 2012, the IGARN has been in charge of issuing permits for water use. From 2012 until 2015, 500 permits were issued, reaching a cumulative number above 2000 in 2016. The IGARN has inspection responsibilities for the regular use of water; however enforcement is challenging. Although the number of permits has rapidly increased over the last five years, there is significant room for improvement towards a regulated use of water, in terms of greater enforcement, which is seen as an instrument for water security and not as a mere form of punishment.

Other experiences

The Federal District created an inspection fee for monitoring the use of water resources by water users (*Taxa de Fiscalização dos Usos dos recursos hídricos*, TFU). Since 2006, the State of Bahia has been charging for the supply of raw water from some reservoirs. By law, 20% of revenues go to the INEMA and 80% to the Water Resources Environmental Company (*Companhia de Engenharia Ambiental e Recursos Hídricos da Bahia,* CERB), mainly for administration, operation and maintenance of water infrastructure of these reservoirs. In the State of Pará, those using water as an input in production processes or for the purpose of exploitation or economic benefit have been paying a fee for control, monitoring and inspection of these activities since 2015. In 2016, the State of Paraná also created this fee for control, monitoring and inspection.

Notes

1. What makes water an economic good is not the fact that a charge is levied but rather both its relative scarcity (beyond physical scarcity or abundance it has alternative uses that compete) and its contribution to utility / well-being.
2. This is responsibility of the competent body in charge of granting permits.
3. At federal level, according to art. 38 of Law 9433/97 and art. 6 of CNRH Resolution 48, the water charge (c*obrança*) is applied only if river basin committees decide to do so.
4. Paraíba do Sul, Piracicaba, Capivari and Jundiaí, São Francisco and the Doce River Basins (ANA, 2016).
5. At federal level in 2016, almost 2 900 users were charged.
6. The proposal was approved even though the technical note by ANA raised concerns regarding the ability of water charge (very low) to cover the financial needs for the activities foreseen in the river basin plan.
7. Agência de Água PCJ (n.d.), www.agenciapcj.org.br/novo/institucional/o-que-e-a-agencia; CBH PCJ (n.d), Apresentação: Histórico da implantação da Fundação Agência das Bacias PCJ "Agência das Bacias PCJ", http://www.agenciapcj.org.br/novo/images/stories/FABH_Hist-Implantacao.pdf.
8. AguasParaná (n.d.), Câmara Técnica de Cobrança pelo Uso dos Recursos Hídricos – COALIAR,www.aguasparana.pr.gov.br/modules/conteudo/conteudo.php?conteudo=154 (accessed August 2017).
9. AguasParaná (n.d.), Cobrança pelo direito de uso de recursos hídricos, www.meioambiente.pr.gov.br/modules/conteudo/conteudo.php?conteudo=162 (accessed August 2017).
10. AguasParaná (2013), Paraná vai cobrar água usada por indústrias e grandes usuários, www.aguasparana.pr.gov.br/modules/noticias/article.php?storyid=235 (accessed August 2017).
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12. Tariff K1: usage rate or amortisation of the investment of common use irrigation infrastructure and production support infrastructure; Tariff K2: tariff for the administration, operation, conservation and maintenance costs of irrigation infrastructure for common use.

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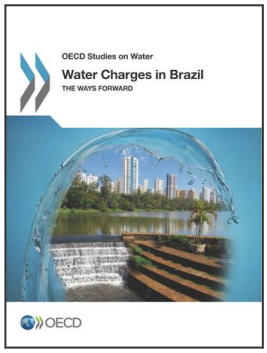

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