A cross-sectional analysis of Brazil's effluent discharge regulation

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Abstract

From a regulation based only on command and control instruments, applied up to the 1970s, Brazilian environmental policy switched to a more preventive approach in the 1980s, and finally became, at least in conception, an integrated environmental policy in the 1990s. The target of this new policy is the use of environmental management policies and economic-based instruments. Law 9433 (enacted in 1997), which focused on water management, incorporated this issue by defining the hydrographic basin as a unit for environmental planning, considering the multiple uses of water resources. However, almost 10 years after this law took effect, Brazil's policy has in many ways regressed to the command and control instruments that prevailed in the 1970s. An example of this is the revision of the code that defines water quality standards and effluent limits. This revision established fixed limits for effluent discharges, thus making no distinction between these discharges according to the related activity or technology. It did not consider the carrying capacity of the water bodies that will receive the discharges, and is not linked to the other instruments set forth in Law 9433 (e.g., economic-based instruments). This might reduce the efficacy of the instruments and generate diseconomies for public and private agents. To contribute to a new revision of Brazilian water codes, this paper presents a cross-sectional analysis comparing the Brazilian water regulation to those applied in France (whose water regulation inspired the Brazilian model) and the United States. Effluent discharge regulation is emphasized in this comparison, along with water quality standards. Finally, the comparison also analyzes how the regulation of effluent discharges is incorporated in the water management policy of these countries.

Keywords: water management, effluent discharge limits, water quality standards, Brazil.

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1 Introduction

From a mainly corrective focus in the 1970s, Brazil's environmental policy switched to a more preventive approach in the 1980s, only becoming what can be called an integrated policy in the 1990s [1]. Important institutional advances were Law 6938/1981 (For Brazilian legislation, the number after the slash mark indicates the year of enactment or issuance.), which established the National Environmental Policy (*Política Nacional de Meio Ambiente* – PNMA), and Resolution 001/1986 from the National Environmental Council (*Conselho Nacional de Meio Ambiente* – CONAMA), which set the general guidelines for implementing environmental impact evaluation as one of the instruments of this national policy. This integrative approach was based on the incorporation of the concept of sustainable development, both at the public policy level and at the strategy of firms and productive sectors. These sectors began to respond to environmental questions not only from purely cost considerations, but also as an area of market opportunity [2]. Moreover, a large number of Brazilian companies began to obtain certification according to the ISO 14,000 standard [2], the international benchmark that supports organizations in implementing or improving environmental management systems.

From the nineties onward, integrated environmental management and planning became consolidated through initiatives that: (i) strengthened the local and global components of action in the environmental field; (ii) reinforced the aspects of participation and negotiation among the actors involved; (iii) increased the use of economic instruments; and (iv) integrated the command and control instruments established by the PNMA (water quality standards, environmental licensing and zoning, conservation units and environmental education).

Law 9433/1997, which established the National Water Resources Policy and created the National Water Resource Management System, defined the *hydrographic basin* as the unit of planning.

However, nearly ten years after the enactment of the above law, instead of the integrated management and planning vision of the nineties, in many respects Brazil has returned to a strictly command and control approach, with the consequent limited treatment of environmental questions [3].

Evidence of this trend is the process of revising CONAMA Resolution 20/1986, which provided for the classification of water bodies and established the conditions for discharging effluents into them. This process, started in 2002, resulted in 2005 in CONAMA Resolution 357/2005, which replaced the earlier resolution. Yet, this new resolution left much to be improved. For example, the conditions and standards for effluent discharge continued ignoring the types of polluting activities and the carrying capacity of the water body. Furthermore, there remained little articulation of this instrument with the other instruments set forth in Law 9433/1997. The many criticisms in this respect prompted CONAMA to promise a new revision of the effluent discharge standards, which is set to occur in 2007 [4].

The wisest course would be to base this revision mainly on the international experience. This article aims at contributing to this effort, by analyzing the case of the United States, which can provide valuable insight in terms of defining effluent standards based on control technologies and industrial typologies, and the case of France, whose water resource management legislation originally oriented Brazil's institutional model [3].

2 The United States

The American states have relative autonomy in relation to the federal government [5]. In addition, the country has a system of agencies that have their own statutes approved by Congress. These laws define the agencies' objectives and areas of action. The regulations they issue have force of federal law throughout national territory [5]. More specifically, the US Environmental Protection Agency (EPA), created in December 1970, is entrusted with protecting human health and the environment: air, water and soil [5].

The main law concerning surface water management in the USA is the Water Pollution Control Act, or Clean Water Act (CWA). Enacted in 1948, the CWA was first amended in 1972, and then again in 1977 and 1981. In 1987 it underwent a major reform, with the inclusion of important provisions for the preservation of water bodies. (All water regulations mentioned in this paper were taken from the US-Environmental Protection Agency web site, available at: www.epa.gov.) The CWA of 1987, with its provisions and deadlines, continues to be followed by the EPA and by the states, industries and public at large [6]. The discharge of effluents into water bodies is covered in the CWA in Title III, according to which such discharges are defined by the EPA in regulations containing the limits on release of pollutants by industrial type. These directives and standards are drafted based on the level of reduction that can be attained by each type of industry, by use of specific technologies defined by the Agency (CWA Best Practicable Technology – BPT or Best Available Technology – BAT).

Before the 1987 reform, the CWA only covered the control of individual pollutant sources. But the EPA along with state authorities saw the need for greater control of diffuse sources, responsible for over 50% of the pollution of the country's water bodies [6].

The CWA also provides water quality standards (WQS) for water bodies. It is up to each state (or territory) to implement and establish these standards, which consist of the designated uses for the particular water body (public water supplies; propagation of fish, shellfish, and wildlife; recreation in and on the water; and agricultural, industrial, and other purposes including navigation), the quality criterion and the anti-degradation policy. These standards must be submitted to the EPA for approval and take effect when the Agency declares them in conformity with the CWA. If a state does not submit its standards to the EPA, or the standards are found not to be in compliance with the CWA, the EPA is empowered to issue the standards for that state. For example, in 1990, the EPA issued water quality criteria for the states or other jurisdictions that had not

adopted WQS for toxic pollutants as defined in the CWA (Rhode Island, Vermont, New Jersey, Puerto Rico, District of Columbia, Florida, Arkansas, Kansas, Nevada, Alaska, Washington and California) [7].

Additionally, the states must identify the water bodies whose pollutant discharge limits are not rigorous enough to satisfy the WQS or those where the control technology is insufficient to ensure the designated use(s). For these bodies, the state must define the total maximum daily loads (TMDL) (the TMDL can be calculated daily, monthly or seasonally) for pollutant discharge. The load, defined both for individual and diffuse sources, according to each contaminant, must permit the WQS to be met. The TMDL is the maximum amount of a specific pollutant that a water body can receive and still meet the WQS. Thus, the TMDL is established at the level necessary to assure the designated use(s) for each water body, when this is not possible through meeting the discharge standard defined in the EPA regulations for each type of industry. Some factors must be considered: seasonal variations, safety margin (the safety margin is a guarantee based on the degree of certainty of a response from the system regarding the parameter in question. If, for example, the best scientific thinking suggests that the concentration of a certain nutrient will be low enough to limit the growth of algae to an acceptable level, the safety margin can determine that the TMDL be established at 70% of the concentration of this nutrient, given the uncertainty of the figure. If the nutrient's concentration decreases, the concentration of the other species of algae that need a lower concentration of the referred nutrient can increase [8]) and any lack of knowledge about the existing relation between the effluent discharge limit and the water quality. If a state fails to determine the TMDL, the EPA implements this task.

Another element of the American government's water policy is the National Pollutant Discharge Elimination System (NPDES), introduced in the first revision of the CWA in 1972. To achieve lawmakers' objectives, the CWA assumes that any release of pollutants in American waters is illegal, unless it is authorized by the NPDES. Therefore, the NPDES is a permit of discharge, which must be obtained by point sources.

More recently, the administration of President George W. Bush has revised various programs and rules contained in the CWA, and has proposed some new initiatives. Among these, it is worth mentioning the Water Quality Trading Policy, approved in January 2003, seeking to help industries and local governments to meet their water pollution emission limits. According to this policy, a source that is not compliant with the established emissions limits can use credits from another source that pollutes below the limits established for it (because it has lower emission control costs, less need to pollute or some other factor) [9, 10].

More specifically regarding effluent discharges by type of industry, the US Code for Federal Regulation (CFR), Title 40 Protection of Environment, sets the criteria and standards for pollutant discharge defined by the EPA by industrial type, which must be stated in the NPDES. Additionally, the Technical Support Document for the 2004 Effluent Guidelines Program Plan, developed by the EPA, provides for the Effluent Guidelines Program [11]. In establishing

guidelines for effluents, the EPA considers two factors: (i) the performance of the best pollution control technologies or prevention practices that are available for a particular type of industry; and (ii) the economic probability of obtaining that technology, considering costs, benefits and the value of managing to reduce pollutant discharges. The EPA must conduct an annual review of these guidelines and if necessary revise its regulations to reflect any changes in the industrial type and/or available technologies. The EPA also defines control technologies for conventional pollutants applicable to new sources. In this case, it considers the best technologies, since new sources have the opportunity to install newer and more efficient treatment facilities and less polluting industrial processes [11]. In its analysis, the EPA considers the cost of obtaining sufficient pollution reduction, environmental impacts not related to water quality and the energy requirements [11].

To sum up, American legislation is based on the determination that industries employ the best available and practicable control technology or technique (technique), or the best technology (or technique) available and also economically feasible, to control the quantity of pollutants discharged into water bodies. If a particular body continues to be contaminated beyond the legal limits (set by the water quality standards) even after the polluter installs the best technology, the state must implement control strategies, such as the TMDL. And the CWA is guided by a policy of federal-state partnership, where the federal government establishes the agenda and limits, while the states are tasked with implementing and overseeing enforcement of the determinations of the CWA. The CWA delegates to the following responsibilities to the states: to issue the NPDES, enforce the pollutant discharge limits established therein and define and implement the WQS. The EPA is responsible for issuing the regulations and guidelines necessary to comply with the CWA.

3 France

As a way to better manage its territory, France has begun a process of decentralizing the powers of the government. Currently there exist the *préfet,* or prefect, of the region, the prefect of the department and the mayor of the municipalities [12].

France has six hydrographic basins (Adour-Garonne, Artois-Picardie, Loire-Bretagne, Rhin-Meuse, Rhône-Méditerranée-Corse and Seine-Normandie). These are divided into sub-basins, defined in Law 92-3, enacted in January 1992 (for French laws, the year of enactment is given first), with each corresponding to a hydrographic unit or aquifer system (all water regulations mentioned in this paper were taken from the French law disclosure public service web site, available at: www.legifrance.gouv.fr). Thus, for water management purposes there is a distribution of responsibilities at various levels [13]:

1. Nationally, the main actor, the Ministry of the Environment and Sustainable Development, acts with the Health Ministry and Agriculture Ministry for balanced water management, aiming at conciliating the different uses in a perspective of the long-term development.

2. The basins are governed by a coordinator, a basin committee and a water agency.
3. The National Environmental Direction (*Direction régionale de l'environnement - DIREN*) is a decentralized service of the Ministry of the Environment and Sustainable Development. Its powers regarding water are exercised in general by the Water and Water Body Service (S*ervice de l'Eau et des Milieux Aquatiques - SEMA*).

The prefects are the representatives of the government and coordinate the water policy in the departments. They have authority over the decentralized ministerial services: the Departmental Agriculture and Forestry Direction (*Direction Départementale de l'Agriculture et la Forêt – DDAF*), Departmental Direction of Equipment (*Directios Départemental de l'Équipement – DDE*), and Departmental Direction of Sanitary and Social Affairs (*Direction Départemental des Affaires Sanitaires et Sociales - DDASS*). They also have authority to inspect classified installations (the industrial typologies in France are defined according to the criteria of classified installations (*installations classées),* which are defined in Decree 77-1133) and to grant authorizations to them, mainly regarding water distribution, drainage and conservation, besides the power to take measures to limit water usage in case of drought.

The water resources management by the government in France is complex not only because of having a long institutional history, but also because of the diversity and interdependence of the respective functions [13]. After a discussion dating back to the time of the French Revolution, in December 1964 Law 64-1245 was enacted, entitled *Relative au Regime et à la Répartition des Eaux et la Lutte Contre leur Pollution*, whose aim was to reduce water pollution and create water basin control entities (the control committee and water agency for each of the six basins). This law is an important source of penal action against polluters. The fees for water use and fines for misuse are decided by the committee in each basin.

The 1964 framework law also created the National Water Committee (CNA), composed in equal parts by representatives of the different categories of users, representatives of the General Council and Municipal Council and of the national government. It is consulted for orientation on the national water policy and particularly on proposed legislation and regulations. The law also provided for the creation of the mentioned water agency in the basins, which has the form of a public administrative entity endowed with civil personality and financial autonomy. These agencies' mission is to ensure balance between water resources and needs, to attain the objectives set in the regulations, to improve and increase the resources and to control floods. These committees are empowered to intervene regarding surface, underground and maritime territorial waters. Besides, according to the 1964 law, the management of each hydrographic basin is entrusted to the basin committee, which is presided over by a local representative and whose main role is to orient users and foster responsible use.

The next important development in French water policy was Law 92-3 of January 1992, known as the "Water Law" (*Sur l'Eau*). It emphasized the integrated water management, by adding a planning instrument for each basin,

the Master Water Planning and Management Scheme (SDAGE), and a Water Planning and Management Scheme (SAGE) for each of the sub-basins.

The SDAGE is an instrument that sets for each basin, or group of basins, the basic orientations for water management regarding overall policy, including quantity and quality, for a period ranging from 10 to 15 years. Therefore, the National Water Committee has to guide the overall policy. The basin committees of each of the six hydrographic basins have the task of preparing and adopting the SDAGE. These committees serve also as consultative bodies on the indices and bases for the fees charged for collection of pollutants and discharges, as well as over the priorities of the five-year intervention programs and how to assist the agency regarding the investments in and proper functioning of public and private water treatment works [14]. At the local level, within the sub-basins there are water commissions, composed of representatives of the collective territorial entities within each sub-basin (50%), representatives of users (25%) and of the federal government (25%). The commission oversees the local SAGE [15].

In order to adapt to the legislation of the European Community, Law 2004-338 was enacted in April 2004. It maps out the steps France needs to take to become compliant with Directive 2000/60/CE of the European Parliament, which establishes a common framework for water policy in the Community.

Finally, within French basic framework legislation there is the Environmental Code of September 2000, which was based on the National Parks Law of 1960 and Water Law of 1964, and emerged from an ordinance launched in September 2000. Regarding water, it also encompasses Law 92-3 and the provisions of the Rural Code

Specifically in relation to effluent discharges, the instruments that act directly are authorizations, granted to classified installations (decree 77-1133 defines what the classified installations are, how they must obtain authorizations or declarations for operation and also how they are classified), and fines, assessed for any discharge that can cause environmental harm. Based on various directives from the European Community and French legislations on the environment and pollution, Resolution 2 of February 1998 sets the prescriptions applicable to water catchment and consumption, as well as emissions of all types from classified installations. The provisions of this resolution apply to the resolutions authorizing new classified installations and permit renewal of existing ones. It particularly refers to pollution of surface waters, establishing reference limits for emission of specified pollutants, according to different productive activities.

In turn, referring to Resolution 2, the Circular of December 17, 1998 specifies how to calculate the emission limits of classified installations, considering the best technology available and the limits suggested by the Resolution. This circular is general in nature. The limits relative to the concentration and flow of the main pollutants are set based on the best available technology, at an economically acceptable cost and respecting the requirements for environmental protection.

The authorization resolutions for each new classified installation will thus cover the technical control measures corresponding to each case. Hence, the

Circular emphasizes that the authorization resolution must set the limits for the concentrations and discharges of the main pollutant substances. Moreover, the Circular focuses on the importance of the SDAGE in imposing the final discharge limits applied, on a case-by-case basis.

Therefore, Resolution 2 only contains reference values for the discharge limits. The final limit will depend on the type of industry, conditions of the receiving water body and its uses. The reference values, then, vary with the parameters mentioned above. Each industrial plant is categorized as a classified installation at a specific rubric. For it to start operating, an authorization resolution or declaration is necessary (according to the potential risk and the seriousness of the effects on the water sources and water bodies), issued by the department prefect. To obtain this permission, Law 92-3 determines that the installations subject to authorization or declaration (as defined in Law 76-663) must prepare a study of the possible impacts, to be evaluated by the departmental prefect, who will obtain expert opinions from various members of the department. If the study and respective opinions are found satisfactory, the prefect will issue the authorization or declaration and the installation can start up [16].

In short, then, according to Law 92 -3 (*Sur l'eau*), the Master Water Planning and Management Scheme (SDAGE) sets for each basin or group of basins the basic orientations of an integrated water management policy. The discharge standards differ according to the industrial type, the designated use of the receiving water body and the medium's conditions, according to what has been determined in the SDAGE. Therefore, the discharge limits (applied for a specific project or defined as reference value in the French law) vary according to the control technologies and techniques available, as well as to the industrial classification.

4 Conclusions

The analysis of the effluent discharge standards in Brazil in comparison with those in the United States and France shows that Brazil is consolidating an extremely rigid control system, where the standards do not vary either by type of industry and control technology or in function of the water quality and use designation of the receiving body.

This inflexibility engenders an overvaluation of the command and control instrument by the various social actors, in detriment to a balanced and integrated view of environmental management to be practiced by the various public authorities, oriented mainly by the support capacity of the environment. Besides being less effective in protecting the environment, this process imposes huge costs on the different public and private agents.

Therefore, there are many improvements that should be incorporated in the Brazilian legislation. However, two categories deserve special mention:

- Promotion of effective decentralization of water resource management, as occurs in the United States and France.

- Changes in the definition itself of the discharge standards, which should firstly consider the type of industry involved and the control technologies and practices according to the industrial process or product, and secondly, should be linked through some instrument to the water quality standards of the receiving bodies. This link in the United States is accomplished through the Total Maximum Daily Loads (TMDL). In France, the fact that the standards are used only as a reference, but the final definition is done at the level of the basin committees, also permits establishing the link between water quality of receiving bodies and discharge standards for industrial activities.

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