

# Chapter 7

## Water Pricing in Colombia: From Bankruptcy to Full Cost Recovery

Diego Fernández

**Abstract** Despite having one of the largest water resources of the world, in the early 1990s, the Colombian water and wastewater sector was in a deep crisis, with low coverage, low investment, and financial infeasibility of most of the companies responsible for the provision of these services. Rates were not consistent with the needs of maintenance, operation, management, and investment, and providing companies were almost totally dependent on state resources. The enactment of Law 142 of 1994 and regulations issued by the new (CRA acronym for Comisión de Regulación de Agua Potable y Saneamiento Básico) completely changed the landscape of the sector. In 1995, CRA set a clear methodology for the calculation of costs and charges for water and sewerage services, which aimed to cover the full costs of administration, operation, and investment. The law defined specific levels of subsidy only applicable to the basic consumption of poor families. Implementation of the new tariff scheme began in 2006 and lasted for several years, finally achieving financial viability of most businesses.

**Keywords** Colombia • Regulation • Social rates • Water services • Water companies

### 7.1 Introduction

Thanks to its geographical location and landscape, Colombia has one of the largest water resources on the planet, being the fourth in the world in volume of surface water, with  $2.13 \cdot 10^9$  km<sup>3</sup>, next to Russia, Canada, and Brazil—countries with surfaces three or more times that of Colombia's. It also has an average of 3,000 mm/year annual rainfall, which is twice the average rainfall of South America (1,600 mm/year) and three times the world average (900 mm/year).

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However, as shown by the Institute of Hydrology, Meteorology and Environmental Studies (Instituto de Hidrología, Meteorología y Estudios Ambientales, IDEAM), the natural water supply is not so evenly distributed over the different regions of the country, resulting in areas of high resource abundance, large areas of shortage, and areas completely deserted.

Analysis by the Vice Ministry of Environment (Viceministerio de Ambiente 2010) shows that the majority of Colombia's population and economic activities are located precisely in low water supply areas where the adverse effects on water resources from human activities are highest.

As a result, large cities, such as Bogotá, Medellín, Cali, and Cúcuta, among others, have a water demand that tends to exceed the available supply in each of their areas, forcing the use of water from surrounding areas (transfer between watersheds).

In contrast, in the southern (prominently jungle and mountain) and eastern areas of the country, with low population and low economic activity, water resources are abundant, and the demand for them is reduced.

The pressure on water resources in the most populated areas has increased in line with the deepening of the process of urbanization that the country has faced, from an urban population of only 39 % in 1951 to 66 % in 1985, 76 % in 1995, and around 80 % by 2014.

In that framework, it is not surprising that historically Colombia has always had a great concern for the prices of urban public services. Thus, since 1968,<sup>1</sup> there was a National Board of Public Utility Rates (Junta Nacional de Tarifas de Servicios Públicos, JNT), which was centrally (from Bogotá) regulated and even set prices of public services, such as water and wastewater (W&W), electricity, telephone, and mail for the entire country.

In 1994, Law 142 was issued. This law created a totally new institutional and regulatory framework for utility services. As part of this change, JNT was split into three specialized institutions: (1) the Regulatory Commission of Energy and Gas (CREG), (2) the Regulatory Commission of Telecommunications (Comisión de Regulación de Telecomunicaciones, CRT), and (3) the Regulatory Commission of Potable Water and Basic Sanitation (Comisión de Regulación de Agua Potable y Saneamiento Básico, CRA).

For the water sector, Law 142 created the free market entry for any service provider (by removing the ability of municipal governments to be the only providers), forcing public-owned companies to have corporate governance and achieve self-sustainability through rates plus consumption subsidies to poorer users.

The first part of this chapter explains the water pricing system for potable water and sanitation prior to the issuance of Law 142, while the second part focuses on the evolution of the price system implemented after that law.

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<sup>1</sup>In fact, in 1936, a utilities section in the finance ministry was created, and, later, in 1960, an economic regulation superintendency was created, both of which controlled some utilities' prices until the creation of JNT.

## 7.2 Past Water Pricing System

During much of its existence (from 1968 to 1993), JNT was aimed at controlling the prices of the services under its scope in order to decrease the pressure of these prices on national inflation, which was a chronic problem suffered by the country for many years. It must be remembered that while Colombia never suffered from hyperinflationary processes like many other South American countries (Argentina, Brazil, Chile, and Perú), it was distinguished by its high and persistent annual inflation (between 25 and 35 %), which was a permanent concern of the governmental economic teams.

Public services regulated by JNT were provided (principally) by public-owned utilities. The national government owned almost all electricity companies and many water utilities in urban areas of small and medium municipalities. In contrast, municipalities owned the largest cities' water utilities.

The use of the tariffs of these services as an inflation anchor by the national government for many years led to almost all of these companies suffering huge financial deficits that had to be assumed by the public budgets.

The control of electricity rates played an important role in the national government's fiscal deficit. Under pressure of multilateral organizations (World Bank and International Monetary Fund) at the end of the 1980s, JNT started a process to review and increase energy rates to reflect the cost of services and reduce the level of subsidies given by the national government.

As a first step in the institutional reorganization of the water sector, in 1986 the National Institute of Municipal Promotion (Instituto Nacional de Fomento Municipal, INSFOPAL)<sup>2</sup> was closed. The responsibility of provision of W&W services was transferred to municipal and departmental<sup>3</sup> governments, claiming that decentralization would bring greater efficiency and political responsibility for the proper provision of public services.

The transfer of responsibilities of W&W provision services to local governments led JNT to be less concerned about the water prices restriction on the public budgets. Controls of water prices by JNT were so acute that (combined with the administrative and operational inefficiency of these companies) the country's largest company, the Aqueduct of Bogotá (Acueducto de Bogotá), entered into default in the early 1990s, and the national government had to assume credits that the company had with the World Bank. The situation was quite similar to the vast majority of W&W utilities in the rest of the country.

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<sup>2</sup>Until that moment, INSFOPAL was in charge of the delivery of W&W services in almost all medium and small municipalities by decentralized utilities (departmental ACUAS and Empresas de Obras Sanitarias, EMPOS) owned by the national government.

<sup>3</sup>Colombia has three political and administrative public levels: municipal, departmental, and national.

### 7.3 The Water Rate Regulatory Scheme

JNT had, at least on paper, two types of price regulations: “Regulated Freedom” and “Total Control”:

- Using the first scheme (Regulated Freedom), JNT defined the methodology and tariff formulas that companies should use to calculate rates. Companies applied those methodologies and sent the results to JNT for its review, and JNT approved or modified the rates to be applied by utilities.
- In the Total Control scheme, there was no methodology, and JNT administratively defined rate increases to be applied by each utility in response to the respective utility’s request.

The W&W sector was subject, throughout the period of existence of JNT, to the Total Control scheme so that, without any defined methodology, companies developed their studies to request rate increases, especially to recover the inflationary effect, and JNT arbitrarily decided which increases to authorize, often below past inflation. It is worth noting that in the early 1990s (a few years before its closure), JNT established automatic monthly tariff rate increases to recover past inflation, but existing rates, in almost all cases do not reflected the operational cost of the services and, of course, never the cost of investments (neither cost of capital nor depreciation).

### 7.4 Water Rate Differentiation

Since its inception, JNT established a tariff differentiation scheme (cross-subsidies) with higher-income families and nonresidential users paying much higher rates than lower-income families.

Because, in practice, the family income was unknown, for the classification of families, the houses in each municipality were divided into six groups, according to their cadastral (public record) value, calling each group “stratum” and defining stratum 1 as the poorest and stratum 6 as the richest. The nonresidential users were classified as commercial, industrial, or government.

The housing classification system based on the cadastral value lasted for 15 years (from 1968 to 1983). Until it was evident that high rates of Colombian inflation and the lack of an automatic adjustment scheme of cadastral values, led to poor families with houses of recent construction and registration in cadastral systems faced higher fees than homes of wealthy families registered some years before. Thus, in 1983 the classification system based on housing changed to one based on each house’s characteristics, using a methodology defined by the National Administrative Department of Statistics (Departamento Administrativo Nacional de Estadística, DANE).

Initially, the methodology defined by DANE took into account both external (garden, front walls, and roof) and internal (floor, kitchen) housing characteristics and even families’ holding of some electrical appliances (refrigerator, stove, or TV).

To define each house's stratum, an interviewer visited it and set it by direct observation of house features. This ad hoc system led to many problems, and it was common for houses with similar characteristics, even within the same town, to be classified in a different stratum because of the interviewer's judgment on the respective value. Later, DANE slightly modified its methodology, arguing that the classification had to be set based solely on the external housing conditions. However, some problems remained.

In 1992, the responsibility for defining the stratification methodology was passed to the National Planning Department (Departamento Nacional de Planeación, DNP), at that time (and for many years) the most recognized technical and official think tank entity within the national government. DNP's methodology kept the external features as the basis for classification of housing, but added environmental variables characteristic of the dwelling (such as quality of the streets, commercial activity, and existence of pollution sources). Additionally, each house's stratum ceased to be set by the interviewer and resulted in a statistical model that feeds on the information collected in the field.<sup>4</sup>

### 7.4.1 Charges and Blocks

In addition to user categories, the water rate structure for W&W services contemplated the existence of fixed charges, variable charges, and consumption blocks:

- The fixed charge was an amount payable monthly by the user (\$/user/month), regardless of the level of consumption. In many Latin American countries, this fixed charge gives the user the right to a minimum consumption, but in Colombia this minimum was abolished in 1983.
- Variable charge is the value to be paid for each cubic meter of water consumed (\$/m<sup>3</sup>) in each block of consumption.
- There was a block structure with increasing consumption rates. Until 1987, there were five blocks, but, since that year, it changed to three blocks: the first block, called *basic* (0–20 m<sup>3</sup>/family/month), had a lower rate than the second block, called *complementary* (21–40 m<sup>3</sup>/family/month), which had a lower rate than the third block, called *luxury* (41 or more m<sup>3</sup>/family/month).

In summary, the rate structure contemplated categories of users, fixed charges, and consumption blocks, with increasing rates by user's category and blocks, as shown in Fig. 7.1.

The monthly water service bill was then equal to the sum of the fixed charge, plus the product of m<sup>3</sup> of water consumed in each block in the month, times the rate applicable to each block, with different fixed charges and different rates, per category of user and consumption blocks.

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<sup>4</sup>For more details, see Cepal (2006).

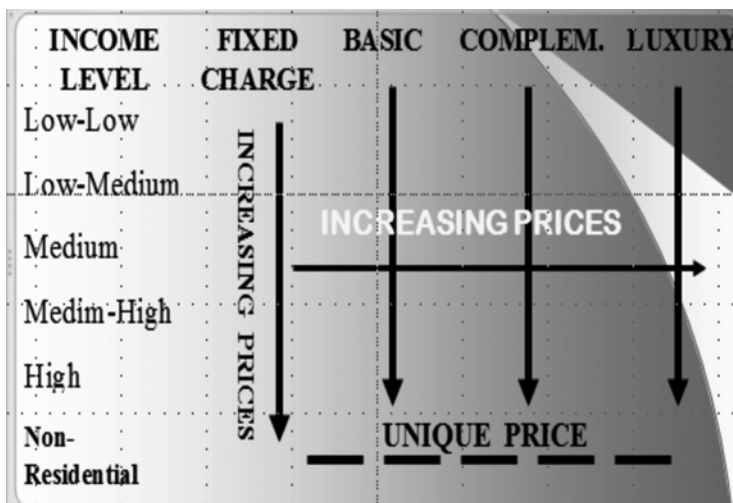


Fig. 7.1 Residential water rate structure in Colombia (Source: Diego Fernandez)

The pricing system applied to both residential and nonresidential users. As explained above, nonresidential users were classified as commercial, industrial, and government. In almost all cities, overprices applied to commercial users were similar to those applied to stratum 5 or 6; overprices applied to industrial users were higher (especially when the water was an important input in their production process), while the government users were rarely subject to surcharges.

For users without a consumption meter, a volume of consumption was assigned according to the category (based on user's consumption measured in the same category in each city) or their economy activity. Then, the bill was calculated as if they were a metered users.

#### 7.4.2 Wastewater Rates

For wastewater service, a charge of 40 % of the invoice value of the water service was applied to users who had wastewater service.

#### 7.4.3 Rates Differences

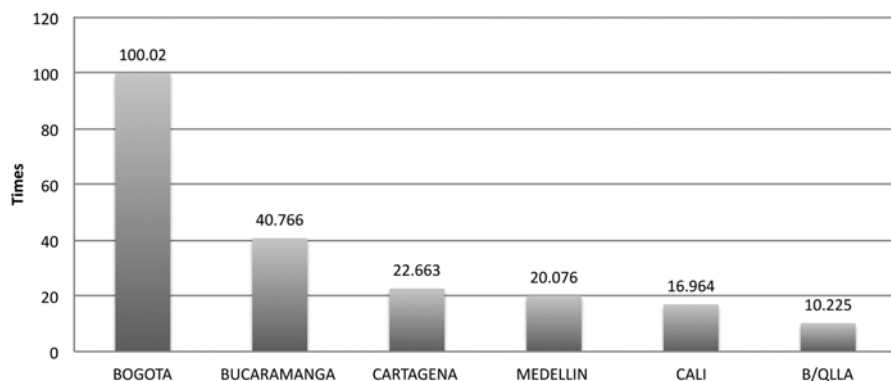
There were no rules about the difference in rates between the different categories of users or between blocks of consumption, although JNT established that luxury block's rate have to be equal for all types and user's categories within each town.

Significant differences between the rates applied in different cities, both in terms of the average tariff rates as distance between categories of users and blocks

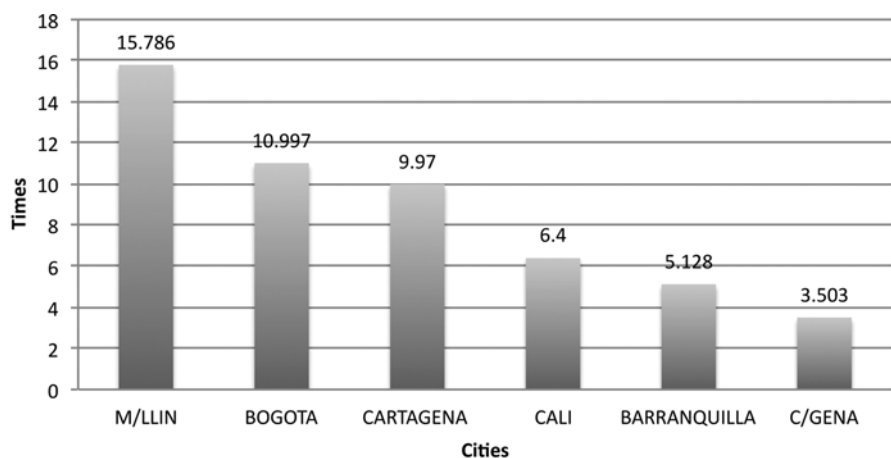
consumption arose. Those differences can't be attributed to differences in the cost of service delivery but to local policy decision.

An example that can be seen in Fig. 7.2 shows that in 1995 Bogotá families classified in stratum 6 paid a fixed charge almost 100 times higher than that paid by stratum 1. But this difference was reduced to 40 times in the city of Bucaramanga, 22 times in Cartagena, 20 times in Medellín, and only 10 times in Barranquilla.

Although not as large as in the fixed charge, the differences in variable charges according to the rates of consumption ( $\$/m^3$ ) were also significant. As you can see from Fig. 7.3, in Medellín, the rate per  $m^3$  paid by stratum 6 was almost 16 times



**Fig. 7.2** Water rate distance between strata 1 and 6 in the fixed charge in some big cities in 1995. Source: CRA (2006) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia



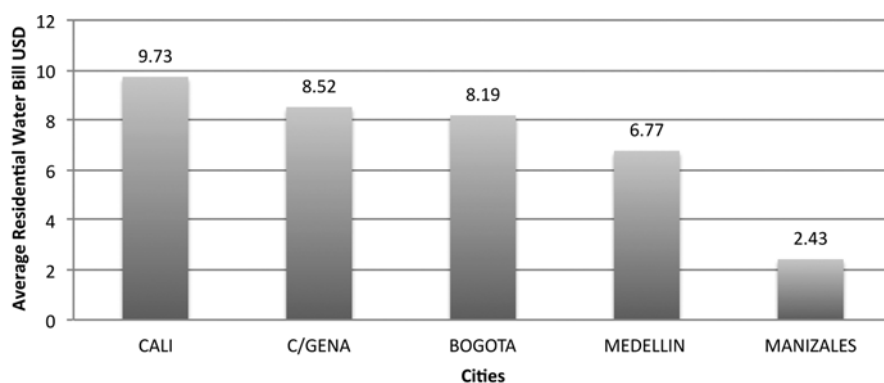
**Fig. 7.3** Water rate distance between strata 1 and 6 in the consumption charge in some big cities in 1995. Source: CRA (2006) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia

that paid by stratum 1; in Cali, that difference was 6.4 times, and in Cartagena it was around 3.5 times.

It is possible to identify some technical and conceptual problems in the tariff system used. However, neither the rate structure (categories of users, consumption blocks, fixed charges, and variable charges) nor the tariff differences (among categories of users or blocks) seemed to generate practical problems, so the real problem was the very low value of the average water bill, as can be seen in Fig. 7.4.

The Pan-American Health Organization (PAHO 2006) study evidenced the low tariff levels applied: in 1994, stratum 1 (poorest families) spent between 0.25 % and 2.5 % of legal minimum monthly salary (MMS) on their monthly water bill, and 60 % of this stratum paid less than 1 % of an MMS on their water bills.

Those low tariffs did not allow water utilities to recover at least the total operating costs (see Table 7.1) nor the depreciation or cost of capital. That entailed that, for the realization of any investments for expanding coverage or even for existing infrastructure renewal, public water utilities completely depended on the contributions of the municipal or national government budgets.



**Fig. 7.4** Average residential water bill (USD) in some big cities in 1995 (Source: CRA (2006) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia)

**Table 7.1** Average cost vs. average income

Town size in habitants (thousands)	Monthly operational cost by suscriptor in USD	Monthly income by suscriptor in USD
<30	1.29	0.84
30–100	3.25	2.16
100–500	3.88	2.59
>500	7.48	6.43

Source: CRA (2001) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia



The problems of very low rates and revenues were reflected directly into bad services. In its 1996 study (Organización Panamericana de la Salud 1996), PAHO found that although almost all water utilities have potable water treatment plants, the quality of water delivery was very low, water losses were very high, and the W&W coverage was low.

The political management of tariffs, along with citizen demands for better service, produced a crisis in 1980 in which the water and sewage companies were involved, as stated by Malinovitz (1998). This resulted in the need to propose a new model for providing potable water service.

## 7.5 Tariffs in 1995: Examples from Medellin and Cali

### 7.5.1 Differences in Fixed Costs

As can be seen, the families of the higher strata in both Cali and Medellin pay higher fixed charges. However, the absence of a clear pricing policy led to significant differences between these cities in tariff applied.

For example, the fixed charge applied to the families of stratum 6 in Medellin was 84 % higher than that applied to the same stratum in Cali. In total, Medellin families of higher strata had a bill significantly higher than the families of Cali (Fig. 7.5).

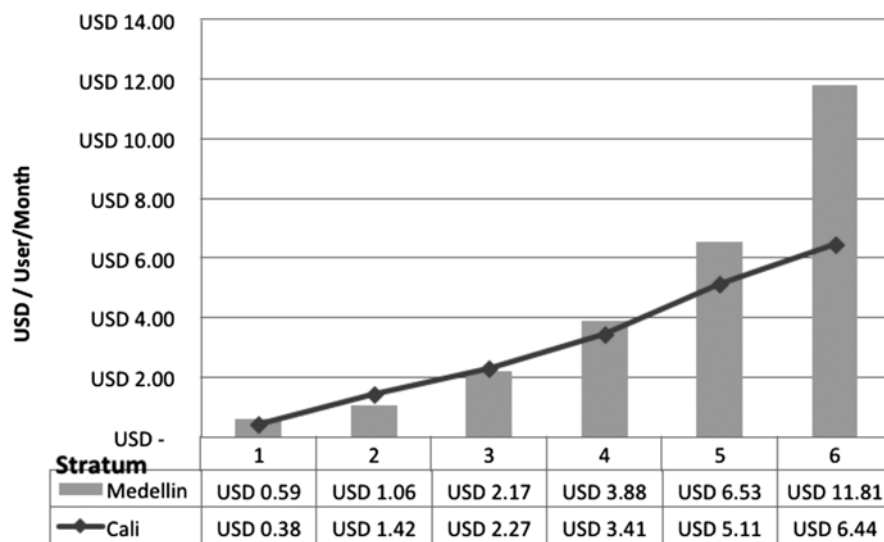
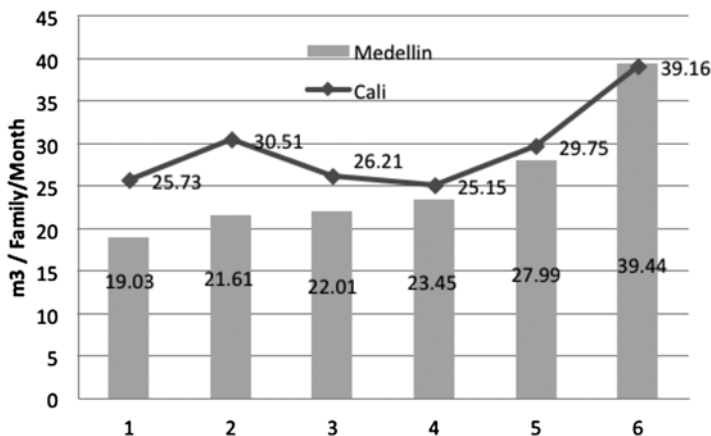


Fig. 7.5 Fixed charge in 1995 in Cali and Medellin (Source: Author with data of Comisión de Regulación de Agua Potable y Saneamiento Básico)



**Fig. 7.6** Average monthly consumption in 1995 (Source: Ahutor with data of Comisión de Regulación de Agua Potable y Saneamiento Básico)

### 7.5.2 *Difference in Total Monthly Bill*

Before analyzing the difference in the monthly bill, it should remember that its total value depends largely on consumption. As shown in the graph, in 1995 Cali had average monthly consumption (per subscriber) higher than Medellín for all strata, probably explained by the difference in average temperature between these cities (25 % vs. 20 %). However, the difference in average consumption is quite variable across strata (see Fig. 7.6).

When calculating the total monthly bill (taking into account fixed costs, volume of consumption, and rates of each city in 1995), we find that the difference between the two cities follows a clear pattern, with the greater distances in lower strata and smaller distances in the higher strata.

Thus, the monthly bill paid by Cali stratum 1 was 216 % higher than that paid by the same stratum in Medellín. For strata 2, 3, 4, and 5, the differences were 168 %, 37 %, 10 %, and 6 %, respectively, always against users in Cali. However, for stratum 6, the difference is about 6 % but in this case users in Medellín paid a monthly bill higher than users of the same stratum of Cali.

The inability of tariff revenues to cover even the operating costs of the services made completely unviable the provision of these services, which depended on governmental budget transfers for investing both in renovation of existing infrastructure and the expansion of the service, which explained the low coverage and poor quality of services provided.

It is therefore not surprising that, when in 1994 Law 142 defined that rates should reflect the cost of service delivery, and the water regulator established the economic methodology for costing, the need for significant rate increases became evident, as we shall see in next section.

## 7.6 Current Water Pricing System

In 1991, seeking to make numerous political and institutional changes in Colombia, a new constitution was issued, which included as one of the most important issues the need to reorganize the management scheme of residential public services (water, wastewater, fixed landline telephone, energy, and gas).

The 1991 constitution created the Superintendencia de Servicios Públicos Domiciliarios, SSPD) as the agency responsible for monitoring and controlling the adequate provision of residential public services. Additionally, the constitution states that the congress should issue a law regulating all aspects related to public services. In May 1994, the congress issued the Law 142—or Domiciliary Public Service Law.

Law 142 makes a real break in the scheme of providing these services, based on a clear definition of the roles of SSPD and other actors of the sector in regulation, control, definition of policy, and service delivery. It was eliminated JNT and created regulatory commissions. These sectors open to private participation in competition, defining the principles of tariff regime and the basic parameters of the subsidy system.

The new law defined the fundamentals of the public services' tariff system:

- **Neutrality:** Users of the same type that cause the same costs should have equal rates.
- **Solidarity:** Higher-income users must pay overprices, and lower-income users will receive subsidies.
- **Transparency:** Pricing formulas should be known by all players in the sector.
- **Economic efficiency:** Rates should reflect the economic cost of the service.
- **Financial sufficiency:** Tariffs must provide income for allowing efficient companies to provide the service.

Although that law gave priority to the principle of sufficiency, a further review of the Colombian Constitutional Court (Case C-150, 2003) determined that this principle could not have priority, but it should be of equal importance as other principles.

Combined with the rules defined by former Law 99 of 1993 about responsibilities with the water as natural resource, the authorities and functions related to W&W are those presented in Table 7.2.

Law 142 maintains the former rate structure that contemplated categories of users, fixed charges, and consumption blocks, with increasing rates by user's category and blocks (explained in detail above). As a transcendental point, the law states that the rates should be directly related to the economic cost of the service and that subsidies should be granted to the poorest families (strata 1 and 2 and eventually 3) and surcharges be applied to nonresidential users and less poor families (strata 5 and 6).

The subsidies apply only to the basic consumption and can't be more than 50 % of the economic cost of the service for stratum 1, 40 % for stratum 2, and 15 % for stratum 3, while maximum overprices would be 20 % of the economic cost of the

**Table 7.2** Water and wastewater authorities and functions in Colombia

Sector	Authority	Functions
Water as a natural resource	Ministry of Environment and Sustainable Development	Definition of national policy
		Definition of price/rates of water consumption and discharge of contaminated water
	Regional Environmental Authorities (REA)	Grant licenses and use permits
		Definition of price/rates of water consumption and discharge of contaminated water where regional factors are affected
Drinking water and wastewater	Vice minister of drinking water and basic sanitation	Discharges quality control
		Definition of national policy
		Definition of public budget allocation
	Municipalities	Grant licenses and use permits
		Definition of ASE (with approval of the CRA)
		Service provision (in free competition)
		Responsible for the service
		Definition of local budget allocation
	Public and private companies	Service provision
	CRA (Comisión de Regulación de Agua Potable y Saneamiento Básico)	Definition of price methodology and rulings
		Definition of performance indicators
		Definition of overprice and subsidy %
	Ministry of Health and Social Protection	Allocation of subsidies in the budget
		Definition of water quality standards
SSPD (Superintendencia de Servicios Públicos Domiciliarios)	User protection	
	Utility performance control	
SIC (Superintendencia de Industria y Comercio)	Free competition control	

Source: Diego Fernandez

service for strata 5 and 6 and nonresidential users. Both residential users from stratum 4 and official users were exempted from overprices and are not beneficiaries of subsidies.

As will be discussed below, subsequent laws took the maximum subsidy levels for stratum 1 to 70 % (of the economic cost of supply) and released the percentages of overprices. In almost all municipalities, complementary contributions from municipal budgets are necessary to attain balance between subsidies and overprices.

Both percentages of subsidies and overprices to apply, and the budgetary contribution to subsidies, must be defined by each municipal council at least once every 5 years, but can be modified each year. As part of this definition, each coun-

cil has to guarantee the budget to cover the difference between contributions and subsidies.

Defining the first methodology for determining the economic cost of the service proved to be a great challenge for the CRA, because none of the companies of the country providing W&W had a consolidated accounting system. Practically, every company in the sector was governed by budget rules rather than for public business accounting standards; and almost none of the companies in the sector had an investment plan over medium term.

Resolutions 8, 9, 12, 14, 15, 16, and 17 of 1995<sup>5</sup> defined, for the first time in Colombia, a tariff methodology for W&W services. These norms were issued between August and November 1995, and the new tariffs were to be applied in June 1996. The tariff regime defined by CRA is based on economic cost of providing the service, taking into account administrative, maintenance, operating, and capital costs, both in terms of the amount of capital invested as the cost of capital (or profitability) expected from the inversion in a sector of similar risk. In the new methodology, fixed charges had to cover billing and management costs. The variable charge must cover operation, maintenance, and investment costs.

Included within operating costs are applicable environmental charges (charged for environmental authorities)—that is, a “water fee” for use of water (as a natural resource) in the case of drinking water and a “pollution fee” for wastewater service.<sup>6</sup>

As solution for the limited reliable financial information and investment plans, the first methodology defined by CRA stated that the cost to recover (by tariffs) were:

- Direct costs of administration and operation reported by each company, excluding only those who had no relation with the provision of the service
- Capital costs calculated based on the new value of renewal (VRA<sup>7</sup>) of existing assets and a cost of capital rate between 9 % and 14 % real annual, before taxes

### **7.6.1 Wastewater Rates**

Unlike the existing rate schedule prior to Act 142, the new tariff methodologies defined water and wastewater costs and tariffs separately. To calculate the wastewater consumption charge, the volume of water used is taken into account.

<sup>5</sup>All these resolution were compied further in Resolution 151/2001.

<sup>6</sup>For details on the subject of environmental charges, see Rodriguez et al. (1996) or Rudas (2009).

<sup>7</sup>Valor de Renovación a Nuevo (VRA For its acronym in Spanish).

## 7.6.2 Implementation of the New Tariff Regimes

Between the last quarter of 1995 and the first half of 1996, the majority of the country's largest companies conducted their cost studies. A 1996 CRA report shows that the weighted average increase in the bill for eight of the major cities of the country would have to be 212 %. For strata 1 and 2 (the poorest), even after applying the maximum subsidies (50 % and 40 %), increases would be 569 % and 310 %, respectively (see Table 7.3). To soften the impact of increases, in 1996, through the Law No. 286, a term of 2 years (until 1998) was established for companies to make adjustments.

A study performed by the University of the Andes<sup>8</sup> showed that in December 1997 levels of subsidies and overprices in 16 of the major cities of the country were far from legal goals, but that the situation was worse in large cities, as shown in Table 7.4.

The analysis of the dynamics of prices between 1998 and 2001 submitted by the Superintendence of Public Services<sup>9</sup> showed that while the growth of the total national consumer price index was nearly 28 %, prices of the W&W sector increased at 82.5 %.

Although there was a significant increase in water rates in that period of time, they remained below the targets. So a new Law (632/2000) extended until 2005 the term to fulfill the rate adjustment plan. To ensure the achievement of the objective, CRA established that companies should decrease each year at least one-fifth of the difference between applied tariffs and target tariffs (resulting from the application of the methodology). Additionally, through Law 812, the subsidy level of stratum 1

**Table 7.3** Expected increase in average bills of W&W of eight major cities due to the implementation of the tariff methodology

Stratum	Participation in total stratum (%)	Monthly consumption m <sup>3</sup> /user	Bill in December 1995 USD/Month	Legal bill target USD/Month	Required increase (%)
Stratum 1	5	24.72	1.56	7.54	569
Stratum 2	25	27.26	3.12	9.16	310
Stratum 3	40	24.95	4.87	10.46	190
Stratum 4	20	26.25	7.41	11.68	124
Stratum 5	7	28.37	11.73	15.20	62
Stratum 6	3	33.04	16.48	16.92	34
Average increasing required					212

Source: CRA (2001) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia

<sup>8</sup> See CEDE (2004).

<sup>9</sup> SSPD (2002).

**Table 7.4** Percentage of cost of reference covered with tariffs in December 1997 (%)

Stratum	Average 16 large cities	Medellín	Barranquilla	Bogotá	Cali	Legal target
<i>Water</i>						
1	25	12	17	7	14	50
2	38	26	23	18	31	60
3	58	49	34	30	43	85
4	80	80	82	44	68	100
5	103	120	109	65	95	120
6	124	159	135	79	118	120
<i>Wastewater</i>						
1	26	14	22	9	11	50
2	37	26	28	19	22	60
3	52	51	37	28	30	85
4	73	85	77	38	58	100
5	93	137	109	58	74	120
6	118	174	137	81	103	120

Source: CEDE-ANDESCO, Analysis of the evolution of the Public services, 2005, Tables 19 and 20

**Table 7.5** Consumption reduction by stratum in five of the major cities of the country between 1997 and 2001 (%)

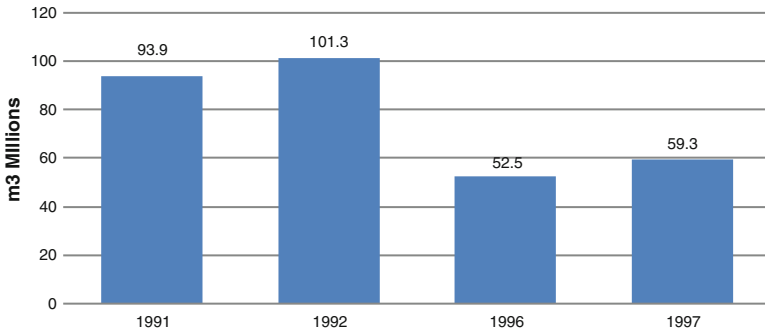
	Bogotá	Medellín	Cali	Barranquilla
Stratum 1	-30.9	-22.9	-16.1	11.8
Stratum 2	-32.2	-24.2	-20.6	-25.8
Stratum 3	-34.2	-17.4	-10.6	-35.0
Stratum 4	-21.5	-14.0	-8.2	-37.2
Stratum 5	-17.1	-17.3	-6.3	-39.4
Stratum 6	-13.1	-25.5	0.9	-31.1

Source: CRA (2001) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia

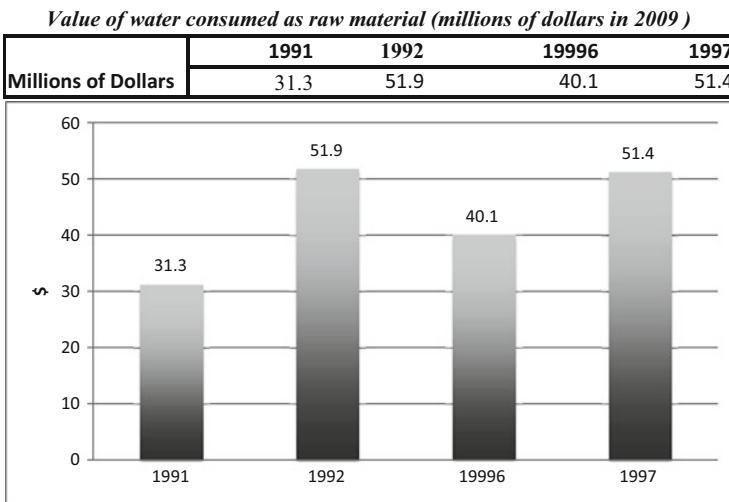
expanded to 70 % and left without limits to overprice applicable to strata 5 and 6 and commercial and industrial users.

Price increases caused a substantial reduction in water consumption far beyond what was expected. As shown in Table 7.5, for example, between 1997 and 2001, the volume of monthly consumption (in m<sup>3</sup>) of strata 1, 2, and 3 of Bogotá fell more than 30 %.

Not only residential user consumptions fell, but industrial and commercial user consumptions also fell. As shown in Fig. 7.7, water consumption as raw material significantly reduced in 1996 and 1997, after the implementation of the tariff methodology. However, the tariff increases were so significant that no matter the important reduction in consumption, the value of water used increased significantly as can be seen in Fig. 7.8.



**Fig. 7.7** Water consumption as raw material Source: Rudas (2009). Rates and tariffs for water usage. Impact over W&W services in residential areas and over industrial and agriculture profitability



**Fig. 7.8** Value of water consumed as raw material (millions of dollars in 2009) Source: Rudas (2009). Rates and tariffs for water usage. Impact over W&W services in residential areas and over industrial and agriculture profitability

The drastic reduction in consumption and the increase in the percentage of subsidy (stratum 1) led to increases in bills paid by users to be lower than initially expected, but still significant, as can be seen in Table 7.6.

The next big leap in the price regulation of the sector occurred in 2004 with adoption of CRA Resolution 287, which introduces the use of the Data Envelopment Analysis (DEA) model for the establishment of efficient management and operation



**Table 7.6** Evolution of the average bill for each city between 1995 and 2005

Water company	Principal city	USD		
		1995	2000	2005
EAAB	Bogotá	15.02	15.08	27.83
EMP	Medellín	14.32	15.29	26.92
EMCALI	Cali	20.11	14.62	29.79
Triple A	Barranquilla	15.91	19.40	25.29
CAMB + CDMB	B/manga	13.23	10.28	22.22
ACUACAR	Cartagena	12.14	16.82	28.59
EPN	Neiva	10.41	7.08	11.84
ACUAVALLE	Regional	10.42	10.12	15.79
Aguas Kapital Cucuta	Cúcuta	13.19	6.65	16.73
Aguas y Aguas	Pereira	10.44	17.22	21.92
Average		14.93	14.60	26.26

Source: CRA (2001) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia

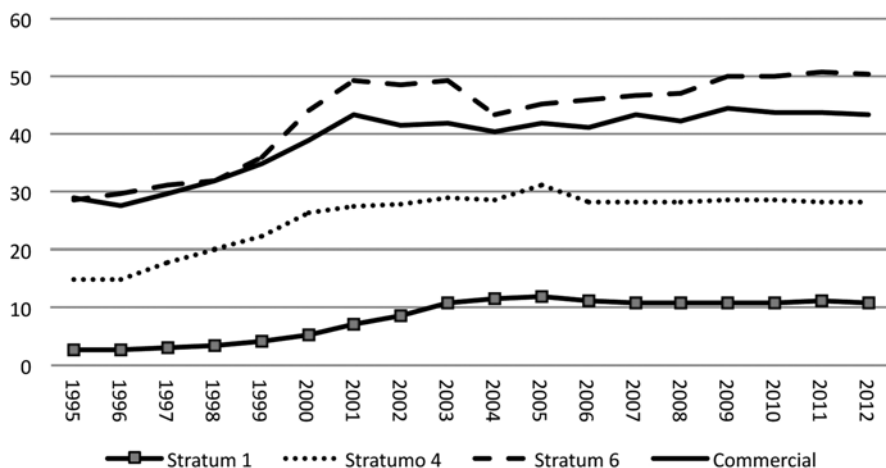
costs. The new methodology has two application periods: in the first period, from July 2004 to December 2006, after computing the DEA scores, CRA ordered a temporary adjustment on the fixed charges of all companies to a maximum of USD 2.9/user/month for the two services (W&W). The second period began in January 2006, when companies started a full implementation of the results of the new methodology (regardless of the limit of the fixed charge) with the application of each DEA score.

By defining the ledger accounts that should be used to calculate each of the (fixed and variable) costs, the most important effect of this new methodology was to reduce the fixed charge (\$/user/month). In contrast to the effect of decreasing the fixed charge, the new methodology increased the usage variable charge (\$/m<sup>3</sup>).

The introduction of control efficiency through the DEA model had a fairly marginal effect, partly due to pressure from a political lobby by service providers, which led to revision of the initial models, eventually leading to the vast majority of companies finding themselves very near the efficiency borders of both their administration and operating costs. Additionally, the effect of methodology was eased up by the establishment of a period of tariff transition (gradual adjustment), which extended from January 2006 to May 2009.

Rates defined by Resolution 287 still apply until the date of preparation of this chapter (May 2014), with adjustments only for inflation, whenever the consumer price index (CPI) reaches a cumulative increase of 3 %.

This new methodology led to a marginal reduction of the average bill with respect to the level achieved in 2005. A long-term bill evolution is presented in Fig. 7.9, including the water bill (excluding sewerage) for four users' categories (poorest or stratum 1, middle or stratum 4, richest or stratum 6 and commercial), as an average for Bogotá and Barranquilla cities. Including sewerage, the bill will increase around 80 %.



**Fig. 7.9** Only water\* bill for four users categories average for Bogotá and Barranquilla USD of December 2012 (Source: CRA (2001) Comportamiento tarifario de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia)

As can be seen in that figure, the poorest families' water bill increased from less than \$3 in 1995 to almost \$12 in 2004 and remains around \$11 since then. That means bill of this user category increased almost 3.6 times. For the middle-class users (stratum 4), the increase between 1995 and 2012 was almost two times, and for the richest category, it was 1.5 times.

The only relevant changes (additional to the adjustment for inflation) that have occurred since 2006 are:

- The change in sewerage tariffs in some companies (with prior approval of CRA) to include the operational costs and/or investing in cost of their new systems of sewage treatment (such as Bogotá, Cartagena, Barranquilla, and Manizales).
- The introduction in Medellín (in 2010) and Bogotá (in 2012) of an additional subsidy for the poorest users to fully cover the consumption of up to 6 m<sup>3</sup> of potable water, as part of the introduction to the concept of the human right to water established by the United Nations (UN) in 2010. This additional subsidy is a local policy (initiative of its mayors) and not a national one.

Because the existing scheme provided a subsidy of up to 70 % for the first 20 m<sup>3</sup> per month, this local policy gives an additional allowance of 30 % on the first 6 m<sup>3</sup> water (not including wastewater) for some user groups in Medellín and all users in stratum 1 in Bogotá.

Since February 2013, CRA submitted for consideration and feedback from industry actors a new proposal to replace the tariff methodology defined in 2004 (Resolution 287). The regulations, with highly complex mathematical and conceptual terms, are still under discussion and are expected to start their final implementation in July 2015.

### 7.6.3 *Irrigation Rates*

Colombia has an area of 114.17 million hectares, of which 44.6 % (50.91 million hectares) are for agricultural use. Only some 900,000 ha of this agricultural land has an irrigation system by either gravity, sprinkler, or drip.

Ninety percent of the irrigated area is irrigated by gravity, recognized as the most inefficient system in water use, but most popular for its simplicity in infrastructure installation, easy maintenance, and low or no cost in electricity. According to Marin (1991), “The gravity method is used in the country mainly due to the traditional custom of considering water as an abundant and cheap resource, which can be spent without further rationality and probably also by the high investment initial demanding other systems.”

Of the 900,000 irrigated hectares, two-thirds correspond to small-scale irrigation developed by the private sector, while the remaining area has public irrigation of medium or large scale, which currently is operated under the Colombian Institute for Rural Development’s 24 irrigation districts.

Most of Colombia’s climate is seasonal (with at least three dry months during the year) with driest months requiring irrigation for the production of permanent crops.

Since the 1930s, the national government has been promoting the adaptation of land with irrigation systems, which is reflected in the institutional evolution of the sector: the creation of Electraguas in 1936, the Colombian Institute of Agrarian Reform (INCORA) in 1961, the Institute of Hydrology, Meteorology and Land (HIMAT), and Instituto Colombiano de Hidrología, Meteorología y Adecuación de Tierras (HIMAT) in 1994. INAT was replaced in 2003 by the Colombian Institute for Rural Development (INCODER). Through these institutions, Colombia has tried to operate efficient irrigation districts that contribute to the modernization of agricultural production. However, the absence of a methodology for the definition or regulation of tariffs for irrigation services has led these rates to cover only a portion of the maintenance and operation cost of the systems, preventing investment in renovation, expansion, and modernization of irrigation systems.

The charges for irrigation are composed of a fixed charge per hectare (per year) and a variable metric or consumption volume charge. Currently, INCODER fixed proportion payment of these charges, which in the past were fixed by the HIMAT then by INAT. In the past, the government paid the difference between the proportion collected by INCODER and operation and maintenance needs.<sup>10</sup>

Fixed charges are payable in advance, prerequisite for irrigation services, while charges per unit of water consumed are paid at the end of each season. Due to the inefficiency of the paternalistic system of water charges in 1980, irrigation charges covered only reached 35 % of the costs of operation and maintenance. That percentage reduced in 1987 to 28.7 %, which precluded the state’s investment in creating major areas covered with irrigation systems.

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<sup>10</sup>Plusquellec (1989).

Despite being an agricultural country, Colombia does not have a proper irrigation system, and use of inefficient technologies for water management makes it vulnerable to dry spells. In addition, the subsidized tariff model has not been allowed to invest enough in public irrigation districts.

## 7.7 Future Measure Debate

Today, companies are in the process of discussing a new rate methodology proposed by the CRA for potable water and sewage, which would take effect from July 2015. The aim of the new methodology is simply defining the procedures and formulas to be used by companies to calculate their costs and rates for the next 5 years without changing any aspect (such as categories of users, block consumer subsidy levels, etc.) of the current rate schedule. The new methodology defines in detail how companies should make their projections for new users and billed volumes.

Similarly, projection methods and administrative and operating costs are detailed; maximum unit costs are defined by type of infrastructure and their useful lives (to calculate annual depreciation rates). Although the proposed methodology is certainly more complicated (or detailed) than what is expected from a regulator, it is not expected to have significant effects on the rates currently applied by companies.

In addition to the work of the CRA, the congress is discussing and preparing a legal definition for the theme “human rights to water,” probably to accompany or follow the action already taken by Bogota and Medellin explained above.

Another discussion that is currently under way in Colombia is related to the provision of water and sewerage services in small communities. The definition of an assistance program and special regulations for small providers is anticipated.

## 7.8 Conclusion

The use of W&W service tariffs as an inflationary anchor for years in the past, led water companies into a severe financial crisis that became evident at the beginning of the 1980s. As part of the decentralization process in the mid-1980s, the national government transferred ownership of medium and small enterprises to local governments, which yet were owners of large cities’ W&W utilities. The national government reserved for itself the power to define, through JNT, the tariffs that each of the W&W companies in the country could apply. But the low-level equilibrium of the sector did not change. By the early 1990s, almost all companies in the sector were in deplorable financial and technical conditions. Coverage of water and sanitation services, even in large cities, was low, and the continuity and water quality problems were common. The issuance of Law 142 in July 1994 was a break point that opened

the sector to free private participation, defined the rules to determine rates, and established a clearly defined and transparent subsidy scheme granted to the lower stratum.

CRA issued the first methodology to define tariffs in the W&W sector in 1995, and Bogotá (the capital city) was the first one to apply it. The transition from the old level of rates to those resulting from this new methodology took 10 years. The regulations issued by CRA, establishing clear methodologies for calculating the economic cost of each service (water or wastewater) and the fact that Bogotá was the first to apply the new methodology and initiate rate increases, encouraged other large and medium companies in the country to implement the new regulation.

The tariff increases led some Colombian cities to have the most expensive services of W&W in Latin America. This fact, in turn, resulted in significant reductions in consumption in a way that some Colombian cities also have the lowest consumption per household in Latin America. The sector had significant strengthening to the point that almost all large and medium Colombian W&W utilities cover completely their costs (including depreciation and cost of capital), based on their tariffs.

In general, the companies of the sector have access to capital markets, and some of them have issued bonds (something very unusual in companies of this sector in Latin America), and all of them pay income taxes, like any other economic activity.

The regulation of the water sector in Colombia has had a much better performance than that achieved by any other Latin American country, predominantly served by publicly owned companies.

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