

PLANNED CITY, SUSTAINABLE WATER SERVICES? The case of Brasília – the 47-year-old capital of Brazil

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ABSTRACT

This study seeks to assess the strategy used in managing water supply and sanitation services in Brasília, the new capital of Brazil, as well as repercussions in the immediately surrounding region, from the perspective of sustainable development. The approach adopted was centered on the three principal dimensions of sustainability (environmental, economic and ethical/social), supplemented by considerations regarding institutional aspects related to the management of such services. The economic dimension focused on the evaluation of economic, financial and operational indicators concerning the service provider, as well as issues related to new investments to be made. In assessing the environmental dimension, an attempt has been made to identify criteria for prioritizing sewage treatment measures and their consequences. Also evaluated were the effects of population growth in the surrounding region on the quality of water destined for supplying the population of the Federal District. Analysis of the ethical/social dimension sought to identify inequalities in the distribution of access to such services in the different Administrative Regions of the Federal District and surrounding area, as well as the kind of mechanisms practiced regarding internal subsidies. The results show that there is difficulty in obtaining total recovery of costs, the importance of the role of the State in financing investments, and that there is a need for integration measures that really show results, as well as the creation of basic institutional articulation mechanisms.

Key words: sustainability of water and sanitation services, Brasília, Brazil

1. INTRODUCTION

Brazil is a federative republic composed of 26 States and a Federal District, as well as more than 5,500 municipalities. It is a country of continental dimensions, covering around 8,500,000 km², and faces great challenges in order to supply its population of more than 170,000,000 inhabitants with basic infrastructure services: immense social and territorial inequalities in access to services on the one hand, and a public finance crisis and absence of economic models consistent with solidarity principles on the other. With regard to water supply and sanitation services, there are 35 million people without access to water supply networks, 12 million of which live in urban areas, as well as 99 million people without access to sanitation networks, 60 million of which are to be found in urban areas (IBGE, 2006). Only 30% of sewage collected undergoes treatment. Eradicating existing deficits requires continuous investment of around 0.6% of GDP, over a period of twenty years, this being well above the average annual figure of 0.2% of GDP observed during the last decade (Ministério das Cidades, 2006). The services in question are organized at local and regional levels. At regional level, they are principally provided by State Sanitation Companies, created during the 1960s, which furnish a water supply for around 80% of the urban population and basic sanitation infrastructure for 40% of this population.

Meeting the challenge of universalization requires re-assessment of the existing institutional framework, inclusion of new accords between the different spheres of government, and implementation of new economic-financial and management models. The new federal law establishing basic guidelines for sanitation, approved in January 2007, is going to allow definition of a new agenda of measures for the sector, and give greater clarity to issues that are still pending, for example, the applicability of adopting the principle of total recovery of costs, conditions necessary for insertion of new strategic partners, and optimum territorial dimensions for providing services that make it possible to achieve a greater degree of equality.

At a time when new proposals regarding the sector are being put forward for discussion, we believe that it is important to evaluate the experience of the capital of Brazil, Brasília, in providing water supply and sanitation services. At first glance, in view of its specific characteristics, it may seem that the experience of the capital of the country has little to offer with respect to the remaining entities that comprise the Federation. Nevertheless, closer examination shows that the Federal District and its surrounding area reproduce the wide range of contrasts found in the rest of the country, and that the lessons learned during the 47 years that it has been in existence might be useful, not only for Brazil, but also for other developing countries.

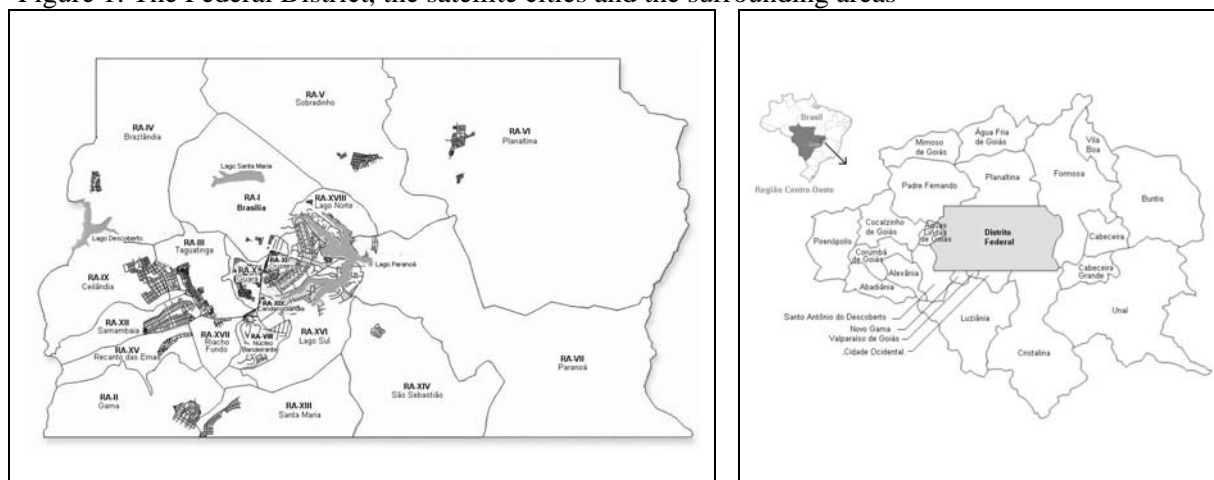
The Federal District occupies an area of around 5,800 km² and is situated in the Central-Western Region of Brazil, on the high central plateau, bordered by the states of Minas Gerais and Goiás. It has been home to the new capital of Brazil since 1960. The decision to move the capital from the coast to the interior of the country, something that had been under discussion since the eighteenth century, was made with two objectives that conflict to a certain extent: on the one hand, the need to create a city with essentially administrative characteristics in order to provide a base for the Federal Government and, on the other, the importance of instigating a process of economic development in the interior of the country. Three conditions governed the choice of site: its location should be such that allows for the interiorization of development; the site should have ease of access to means of road/rail and air transport; and water resources in the region should be abundant (Silva,1999). This last requirement was not met, as the Federal District is located in a region of springs, with a low level of water availability.

As far as the structure of the city is concerned, the planners of the capital minimized the impact of economic development and occupational pressures, principally focusing on administrative aspects. However, Brasília was conceived during a period marked by intense migratory movement, as it was in the 1960s that the urban population of the country began to exceed the rural population. Very early on, the initial urban planning of the city underwent alterations in order to house those populations that flowed into the region in search of jobs as construction workers and new living conditions. In this way, concurrently with the construction of its Pilot Plan, new satellite towns came into being, considered as peripheral nuclei, which were subsequently organized in the form of Administrative Regions (Fig.1). Efforts to bring order to urban occupation in Federal District territory met with little success. The current total of 2.3 million inhabitants greatly exceeds the initially planned population of 700 thousand people.

The social and economic indicators exceed national averages, although these regions have distinct differences between one another. If socio-economic differences can be clearly distinguished at the territorial boundaries of the actual Federal District, discrepancies are even more evident when one compares the socio-economic standard of the surrounding region. The expansion of transport networks and the migratory influx of people are aspects that have changed the occupation profile of the central region of the country in a manner that was not foreseen in initial planning, thus bringing about all the consequences of disordered occupation. In 1960, there were 60,000 inhabitants living in the region. At the present time, around 900,000 people live in the region surrounding the Federal District. When compared with the population living in the Federal District, their socio-economic differences are significant: average monthly household income is around three times lower than that enjoyed in the capital of the country (CODEPLAN, 2003). The dynamics of development of municipalities in the

region, economic dependence interrelationships and other types of interaction between these municipalities and the Federal District characterize polarized pressure on the capital of the country that has direct repercussions on the conservation of regional natural resources, principally water resources.

Figure 1: The Federal District, the satellite cities and the surrounding areas



This is the context within which this study has been developed. We will seek to assess the strategy adopted in managing water supply and sanitation services in the Federal District of Brazil, together with repercussions in the surrounding region, from the point of view of sustainable development. We will adopt a preliminary approach focusing on the three dimensions of sustainability, namely: environmental, economic and ethical/social, as defined by the United Nations, and inspired by the “3E Approach”, developed at Eurowater program level (Correia, 1999), Barraqué, 1999) and applied in other case studies (Massaruto, 2006). As far as the environmental dimension is concerned, this approach is considered to be suitable due to the fact that the Federal District is to be found in a region of scarce water resources, with a high degree of fragility regarding the quality of its water, and under intense urban occupation pressure, both inside and outside its territorial boundaries. With respect to the economic dimension there is constant challenge, on the one hand, of meeting growing demand arising from population growth and, on the other, guaranteeing the renovation of existing systems. With respect to the ethical dimension the specific characteristics of the capital of Brazil – a planned city and center of government – require specific water supply and basic sanitation solutions, very often more onerous than those made available for the remainder of the population of the country, thus creating a distinct contrast with the surrounding region and increasing inequalities.

2. INSTITUTIONAL, REGULATORY AND LEGAL ASPECTS

In Brazil, conditions regarding the provision of water supply and sanitation services are governed by standards established at Federal, State, Federal District and Municipal levels of jurisdiction. These services are directly related to environmental conservation (under joint Federal, State, Federal District and Municipal jurisdiction), the integrated management of water resources (Federal jurisdiction in the case of those rivers over which it exercises authority, and State and Federal District jurisdiction in other cases¹) and public health (under joint Federal, State and Municipal jurisdiction).

The Federal Constitution is not clear in defining the level of authority responsible for providing these services. It is understood that they represent a local level of concern, with the result that their concession would be the responsibility of Municipalities. In the case of the capital of the country, such services fall under Federal District jurisdiction. Given the local level of concern of these services with

¹ Rivers under Federal Government jurisdiction: transboundary rivers or rivers that go to more than one state.

respect to regulation, responsibilities at Federal level are those of determining general guidelines by the Ministry of Cities. With respect to the management of water resources, in 1997, the Federal Government instituted National Water Resources Policy and created the National Water Resources Management System. The territorial unit considered for implementation of this policy is the hydrographic basin, and planning the use of water comes about with the participation of society, by means of Watershed Committees. The National Water Agency is the federal entity, associated with the Environment Ministry, responsible for implementation of Water Resources Policy and coordination of the National Water Resources Management System.

In the Federal District, the legal and institutional framework that governs the provision of water supply and sanitation services, as well as correlated areas, follows guidelines laid down by the Federal Government. Sanitation policy is the responsibility of the Urban Development Department, linked to which is the “*Companhia de Saneamento Ambiental do Distrito Federal – CAESB*” (Federal District Water and Sanitation Company). This department is also responsible for implementation of the “*Plano Diretor de Ocupação Urbana*” (Urban Occupation Master Plan), which establishes Federal District urban occupation milestones. The Environment and Water Resources Department is responsible for the establishment of supplementary rules and standards relative to protection of the environment, as well as implementation of Federal District Water Resources Policy. Regulation of the management of water resources and sanitation services comes about via a single entity, the “*Agência de Água e Saneamento do Distrito Federal - ADASA*” (Federal District Water and Sanitation Agency). This agency is responsible for regulating, controlling and inspecting the quality and quantity of surface bodies of water within Federal District territory, as well as water supply and sanitation services. The quality of water distributed to the population is monitored by the Sanitary Inspectorate, linked to the Health Department, which adheres to standards established by the Ministry of Health.

In 1998, the “*Região Integrada de Desenvolvimento do Distrito Federal e Entorno - RIDE*” (Federal District and Surrounding Area Integrated Development Region) was created, with the objective of establishing an institutional mechanism destined for aiding the government authorities in dealing with regional issues. The *RIDE* region covers an area of 55,400 km², comprising the Federal District itself and twenty-two municipalities in the state of Minas Gerais (two) and the state of Goiás (twenty). It involves action at three government levels: i) Federal, by means of the National Integration Ministry; ii) State, through the states of Minas Gerais and Goiás and the Federal District; and iii) Municipal, with participation of the twenty-two municipalities.

3. SUSTAINABILITY OF SERVICES IN THE FEDERAL DISTRICT

3.1. Provision of water supply and sanitation services in the Federal District

Up to 1969, the local authority was responsible for operation of water supply and sanitation systems in the Federal District. In April 1969, a public service concession was granted to the “*Companhia de Água e Esgotos de Brasília – CAESB*”, instituted in accordance with established laws governing Public Limited Companies². The company was created during the military government, at the height of measures associated with the “*Programa Nacional de Saneamento – PLANASA*” (National Sanitation Program). Like the other companies, it benefited from access to financial resources from the “*Fundo de Garantia por Tempo de Serviço - FGTS*” (Government Severance Indemnity Fund for Employees) and technological development programs, until 1993, when the program entered a phase of collapse, brought about by a public sector financial crisis, among other aspects.

² In January 2005, the company name was changed to *Companhia de Saneamento Ambiental do Distrito Federal*, although it continues to be known as *CAESB*.

The current average production capacity of the water supply system is that of 6.1 m³/sec, which serves 99% of the urban population of the Federal District. Basic sanitation services meet the needs of 94% of the population. Considering all collected sewage, 89% undergoes treatment (CAESB, 2006)

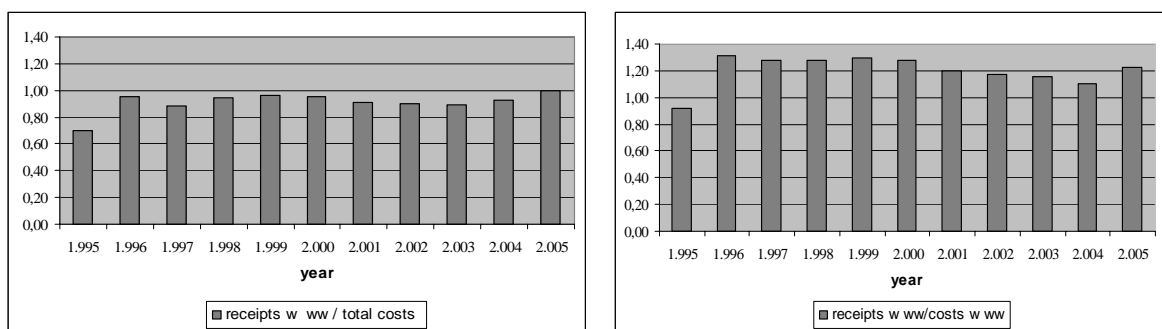
3.2. Economic dimension

An assessment was made of operational aspects associated with the provision of water supply and sanitation services, aspects regarding balance between the cost of such services and financial returns, and issues related to investments already made and yet to be made. An analysis of CAESB operational indicators, over the last 10 years shows that although water production increased by 8%, there was an increase of 35% in the number of connections to the supply network and a 30% increase in the extent of the network. In the same period, there was a 15% increase in the population and a 22 % increase in service in populational terms. Average rates of physical losses remained practically stable at 25% (PMSS, 2007). On the other hand, per capita consumption fell from 213 l/sec during the period 1995 - 2000, to 186 l/sec between 2001 and 2005. This drop can be understood to be the result of water saving program or the existence of restrained demand, which indicate a need for expansion of the system. This second aspect is backed up by the CAESB “Plano Diretor de Água e Esgotos” (Water and Sewage Master Plan), 2000, which recommends the use of new sources of water supply from the middle of the current decade (CAESB, 2004).

Advances in basic sanitation services during the period were more significant. There was a 43% increase in the number of active connections and a 40% increase in the extent of sewerage collection. In the same period, there was a 33 % increase in service, in population terms. However, it is in sewage treatment that the greatest advances can be seen. In 1995, 49% of collected sewage underwent treatment. In 2005, this percentage rose to 88 % and treatment capacity practically doubled. These aspects are discussed in sub-item 3.3 - analysis of environmental dimension.

Figure 2 shows that there is a tendency to average receipts cover the total costs of the services, that comprise the exploitation, interests, depreciation, and amortization costs . However historically, the tariffs practiced are not sufficient to cover these services. On the other hand, operational receipts exclusively generated by the provision of water and sewerage services are, on average, 20% higher than the costs of production, in a more steady way.

Figure 2: Economical performance of water and wastewater services CAESB 1995- 2005



Receipts / total costs

Source : SNIS/Ministerio das Cidades

Receipts/ costs of water and waster services

The tendency towards total costs recovery should be analyzed with care, considering the role of the local government in financing investments in the water supply and sanitation sector. Agreements entered into with the World Bank (IRDB) and the Inter-American Development Bank (IADB) have made it possible for the construction of large-scale treatment plants. In general, the Federal District

Government is responsible for paying great part of the amount loaned. The utility company participates with a smaller portion of its own resources and a reduced part of the loan. In general, it is the utility company that receives resources loaned by national banks.

During the period from 1995 to 2005, a total of US\$ 423 million was invested in Federal District water supply and sanitation services. Of this total, US\$ 213 million represented the utility company's own resources, the remainder coming from loans. A preliminary analysis of the utility company balance sheet indicates that it only started to show a profit from 1999 (assessed at US\$ 52 million up to 2005). Asset depreciation in the period 1995 – 2005 was that of US\$ 307 million (CAESB, 2006). This leads us to induce that part of the depreciation resources was also used for new investments and not only for renewing existing units.

By the year 2030 the population of the Federal District is expected to be around 3,5 million inhabitants. Studies performed at the level of the CAESB "*Plano Diretor de Água e Esgotos*" (Water and Sewage Master Plan), 2000, show that there is a need to increase the production capacity of the system from the current figure of 6.1 m³/sec to 12 m³/sec in 2030 by using new sources of water supply located outside Federal District territory. Investment for installation of the systems amounts to US\$ 321 million and for the expansion of the sewerage systems amounts to US\$ 259 million³. Even with the presently financial performance, once more, the Company will have to count upon part of non refundable money from the Government of the Federal District to cope with these needs.

3.3. Environmental dimension

Our assessment of the environmental dimension of water supply and sanitation services in the Federal District focuses on two basic issues: the first concerns prioritization criteria for sewage treatment measures established by the Federal District Government and their consequences, whereas the second explores the effects of population growth in the surrounding region on the quality of water destined for supplying the population living in the Federal District.

Concerns regarding water resources and the impacts of soil use on water quality have been in existence ever since the new capital was built due to a lack of water resources in the region. These concerns are amplified by the fact that Brasília is situated on the banks of an artificial lake, Lake *Paranoá*, created with the main objective of easing local conditions - a region with vegetation predominantly of the "*cerrado*" kind, low air humidity, and a well-pronounced dry season⁴. Ten years after it came into existence, the lake was already eutrophicated as a result of inadequate sewage treatment and due to the overloading of treatment plants. From 1993 to 1994, two new advanced sewage treatment plants were inaugurated, with the biological removal of phosphorus and nitrogen. The complexity of the treatment process and the amount of investment made place the Federal District on a level that is totally outside the reality of the country. Besides this, for decades, priority given to the clean-up of Lake *Paranoá* postponed the construction of other sewage treatment plants in other regions of the Federal District, thus impacting the quality of watercourses beyond its territorial limits. Figure 2 shows the investment made in construction of sewage treatment plants in the Federal District, as well as the increase in the treatment capacity over the years⁵. From 2005, on average, 85 million m³/year of sewage is treated at the seventeen existing plants.

If, on the one hand, the Federal District has always been attributed with aggravating pollution problems in regional surface bodies of water, on the other, it is not possible to ignore impacts arising

³ Conversion rate 2004 : 1 US\$ = 2.8 R\$ - January 2004

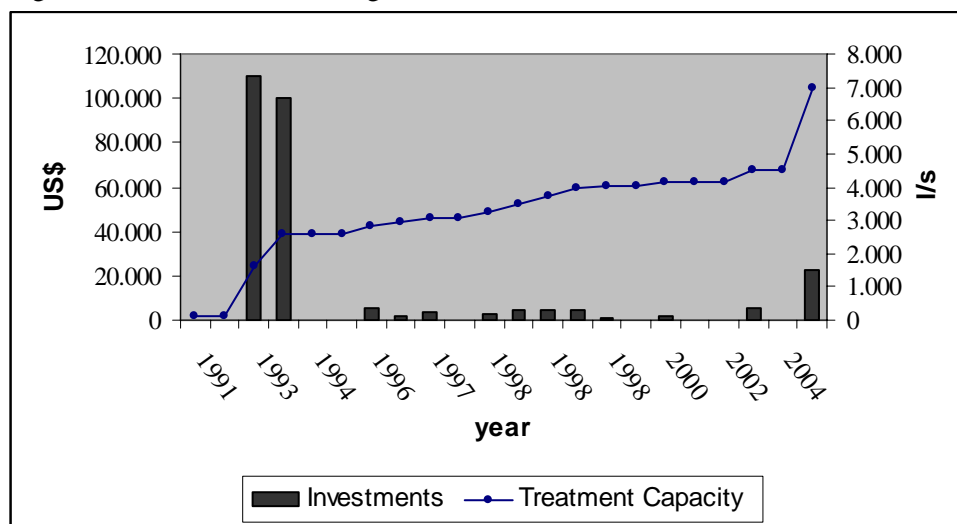
⁴ The lake occupies an area of 38 km² and its hydrographic basin, covering 1,400 km², is home to the seat of Federal Government and a population of more than 600,000 inhabitants.

⁵ There are found to be differences between the costs of the two Lake *Paranoá* treatment plants (153/US\$ m³ treated) and other plants (35 US\$/m³ treated). Alternative and less costly solutions were used in other cases.

from urban occupation in the surrounding area on the degradation of water sources destined for supplying the capital. Two examples deserve special mention. The first concerns the consequences of urban occupation in the hydrographic basin of the main source of Federal District public water supply - Lake *Descoberto*⁶ in part of the territory belonging to the State of Goiás. Another aspect concerns undesirable effects on the future source of water supply of the capital, located outside Federal District territory, due to urban occupation. The western region of the Federal District is an area of high urban polarization. This region is made up of municipalities with high rates of urban growth, low levels of sanitary wastewater collection and incipient treatment levels. The six municipalities that comprise this region⁷ have a sewage production rate of around 500 l/sec, equivalent to 25 thousand kg of organic matter (BOD₅) that is directly discharged into watercourses that form the *Corumba IV* Reservoir, a new water supply source for the population of Brasilia.

The fact that the Federal District has a local policy of collecting and treating all the sewage produced within its territory is not enough to guarantee the environmental sustainability of the region. This component extends beyond the territorial boundaries and has a much more regional connotation than a local one.

Figure 3 : Investments in sewage treatment in the Federal District 1993 – 2005



Source: SIESG – CAESB 2005

3.4. Ethical/social dimension

With a view to assessing the ethical/social dimension, an attempt has been made to check for inequalities in the distribution of access to these services within the different Administrative Regions of the Federal District, and the internal subsidy mechanisms practiced. Secondly, we widen our view to outside the territorial boundaries of the capital, with the inclusion of the surrounding area.

Within the Federal District, there is almost universal access to these services. Even in those Administrative Regions of lower spending power, levels of coverage are high. A similar situation exists with respect to sewage collection and treatment. The information gathered shows a tendency to amplify access to services to the whole population, irrespective of the economic level of the Administrative Region. The level of payment of receipts has remained at the very low level of 0.4%,

⁶ The municipality of *Águas Lindas de Goiás* “arose” in the 1990s. Presently the population exceeded 100,000 inhabitants and still does not have any kind of sanitary wastewater collection solution.

⁷ Luziania; Cidade Ocidental; Valparaiso de Goiás; Santo Antonio do Descoberto; Novo Gama; and *Águas Lindas de Goiás*

showing that there is very little resistance on the part of the population to paying for the services provided.

The utility company pricing policy divides tariffs into bands, with increasing prices based on consumption. The residential category is subdivided into two sub-categories: one for normal users and the other for user of lower spending power. Subsidies are practiced among the different classes of income, which also extends among the Administrative Regions, given their differences in spending power. Consumption in those social strata of greater spending power is greater than that of those of lower income, which leads to a double internal subsidy.

There is a clear tendency for equality in access to services in the Federal District. However, it cannot be extended to the surrounding region, where 28% of the resident population (230 thousand people) does not have access to water supply systems, and 83% (660 thousand people) have no access to sanitation services (Ministério das Cidades, 2003). Here, one is certainly dealing with municipalities located in other states of Brazil; however, this aspect directly touches on the issue of territorial and social solidarity. It also raises questions regarding the role of regional integration mechanisms and the conditions necessary for their success.

4. DISCUSSION

The first point to be discussed deals with recovery of costs as a sustainability factor. In the Federal District, water supply and sanitation services are provided by a utility company that is considered to be one of the best in the country, based on its operational and financial indicators. Nevertheless, historically, its financial performance indicator shows that direct billing has not been sufficient for payment of the total cost of the services. It is important to emphasize that these cost only include part of the debt service (payment of loans), as the Federal Government has always been the principal party receiving loaned resources for large-scale construction projects. The analysis shows that, in order to cope with investments necessary for system expansion and, at the same time, maintain the same pricing policy; it will be difficult for the company to dispense with the financial support of the Federal District Government. On the other hand, the Federal District shows the feasibility of paying for the cost of exploiting the services through tariffs - something that currently only occurs in 30% of the regional utility companies in the country. Another aspect that draws our attention is the fact that the pressure to meet increasing demand always gives less priority to the maintenance/recovery/renovation of assets. These can be extrapolated to other locations in Brazil and to other developing countries that have to face, at the same time, the challenge of increasing service coverage and assuring the performance of the existing systems, in a context of scarcity of financial funds. These are relevant aspects to be considered by the Federal Government when establishing the national goals for the services. Total recovery cost is unrealistic even in well managed companies; however, great part of these costs can be recovered if the operators are stimulated to increase efficiency. Besides, more and more it is important if to have clear policies towards the renewal of assets, in spite of every pressure for enlargement of the systems.

It is difficult to assess the environmental dimension of the sustainability only considering the territorial boundaries of the Federal District. The regional dimension simply cannot be ignored in evaluating environmental aspects. In the same way, it is not possible to speak of the regional dimension without considering institutional aspects. The emphasis placed on cleaning up Lake *Paranoá* has contributed to the deterioration of water quality in the surrounding region. The urban pressure of neighboring towns means that the quality of sources of water destined to supply the population of the Federal District is subject to risk. Environmental sustainability can not be considered within territorial limits of the capital of Brazil.

During our analysis, at each moment we came across with the need of incorporating the regional dimension in the 3E approach of sustainability. Integrated solutions that consider the Federal District

and its neighbouring municipalities could lead to economy of scale, with direct effects on the economical sustainability. In turn, the extension of service coverage would conduct to better equity and would contribute to better environmental conditions. However, these solutions demand the efficient implementation of institutional articulation mechanisms; what has not occurred so far. The *RIDE* was created with the objective of establishing an institutional mechanism destined for aiding the government authorities in dealing with regional issues, however, the lack of articulation between its constituent entities is distinctly problematic. The municipalities are to be found in different states of the Federation (Minas Gerais, Goiás and the Federal District), and it has been difficult to common and cooperative solutions in order to attain the required threshold for sustainable development. On the other hand, implementation of National Water Resources Policy instruments, the management unit of which is represented by the hydrographic basin, has been sluggish and with not very expressive results in the region of the Federal District.

A preliminary glance leads us to believe that, up to now, water supply and sanitation problems in the surrounding region will only have a chance of solution from the moment they are linked to a wider sphere of priority of the Federal District, despite of the existing mechanisms for institutional integration. A truly approach towards water resources sustainability in the region should consider the reinforcement of these mechanisms of articulation in such a way to encompass others actors in the definition of the priorities.

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