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Access to Water Supply and Sanitation
in Brazil: Historical and Current
Reflections; Future Perspectives

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Abstract

The paper provides an analytical description of water supply and sanitation in Brazil. While acknowledging the fragility and imprecision of available quantitative indicators, particularly in measuring service coverage, it attempts to identify trends. A description of the sector's evolution is included which seeks to identify milestones along the way that present obstacles and opportunities for the current day. Experiments are described—municipal cooperatives and experiments, state company experiments and the condominium system—that may be considered successful and supply paradigms for a new scenario. Finally, there is a look ahead to possible scenarios for the future, based on the current legal and politico-institutional landscape. In this connection the paper highlights the federal government's bill for Law no. 5.296 and the potential it has to supply what the sector historically has lacked—the setting of clear guidelines for service provision that would lead to universality and improvements in the quality of service for the population. The document tries to show that, although important advances in water supply and sanitation have been made in Brazil, there remains a significant deficit to be addressed. Namely, that a more satisfactory framework, including progress in meeting the Millennium Development Goals, will be produced only when the sector's public policy dimensions, and its need for effective administrative tools, are seriously taken into consideration. Furthermore, it is suggested that subsequent analyses of this reality and its evolution ought not to ignore the tensions produced in the struggle within the sector for social, economic, and political power, which variously pits its different actors—federal authorities, private enterprise, and civil society— against one other.

Key words: abastecimento de água, esgotamento sanitário, Brasil, política pública, gestão, organização, indicador [water supply, sanitation, Brazil, public policy, administration (or, "management"), organization, indicator]

1. Introduction

It is truly no small endeavor to assess water supply and sanitation services in a given locality (1). The most common approach is to use coverage and service indices available from official sources (2). At the national level the standard procedure has been to take the number of residents with access to services, usually for urban, rural, and total population, then to determine their proportion relative to the total respective population. This process involves a number of

imprecise elements: definitions of urban and rural; how total populations are determined; how the population served is determined and, most of all, the concept of access.

Different definitions of access can be adopted for both water supply and sanitation systems. Each definition incorporates social and political values; each has been found to lead to different results and implications. The difficulty, however, does not lay simply in defining the status of the service under consideration. Clear methodological limitations also exist in terms of how a given status is characterized, particularly the quality of service delivery. Overcoming these limitations produces analyses of greater depth—combining quantitative with qualitative assessment, aggregate with disaggregated data, secondary data with investigations in the field, historical perspective with the current or cyclical context, and political-institutional analysis with evaluations of indicators, among other points of focus. Clearly, an undertaking based on such a vision would require specific studies of a kind that usually are impossible when relying solely on research using available secondary sources.

Aware both of the limitations of an analysis that employs only official data, and of the difficulties involved in attempting a study in greater depth, the present article seeks to assess the current state of access to water supply and sanitation services in Brazil on the basis of a broader range, and a more qualitative appreciation, of the data.

It therefore begins with a description of the historical evolution of the sector, attempting to identify milestones along the way that present obstacles and opportunities for the current day. The state of service delivery over recent years is assessed in an effort to establish indices of quality where these are apparent, while pointing out the limitations of available indicators. Experiments in the country that may be considered successful, supplying paradigms for a new scenario, are described. Finally, the study will attempt to look ahead to prospective scenarios in the context of the current legal and political/institutional landscape. We are aware that this will be a preliminary effort, one that will require adjustments and greater analytic depth, but which ultimately will serve as a frame of reference for later assessments.

2. Brief History of the Organization of the Services

In order to more properly understand the current state of this sector in Brazil it is essential to examine how the Brazilian national government's view of it has evolved throughout history. Five distinct periods in the sequence of models for sanitation in Brazil are identified here, as follows (3):

First Period: Sixteenth to mid-Nineteenth Centuries

A Portuguese colony until the start of the nineteenth century, Brazil supplied a platform for an economic policy based on foreign trade. The colonial structure was shaped to serve those interests; there were therefore no explicit policies aimed at improving living conditions in Brazil. Political authority was characterized by decentralization, beginning with the system of hereditary captaincies that concentrated political power in the hands of the largest landholders. Most sanitation measures were of an individual nature, and few collective steps were taken until the mid-eighteenth century. After gold was discovered population growth generated a demand for collective, public sanitation measures, which would favor the most vigorous economic centers. The situation changed somewhat when the Portuguese Court was transferred to Brazil, generating demand for hygienic improvements in the ports. This resulted in the creation of the first institutions of public health and hygiene, but most initiatives were limited to the capital, Rio de Janeiro. The role of federal authorities during the period was heavily determined by the fact that most initiatives were targeted at promoting economic activity.

Second Period: 1850-1910

With the rapid growth of the cities came a growing understanding on the part of the governing elites of the social implications of sanitation and of the consequent risks of epidemics. Yellow fever, cholera, and smallpox were common throughout the territory, reaching drastic proportions in the most populous cities. Based on slave labor, the national economy suffered from the instability epidemics caused. It was an understanding of this interdependence, along with a desire to improve Brazil's image in Europe, that led to the introduction of sanitation initiatives. After the proclamation of the Republic in 1889 a new constitution reaffirming the states' autonomous authority to provide health services brought about decentralization, except in the capital, where they remained the federal government's responsibility. Nevertheless, this constitutional arrangement limited the national government's reach over national territory, stalling any further advances in coordinating sanitation initiatives and consolidating public authority in Brazil. The contagionist concept, based on the paradigm of the uni-causality of disease, came to prevail in scientific circles and the focus was on combating etiologic agents, not on initiatives of a more collective nature. During the end of the 19th century and the beginnings of the 20th, however, the national government began to define water supply and sanitation services as belonging under public authority, and to transfer them to private enterprise, mainly firms backed by English capital. The effort to link up the Brazilian economy with global capitalism crucially affected sanitation policies, which now focused on creating suitable infrastructural conditions for economic activities. Private companies therefore gave priority to locations where national elites were concentrated,

preferring to intervene in the central regions of cities where residents were in a position to ensure healthy returns on their investment.

Third Period: 1910-1950

The emancipation of the slaves at the end of the 19th century had deep repercussions: slaves were abandoned by the national government and replaced by immigrants, who received similar treatment. This meant expanding the number of excluded peoples, and prompted the irregular settlement of urban spaces. The general public was excluded from any of the benefits of the country's modernization. This generated unrest in the population, including public protests against companies and the limited systems they were introducing. The majority of companies were of short duration, as a result, except for the Rio de Janeiro sewerage company, which was in business until 1947, and the Santos, Sao Paulo water and sewerage company, which lasted until 1953. In the wake of this discontent the national government took charge of administering the services, creating specific entities for municipal, state, or federal administration. At the same time, in the beginning years of the twentieth century, the so-called "re-discovery of the interior", with its rural expeditions, called attention to the precarious health conditions affecting the population there. This awareness resulted in the movement known as the Brazilian Pro-Sanitation League, which sought improvements in rural health as key to future economic development based on the country's agricultural potential. This movement became the vehicle for the national government's expanded presence in units of the federation, impelled by the understanding that isolated economic and technical solutions would not solve the problem. There was a consequent incentive to develop trained personnel in the field of sanitation engineering. This, along with advancing industrialization, hastened the national government's takeover of sanitation initiatives. The period 1910-1930 was the first great leap in the history of sanitation in Brazil, and would come to be known as the Era of Sanitation, lasting until the 1950's. From then on there would be a progressive bifurcation of water and sanitation.

Fourth period: 1950-1969

This period was marked by innumerable discussions and debates surrounding the institutionalization of the WSS sector, which now had greater significance in the context of industrial policy. Different administrative models were analyzed, and financing solutions began to draw more attention as well. Still, society and the municipalities themselves remained at the margins of decision-making. The

first post-graduate programs in sanitation engineering were created at the start of this period with the support of the USA, which maintained heavy influence over the technological foundations then being created. In 1953 the Ministry of Health was established. For its own part, the WSS sector came to be more and more independent of the health sector in its characteristics, adopting new administrative models as alternatives to direct municipal management. Greater autonomy was sought for the services, and the 1950's and '60's saw a transition from a centralized administrative model to service providers of a more autonomous nature. The period was marked by important decisions that sought to foster progress in WSS initiatives; the concept of self-sustaining tariffs was adopted, which helped to generate additional financial resources. This took place in the context which the country's new reality was imposing, that of growing industrialization and urbanization. From then on the politico-institutional context of the sector would adapt, making it possible to implement PLANASA [the National Sanitation Plan] over the following decade through the progressive use of financial support mechanisms and technical assistance—with the still-heavy presence of American technical cooperation.

Fifth Period: The 1970's to the present

The Brazilian context at the start of the 1970's was that of an authoritarian government which, politically, imposed harsh restrictions on individual liberties and censored free expression in the media. In the economic sphere there was accelerated growth thanks to a massive intake of foreign capital, which resulted in runaway increases in foreign debt. During the military dictatorship national urban policy came to be one facet of a larger strategy to achieve economic growth and bolster the new regime. Investment in water systems and water supply came to be part of the effort to generate new jobs, propel economic development, and win public approval, thereby softening rejection of the new political order. PLANASA [The National Sanitation Plan] was therefore launched at the beginning of this period, in the midst of the "economic miracle". Its funding was based on the FGTS-Employment Guarantee Fund [Fundo de Garantia por Tempo de Serviço], gathered from company withholdings of employee wages. This context is described below in a discussion of the current scene, in light of its profound influence on the sector's present state.

It is clear that, as an area of public policy, the Brazilian national government's view of water supply and sanitation, and the extent of its responsibility for them, has gradually changed. The view usually was the product of factors external to the workings of the sector itself, for example: concerns associated with disease control, including the necessity of good sanitation conditions; or economic,

political, social, and cultural processes that influenced development models for the country during each era. In each era, as well, perceptions of the sector clearly were determined by then-prevailing concepts of the state. Moreover, the nature of the sector itself came to influence the dynamic of other sectors and other aspects of the population's quality of life, for example its impact on health, the environment, and on social and economic conditions.

History further shows that, if delivering suitable sanitation services to the public initially was a task for which no one entity cared to assume responsibility, in light of the burden it imposed, the service gradually came to be coveted as an important lever of political, economic and social power, prompting disputes between public and private actors and between different federal authorities. The description of the historical and politico-institutional framework presented in this text helps to illustrate this. It should be added that, paradoxically, the struggle over this power occurs even in contexts where the dearth of services, and the challenge of providing them, are most profound.

The field of water supply and sanitation reached its present form when it was reorganized during the 1970's as part of PLANASA's implementation, and a new structural regime was established for the sector. This plan, the concept of which still exerts broad influence in the country, set in motion important institutional changes as it was implemented.

Perhaps PLANASA's most important legacy has been in its changing the federal entity responsible for administering the services. The Brazilian federal structure, in which significant power is concentrated in the hands of the states, was highly conducive to transferring administration of the services from the local to the state level. If, up to that time, the union and the states had acted principally in the areas of technical assistance and the financing of projects for water supply and sanitation, under this plan the states would now become the direct providers of services. Although the municipalities owned the services under the federal constitution then in effect, they now found themselves having to authorize the transfer of services to the state level, or risk losing access to federal and state funding. A contractual relationship was therefore established similar to that currently used in many parts of the world for formalizing private participation: concessions. This resulted in the creation of a new company for water supply and sanitation in every state of the federation, in some cases by adapting existing structures. These in turn became responsible for securing financing, for introducing (or expanding) systems, and for their operation and maintenance, while gaining the right to collect the respective tariffs.

Another of PLANASA's features was that it established a new source of public funding for its activities, which initially was more reliable than the scattered sources that prevailed before the plan was launched; the FGTS [Employment Guarantee Fund].

Also under the rubric of financial management, the plan established that the services would become self-sustaining on the basis of tariffs collected, and that, at the state-company level, this support could be supplemented by a policy of cross-subsidies, using a tariff model of each state's own devising.

Historically, PLANASA's implementation should also be placed in the context of the veritable "urban revolution" experienced by the country during that period, with high population growth and clamorous migration from rural zones into the major cities. Over a period of 30 years Brazilian cities went from a population of 52 million residents in 1970, representing 56% of the country's population, to a population of 138 million residents in 2000, which then corresponded to 81% of the population—an impressive growth of 86 million new residents, needing and demanding urban infrastructure.

The dissolution in 1986 of the BNH -National Housing Bank [Banco Nacional de Habitação]—PLANASA's financing entity, and the transition to democracy, led to a degree of change in institutional methods and the forms of federal government activity, but the prevailing model was not modified to any great extent. It is important to emphasize that the municipal level's role was enhanced during that time, particularly after the Federal Constitution of 1986, and as a consequence of it. This resulted in greater political-administrative autonomy, larger budgets, and increased access to financing-- while falling short of what would have been desirable in decentralization under ideal circumstances.

Therefore it cannot be said that one sole model, or linear path of political-institutional options came into being to replace the model represented by the BNH. In the two decades following the bank's dissolution, a succession of federal administrations passed through phases of anarchic institutional oscillation (the Sarney government –1985-90), over-reliance on private forces in shaping the sector's political orientation (the Fernando Collor de Mello government—1992-94), a nationalism which yielded few results in the area (Itamar Franco government, --1992-94), systematic, ill-fated efforts to expand private participation (the two terms of Fernando Henrique Cardoso's administration – 1995-2002), and an attempt at ordering the sector institutionally (Lula's administration, beginning in 2003).

From a legal perspective, a milestone in the effort to organize the water supply and sanitation sector came in 1993 when, after extensive and productive debate among various entities representing different segments of the sector, the National Congress passed PLC-19, which coordinated the National Sanitation Policy and its legal mechanisms. Nevertheless, after its legislative approval PLC 199 was vetoed in its entirety by President Fernando Henrique Cardoso on the grounds that it was not in the public interest. As an alternative to PL199 the government introduced the Sanitation Sector Modernization Project [Projeto de

Modernização do Setor de Saneamento (PMSS)], which would be financed by the World Bank [BIRD], consistent with neoliberal principles.

Another legal reference worthy of note is Law 8.987, known as the Concessions Law and signed by President Cardoso in 1995, which regulated the system of concessions and allowed private enterprise to provide public services. Along with this legislation there was an effort, via PLS 266, to transfer ownership of metropolitan-area services to the states; the heated debate it generated led to its rejection by Congress. It is believed that one of the project's main objectives was to reduce risk for private enterprise in those regions, which were more attractive to capital investment.

As part of the same privatization rationale, an agreement with the IMF was signed in 1999 committing the Brazilian government to accelerate and broaden the scope of the privatization and licensing program for water and wastewater services. The government declared it was adopting measures to limit the municipalities' access to official resources. As part of the policy the same administration sought to launch programs and projects—for the most part financed by BIRD—aimed at making the state companies more attractive to private enterprise.

As a rule, during the period after PLANASA was implemented water supply and sanitation had hardly any formal organization at all within the state-level government apparatus. In general the states disavowed their responsibilities, claiming that these fell to the state companies, although the latter were limited in the geographic reach of their coverage since a portion of the municipalities retained management of water supply services (In 2000, 68.8% of districts were operated by state companies and 45.5 by municipal agencies) and an even larger portion retained sanitation services (14.1% of the districts were operated by state companies and 38.4% by municipal agencies in 2000) (4). There was an equal failure on the part of most municipalities to shoulder their duties in the area, especially those that had concluded concession contracts. It was thus rare to find any kind of mechanism for social oversight or community involvement.

3. Evolution and current state of access to services: information and disinformation from available indicators

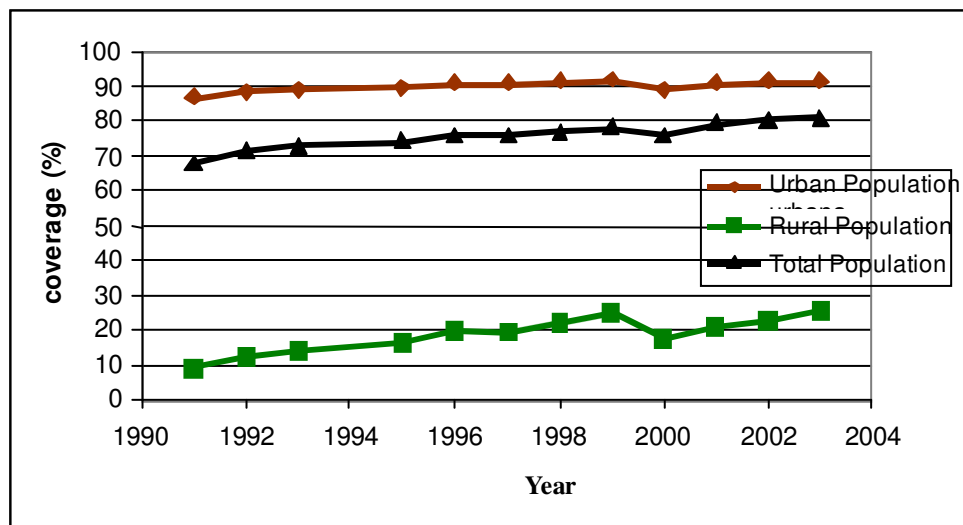
3.1 Statistics for access to services

Assessing the evolution of access to water supply and sanitation services in detail is a complex endeavor, depending on one's objectives. Brazil maintains a periodically updated data system on sanitation that is considered quite complete, even exemplary. Still, it is often unable to put service delivered to populations in an appropriate qualitative context, because the information systems ultimately valorize the indicators' quantitative dimensions.

A part of this task should certainly be to try and quantify the portion of the population included in and excluded from access to services, but also to characterize the quality of that access, searching for quality indicators for how the population is served. Brazil registers one of the highest [income]-inequality levels in the world (UNDP 2005), making it important in the national context to try to identify in which areas, and in what magnitude, asymmetries occur.

Data from the Brazilian Foundation and Institute for Geography and Statistics [IBGE-Fundação Instituto Brasileiro de Geografia e Estatística], which performs a census every decade and takes yearly sample surveys, permit a fairly close assessment of how coverage for community water supply services and for wastewater collection systems has evolved. Generally speaking the censuses allow us to estimate population coverage, and the sample surveys household coverage.

Based on these findings, Figure 1 shows how the percentage of coverage by water supply network evolved during the period 1991-2003 for urban, rural and total populations.



Sources: IBGE/National Study by Sampling of Households – [PNAD- Pesquisa Nacional por Amostra de Domicílios – (1992-1993,1995-1999,2001-2003), IBGE/2000 Demographic Census.

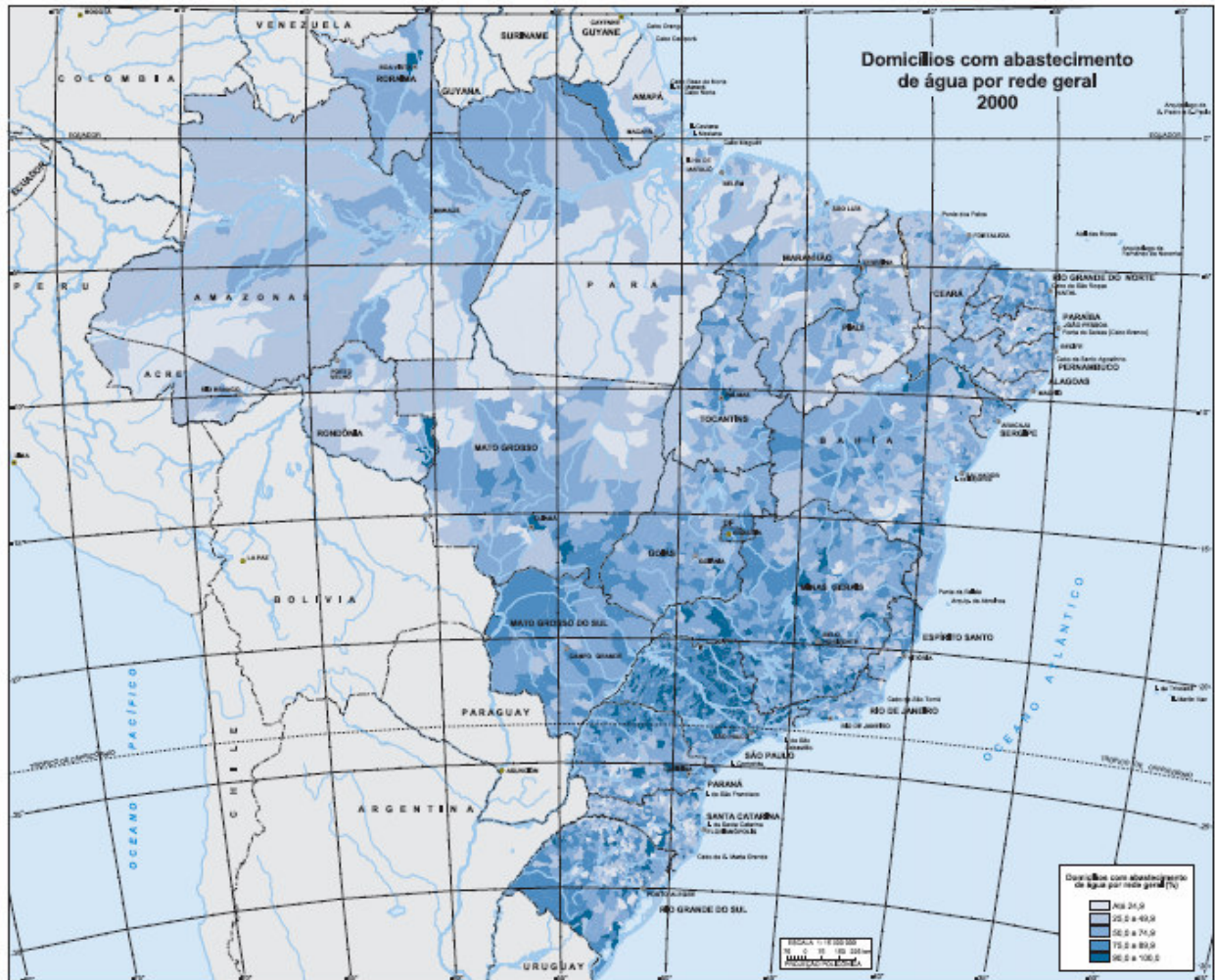
Figure 1. Water supply system coverage. Brazil; total population, urban population, and rural population. 1991-2003.

In this most recent period urban population coverage rose about 4.5 percentage points (from 87 to 91.4%) and, even more significantly, from 9.3 to 25% for the rural population—an increase of more than 16.4 percentage points.

Such behavior shows the difficulty of making further advances in universalizing urban coverage; the population still not provided with service is found predominantly in peripheral and informally urbanized areas. This makes it necessary to adopt specific programs that are integrated within urban development programs. Still, for all that service to the rural population has advanced, coverage is still only in its beginnings. Indeed, the same data reveals the existence of 12,000,000 Brazilians in cities and 22,000,000 in rural areas still unserved, in addition to the demand imposed by surging population growth.

In 2000, the distribution of indices for coverage by collective water supply systems according to municipality was as shown in Figure 2. There is a higher concentration of municipalities with less satisfactory coverage in the North and Northeastern regions of the country—precisely the least socio-economically developed regions.

Households with water supply via public network, 2000



Source: IBGE (2004).

Figure 2. Water supply systems' household coverage, according to municipality. Brazil, 2000.

One important facet of coverage data that is not directly revealed by the IBGE findings is the form in which the supply occurred—whether with regularity, whether the population is offered suitable tariff access, and whether potability standards are being met, among other variables. It is suspected that service does not always fulfill requirements for what is considered adequate; this suspicion is reinforced when one notes the inconsistent financing of services and the operational constraints many have.

Regarding the quality of water provision, Table 2 shows that security is not always guaranteed, given the acknowledged incidence of pollution in water sources and the existence of treatment processes that frequently are inadequate.

As with all tables of variables related to sanitation, differences can be observed; those of a regional nature are quite distinct in this table.

Table 2. Features of the water supply system by macro-region. Percentage of districts according to each feature.

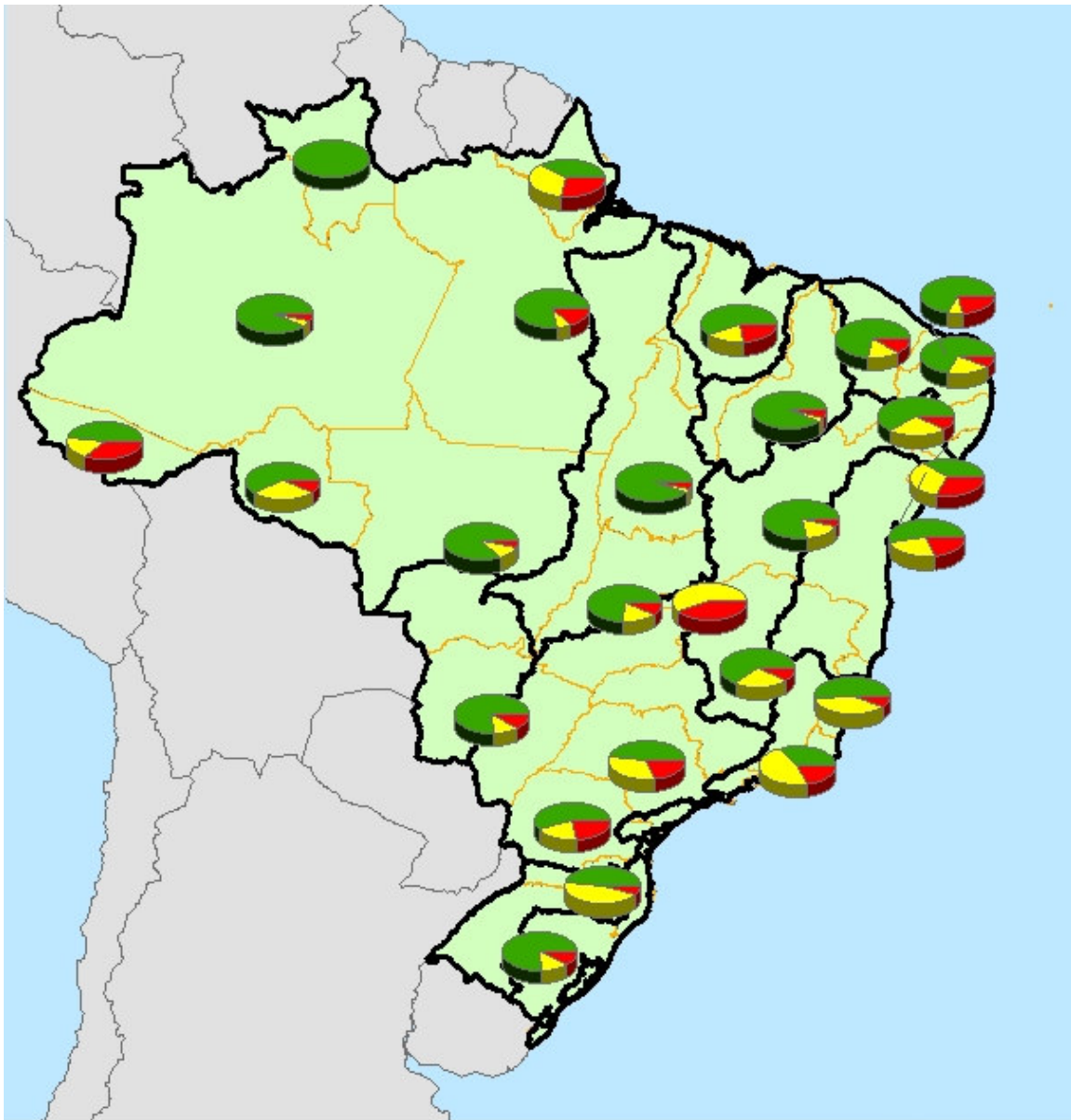
Macro-region/ Country	No general system	With surface water catchment	Claiming contamination, among those with surface water catchment	With conventional* water treatment, among those with surface water catchment, claiming contamination
North	15,7	31,6	17,3	41,7
Northeast	17,3	46,3	15,6	45,7
Southeast	3,4	63,7	42,7	81,2
South	16,0	34,9	37,6	87,0
Central- West	11,6	46,9	27,9	97,5
Brazil	12,1	48,9	32,3	77,5

*Believed to be the most appropriate method of treatment for this type of water source.

Source: IBG (2000b)

Source: IBGE (2000b)

Figure 3 represents a kind of map of health risks stemming from supplied water. It associates information on the water source, its pollution level and the type of treatment in use. When such a cross-reference is made it becomes evident that the most critical situations are distributed across different regions of the country, with no clear concentration. Certainly, these most critical situations can be explained by the significant presence of sources of pollution in water sources, as well as water treatment processes inappropriate for the type of intercepted water.



Legenda

- Regiões Hidrográficas
- Divisão Estadual
- Classes de Risco à Saúde
 - Nível 1
 - Nível 2
 - Nível 3

Nível 1
 Captação em mananciais superficiais, não poluídos, com tratamento convencional ou não convencional.

Nível 2
 Captação em mananciais superficiais ou adutoras, não poluídos, com tratamento de ampla desinfecção ou floculação, ou sem tratamento.

Nível 3
 Captação em mananciais superficiais, adutoras ou subterrâneas poluídas, com tratamento por ampla desinfecção ou floculação ou sem tratamento.

Nível 2
 Captação em mananciais superficiais ou adutoras, poluídos com tratamento convencional ou não convencional.

Nível 3
 Captação em mananciais subterrâneos, não poluídos com tratamento por floculação ou sem tratamento.

Nível 3
 Captação em mananciais subterrâneos, poluídos com tratamento convencional ou não convencional.

Nível 3
 Captação em mananciais superficiais, adutoras ou subterrâneas poluídas, com tratamento por ampla desinfecção ou floculação ou sem tratamento.

Fonte: Caderno Setorial do Setor de Saneamento e Recursos Hídricos (SEH/SMMA, 2005)
 Pesquisa Nacional de Saneamento Básico 2000 (IBGE, 2002)

Secretaria de Recursos Hídricos Ministério do Meio Ambiente
 Brasília, 2006

Agência Nacional de Águas
 Sistema de Informações do PNRH

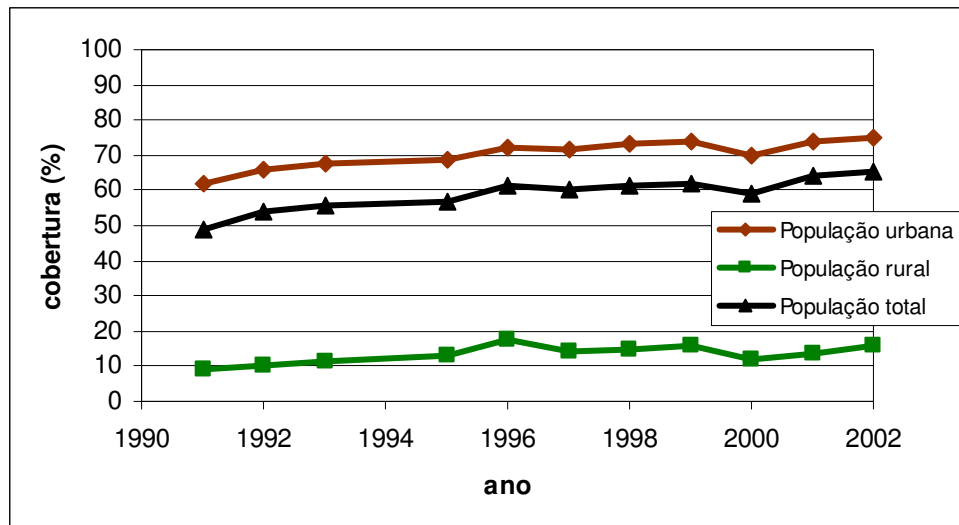
KEY: Hydrographic Regions
 State lines
 Classes of Health Risk Level 1

Figure 3. Distribution of three levels of health risk due to quality of water distributed, according to states and hydrographic basins. Brazil, 2000.

In terms of water quality for human consumption, the impact of Ordinance 518/2004 ought to be assessed. It was originally published in December 2000 as Ordinance 1469, which established procedures and responsibilities for monitoring and supervision of the quality of water for human consumption, and defines the standard for potability. It is a conceptually advanced piece of legislation, given its systematic vision of guarantees that water is provided safely and of the protection of human health, [and] due to its innovativeness in terms of international trends. Such legislation, more because of its conceptual framework than its actual requirements, should impose healthy changes in practices in the agencies. It will require time, effort, and determination on the part of administrative entities, given the stubborn points of view which prevail in the sector.

The same kind of impact is expected of decree-law 5.440/2005, which establishes mechanisms and legal instruments for providing information to consumers on the quality of water for human consumption, which may bring about significant changes in process and in respect for the consumer on the part of agencies.

As for sanitation, a growing, discrete trend is visible in the expansion of coverage by collection system over the period 1991-2002, according to Figure 4.



Translation: See Figure 1

Sources: IBGE/National Household Sample Survey [Pesquisa Nacional por Amostra de Domicílios] - PNAD (1992-1993, 1995-1999, 2001-2002), IBGE/Demographic Census, 2000.

Figure 4. Coverage by wastewater collection system. Brazil, total population, urban population, and rural population. 1991-2002.

Over this period coverage by collection system increased 13 percentage points (from 62 to 75%) and rural population, while showing an increase in coverage, remained at just 16% of households with service; although there is room for debate over the most appropriate technological solution for dispersed populations.

As in the case of water supply, the coverage indicator contains only partial data because information on the destination of effluents is not furnished.

Here it is important to consider the indicator's ambiguity, since the mere existence of coverage by wastewater collection does not necessarily lead to real improvement in health and environmental conditions. In localities which are not provided with interceptors and wastewater treatment, the collection system may even aggravate human health problems—as was the case with the solution which formerly prevailed where, invariably, effluents infiltrated the subsoil via different types of septic tanks, if they were working under average conditions. In this case the system ultimately concentrated wastewater in water bodies in the urban environment, exposing populations and increasing the circulation of pathogenic organisms in the environment. The simple presence of interceptors and treatment stations, given the frequently reduced efficiency of the latter in removing pathogenic organisms, does not guarantee protection of human health and water quality in water bodies they have entered.

On the issue of the nature of the service, the PNSE (IBGE, 2006) relates that 4.097 (42%) of 9.848 districts possess a collection system, but only 1.383 of them have treatment stations (14% of the total). Overall, only 118 perform wastewater disinfection. Of the total volume of wastewater collected, only 35% is given any kind of treatment. This results in around 9, 400,000 m³ of raw wastewater discharged daily into water bodies across the country, only counting that which is collected by systems.

Also worthy of note are data stating that 3,288 districts with systems (80%) do not possess any interceptor extension, which could possibly cause deterioration in the quality of water in receptacles located in urban pockets.

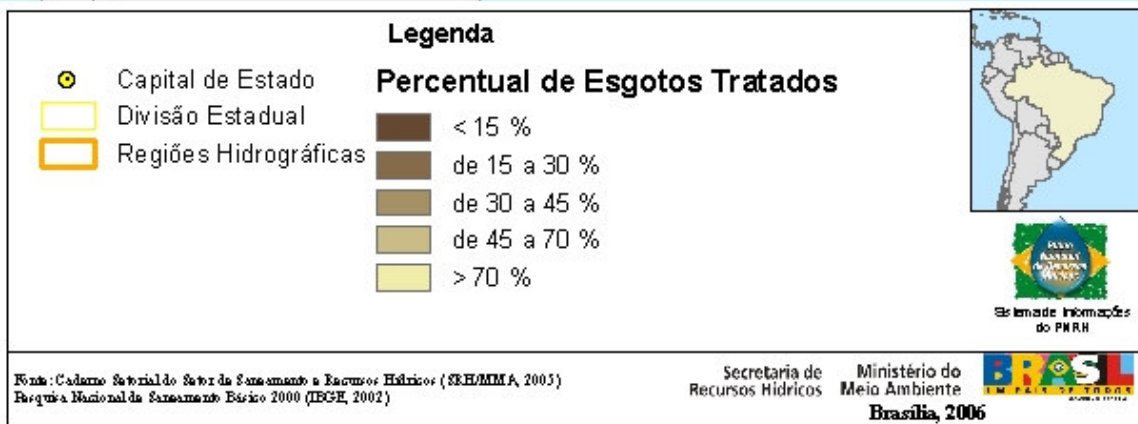
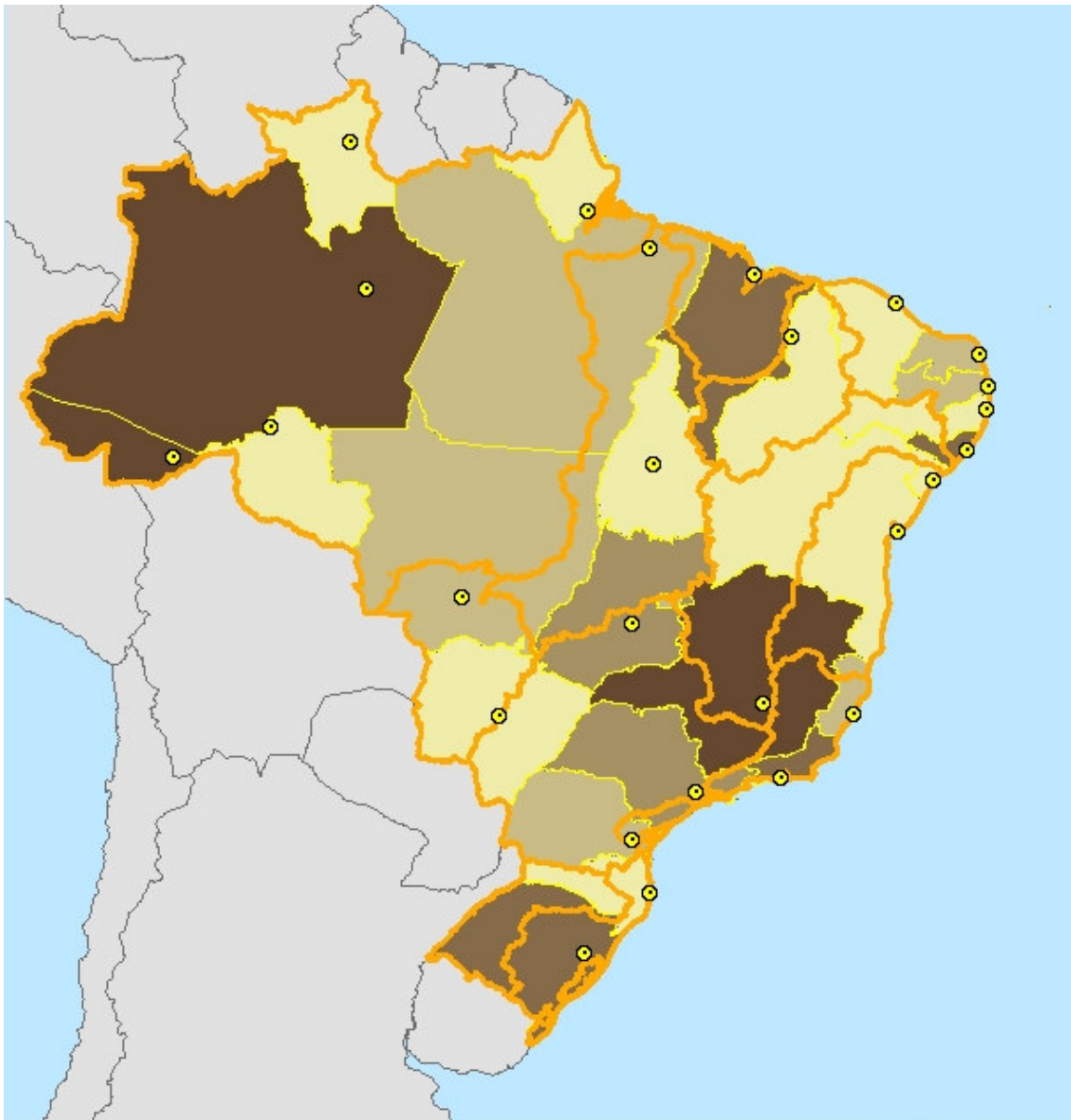
Figure 5 represents coverage by sanitation collection, according to municipalities and national hydrographic basins, which highlights the tendency of the best indices of service to be concentrated in the country's most developed regions.



Source: IBGE (2004)

Figure 5. Coverage by wastewater systems, according to cities (Brazil, 2000)

In contrast, Figure 6 shows the proportion of districts with wastewater treatment in each state. Even with the knowledge that in most districts which claim to have wastewater treatment, it is [only] partially efficient and has a level of population coverage that also is partial, these figures point negatively to the fact that Southern and Southwestern states—the most developed region in the country, are among those with the worst indices. The indices point positively to the performance of the Northeast, North, and Central West regions.



Translation: **Percentage of Districts with Wastewater Treatment**

State Capitol

State line

Table 3. Urban Brazil, 2000. Water supply system coverage and sanitation system coverage, according to administrative model and macro-region, (% of households).

Variáveis de nível 2 / Modelos de gestão	Abastecimento de água					
	Municipal 1*	Municipal 2*	Estadual	Federal	Particular	Total
Macrorregião						
Norte	22,09	6,18	41,09	0,24	30,40	100,00
Nordeste	13,01	6,74	75,09	0,29	4,88	100,00
Sudeste	27,97	11,28	56,60	0,00	4,14	100,00
Sul	13,75	6,30	66,29	0,09	13,57	100,00
Centro Oeste	13,67	4,56	74,49	3,87	3,42	100,00
Porte do município						
Até 5 mil	26,86	3,02	60,90	0,16	9,06	100,00
5-20 mil	12,34	8,73	71,14	0,89	6,90	100,00
20-50 mil	9,51	17,48	63,11	0,19	9,71	100,00
50-200 mil	6,75	22,19	60,13	0,64	10,29	100,00
mais de 200 mil	8,00	19,00	67,00	0,00	6,00	100,00
IDH municipal						
Baixo	40,00	0,00	46,67	0,00	13,33	100,00
Médio	18,19	6,75	66,67	0,50	7,90	100,00
Alto	21,04	17,04	49,74	0,00	12,17	100,00
Variáveis de nível 2 / Modelos de gestão	Esgotamento Sanitário					
	Municipal 1*	Municipal 2*	Estadual	Federal	Particular	Total
Macrorregião						
Norte	37,93	6,90	34,48	0,00	20,69	100,00
Nordeste	83,16	3,85	11,54	0,00	1,46	100,00
Sudeste	57,92	11,25	28,89	0,00	1,94	100,00
Sul	55,65	5,54	38,58	0,00	0,22	100,00
Centro Oeste	33,75	10,00	53,75	0,00	2,50	100,00
Porte do município						
Até 5 mil	78,75	2,31	18,37	0,00	0,58	100,00
5-20 mil	69,66	6,32	22,09	0,00	1,92	100,00
20-50 mil	42,16	17,30	38,11	0,00	2,43	100,00
50-200 mil	25,48	23,95	46,77	0,00	3,80	100,00
mais de 200 mil	10,31	18,56	67,01	0,00	4,12	100,00
IDH municipal						
Baixo	100,00	0,00	0,00	0,00	0,00	100,00
Médio	66,12	6,26	25,86	0,00	1,76	100,00
Alto	46,75	20,48	31,08	0,00	1,69	100,00

Translation Key:

Water Supply

Level 2 Variables

Administrative Models: Municipal 1 Municipal 2 State Federal Private Total

Macro-region

Size of Municipality

Up to 5,000

5-20,000
20-50,000
50-200,000
more than 200,000
Municipal HDI
Low
Medium
High

Sanitation

Water Supply
Level 2 Variables:
Administrative Models: Municipal 1 Municipal 2 State Federal Private Total
Macro-region
Size of Municipality
Up to 5,000
5-20,000
20-50,000
50-200,000
Municipal HDI
Low
Medium
High

Municipal 1 = Direct administration + participation of public authorities
Municipal 2 = Local government

Source: Rezende (2005), based on IBGE (2000a) and IBGE (2000b)

The table indicates that the model PLANASA envisioned—that of administration through state companies—has not achieved universal coverage for all strata of municipalities, almost three decades after the plan's implementation. In fact, it is obvious that the model:

- Privileged water supply to the detriment of sanitation (for reasons of economic-financial viability);
- Was unsuccessful in expanding as intended into the municipalities of the least developed regions (perhaps because in these regions a greater proportion of municipalities exercised their rights of autonomy and did not offer concession contracts);
- Nor was water supply extended further (via state companies] into municipalities with the highest HDI, due to the fact that these were stronger politically, and their agencies more financially profitable because they were kept under municipal management;
- Less priority in sanitation was given municipalities with under 20,000 residents, clearly for reasons of economic-financial viability.

Evidence of this kind points to the hypothesis that the state model, probably because of the entrepreneurial character of its design, helped to enlarge asymmetries.

When percentages of coverage are disaggregated according to administrative and features of the municipality (Table 3) it appears that the state model is equivalent to the municipal model in terms of effectiveness of service—particularly the performance of local municipalities in water supply. Apart from that, the table shows that, actually, the municipalities that received more attention are the most developed (higher HDI) and have the largest population, both in water supply and sanitation.

Variáveis de Nível 2	abastecimento de água	esgotamento sanitário
Modelos de gestão		
Municipal 1	90,70	40,54
Municipal 2	94,03	50,35
Estadual	90,18	52,24
Federal	82,72	17,67
Particular	83,34	17,89
IDH municipal		
IDH baixo - < 0.500	63,89	2,23
IDH médio - 0.500 - 0.799	85,69	43,98
IDH alto - > 0.799	95,11	74,05
Porte do município		
Até 5 mil	85,15	31,79
de 5 a 20 mil	85,85	41,16
de 20 a 50 mil	87,32	49,64
de 50 a 200 mil	89,50	56,36
acima de 200 mil	92,80	69,47

Translation; See Table 3

Table 4. Urban Brazil, 2000. Water supply system and sanitation system coverage, according to administrative model, municipal HDI, and size of municipality.

Municipal 1 = Direct administration + Participation of public authorities

Municipal 2 = Local government

Source: Rezende (2005), based on IBGE (2000a) and IBGE (2000b)

3.2. Limitations on data provided by indicators

On this point a critical discussion is taking place as to the quality of data these indicators provide. The debate has been conducted in published works in the literature of the field, but it calls for more analysis. To illustrate: one salient fact is that, depending on the criteria being adopted to define what suitable service on the part of agencies would be, a population deficit of either 171 million residents (8%) can result for the urban population in 2000 in Africa, Asia and Latin America and the Caribbean --when a more tolerant concept is used--or 690 to 970 million (28-46%) when a more demanding definition is employed for access to water supply. The same comparison, when applied to sanitation, yields figures of 394 million (19%) as against 850 to 1.130 million (42-56%) (4).

On the other hand, when assessing coverage statistics officially released by the WHO and UNICEF (2000) for countries in Asia and Africa, Satterthwaite (2003) questions, for example, why official data indicate that only 4% of Kenya's urban population were without sanitation services in 2000, given that about half the population in the capital city Nairobi live in informal housing. In these areas conditions can be so daunting that 150 in every 1000 children die before reaching the age of five; a small proportion of domiciles have their own toilet, and it is common for as much as 200 people to share the same pit latrine. The author also questions the figure that there is 98% sanitation coverage in Tanzania, since local surveys have been showing that a high proportion of the urban population use inferior-quality pit latrines, very often shared, which frequently overflow due to flooding. As for water supply in India, while statistics show 92% coverage of the urban population by "improved" services, studies have shown that inadequacies in this provision affect 30% to 60% of the population.

Both the debate on quality and the omissions that occur in indicators from official sources, as well as that concerning the importance to health of the various dimensions in which services are provided, were the subjects of a field study done in the city of Betim, in Minas Gerais (Brazil), with 160,000 residents (Heller, 1990). The research, consisting of a case-control type epidemiological study which investigated morbidity from diarrhea in children up to the age of five, raised several questions in the context of the discussion about access, as summarized below:

[Translator's Note: colored text below, with footnotes, is extracted by the author from the English-language text of the study]

a) What proportion of the population is actually connected to the public water supply network?

In the research, the proportion of the population connected to the public water supply network was actually found to be higher than that officially registered. Table 5 shows coverage according to three different sources.

Table 5. Betim: public water supply coverage according to three different sources

Source	Water supply coverage (% of residential properties)	
	Connected to the network	Unconnected to the network
COPASA-MG (state concessionaire) ^(a)	91.6	8.4
Demographic census ^(b) (n=36,238)	80.1	19.9
Epidemiological survey ^(c) (n=1,000)	98.4	1.6

a. Extracted from COPASA-MG - Companhia de Saneamento de Minas Gerais (1993), *Informações e Indicadores Globais e Informações e Indicadores Gerenciais*. Data refer to December, 1993.

b. Extracted from FIBGE - Fundação Instituto Brasileiro de Geografia e Estatística (1991), *Censo Demográfico*, Rio de Janeiro. Values estimated from the ratio between the total number of residential domiciles connected and the number of urban residential domiciles (94.6 per cent of all domiciles).

c. Heller, Léo (1995), *Associação entre Cenários de Saneamento e Diarréia em Betim-MG: O Emprego do Delineamento Epidemiológico Caso-controle na Definição de Prioridades de Intervenção*, PhD thesis in epidemiology, Federal University of Minas Gerais, Belo Horizonte, Brazil. Values estimated from household survey of dwellings with children under the age of five, randomly selected in the urban area.

This difference, with greater coverage indicated by the epidemiological research which is based on household sample, is due to the high incidence of clandestine connections which are neither accounted for in the official statistics of the concessionaire nor in the demographic census. The smaller coverage observed in the census can probably be explained by the fact that the survey was undertaken two years before the other surveys.

(b) To what risk is the unconnected population to water supply exposed?

In the study, the 1.6 per cent of the population which is supposedly unconnected to the water distribution network, and which is basically supplied by shallow wells, showed no statistically significant relative risk of diarrhoea. There are two possible explanations: the insufficient sample size which prevents the identification of any statistically significant associations, and the absence of risk to this population which would compensate for a deficient water supply through adequate hygiene practice.^a

^a Na literatura epidemiológica observa-se tanto ausência de associação entre abastecimento de água e diarréia (Ryder et al. 1985) ou com mortalidade até cinco anos (Lindskog et al., 1988), quanto a presença dessa relação com enteric infections (Chambers et al., 1989; Georges-Courbot et al., 1990), giardiasis (Chute et al. 1987. In Brazil, one study (Gross et al., 1989) identified the impact of the construction of a water distribution network on the incidence of diarrhoea, Victora et al. (1988) showed the significant health risk of infant mortality from diarrhoea in families without piped water, Azevedo et al. (2005) mostraram uma possível redução na ocorrência de diarréia e de desnutrição crônica, sendo que estudo em crianças residindo em áreas de invasão urbana revelou que o uso de água do sistema público implica menos casos de parasitoses de transmissão feco-oral (Teixeira e Heller, 2006) e menos casos de diarréia (Teixeira e Heller, 2005). Thus, the results of the epidemiological studies developed for several socio-economic and water supply conditions do not allow a definitive statement about the health risk of the population not supplied by public systems, regardless of the specific reality.

(c) Can it be assumed that the population connected to the distribution network has a safe water supply?

To answer this question, the following aspects were analyzed: the quality of the water; the existence of an intermittent supply, with the consequent risk of water contamination; the per capita water consumption.

Any violation of the drinking water standards imposes both biological and chemical health risks to consumers. Moreover, it is important to recognize the distribution network's own dynamics which may cause a deterioration in the water quality through biofilm formation (an organic or inorganic surface deposit inside pipe walls which can cause the growth of pathogenic micro-organisms) or the introduction of contaminants. The latter can take place as a result of intermittent supply or factors which cause low water pressure in the mains.

In Betim, intermittent supply was reported by 44 per cent of the residents interviewed, yet a significant risk of diarrhoea was not identified. It is possible that, because of the general Brazilian practice of domestic water storage, people's perception of intermittence is biased due to their domestic water tank's capacity to absorb variations in flow. Intermittence may be identified by physical and continuous pressure measurements in the distribution system and, only with this information, is an epidemiological risk analysis feasible^b.

The other health risk factor generally related to water supply is level of water consumption. In Betim, a possible risk of diarrhoea in children living in houses with low per capita water consumption (less than 125 litres/person/day in the lower socioeconomic stratum and less than 75 litres/person/day in the higher socio-economic stratum) was identified. The average consumption in the city was 145 litres/person/day. More in-depth research on the link between water consumption and health in urban zones with high per capita consumption is still necessary. A large number of epidemiological studies have indicated the greater importance to health of water quantity over water quality. However, these studies were developed under conditions where per capita consumption was in the order of 10-40 litres/person/day, much lower than that of urban areas with in-house connections.

(d) To what extent does intra-domestic water-handling influence health risk?

The following points were analyzed: the role of the domestic water tank; provision for indoor plumbing; hygiene practices.

The research carried out in Betim examined the effects of having a domestic water tank. Households lacking such a tank (and presumably storing water in household vessels)

^b Burns et al. (1993) concluded that, in Beira, Mozambique, the intermittent water supply led to the search for alternative ground water supply sources; frequently, these sources were contaminated and their use was associated with increases in the occurrence of diarrhoea and cholera.

were found to have an increased risk of diarrhoea. This result does not confirm the hypothesis that the existence of a domestic water tank implies a health risk due to inadequate maintenance. However, the study highlights the fact that the lack of a roof tank indicates the presence of only basic indoor plumbing, usually only a water point on the plot, causing a risk of infectious and parasitic diseases.

The importance of hygienic practices was demonstrated in the Betim research. Four practices were investigated: washing and disinfection of fruit and vegetables; care of drinking water; handwashing before eating; and hand-washing after defecation. After statistical analysis, only the first practice showed a statistically significant epidemiological risk, the greatest risk found among all the environmental exposures investigated, pinpointing the role of hygienic practices in the control of infectious and parasitic diseases. The risks to health from eating fruit and vegetables that have not been washed suggest the use of irrigation water contaminated with sewage, a common practice in the metropolitan region of Belo Horizonte. The fact that the three other practices were not significant in the statistical analysis possibly means that food hygiene is a surrogate for general household hygiene.

(e) How should waste water collection be factored into health protection?

Generally, the statistics relate the existence of a connection to a sewerage system to a definition of adequate provision for waste water disposal. The assumption behind this is that residents of houses connected to sewers are protected and those of unconnected houses are exposed to health problems due to the presence of excreta and grey water (waste water from general household use) in the environment. Two questions arise: (1) in a locality with only a partial sewerage system, is the connected population really protected against excreta and grey water presence in the environment? (2) do the solutions adopted by the unconnected population expose them to a risk of contamination?

The results obtained from the research in Betim illustrate this discussion. Two variables relating to waste water collection were analyzed, namely, the kind of solution adopted and the free-flowing presence of waste water in the streets. After a statistical analysis, the variable relating to solutions for waste water disposal showed no statistical significance whilst the variable relating to the presence of free waste water flowing in the streets showed a significant risk. From this result, one can conclude that the determinant factor linking health protection and waste water disposal is the absence of free-flowing waste water in the environment. House connection to the sewerage system is less relevant than the overall quality of the solutions adopted in each drainage sub-basin, and the upstream solutions determine the risks to downstream dwellings.

In practice, the study suggests that if waste water disposal is approached from a public health point of view, then the unit of intervention must be the drainage sub-basin. With this approach, all the waste water in each sub-basin needs to be disposed of, with connections to adequate sewer systems or with adequate on-site solutions in order to avoid overflows into the streets.

(f) What is the role of interception and treatment of waste water?

It is not only local disposal of waste water but also interception and treatment which determine health risk for the population, although these are rarely referred to. Obviously, the risk affects specific populations, revealing again the perversity of exposure to waste water: inadequate solutions do not necessarily imply risk to the owners of the solutions, but to the population downstream.

In the case of lack of interception, those who live on the banks of the stream are specifically affected; and the absence of treatment exposes not only the population beside the water to risk but also all the urban population which is supplied with vegetables irrigated with contaminated water. Statistics on levels of interception need to be better improved in Brazil. Research into coverage by treatment utilities has been purely quantitative, with a generic classification of treatment processes and no evaluation of levels of pathogen removal nor any in-depth analysis of the health risk to downstream populations.

Thus it may be said, at least on the basis of these references, that where indicators are used to describe a given situation of access to services, they should be constrained by methodological safeguards, and care should be taken to suitably qualify the information. Such caution is important when the same reality is temporally compared using surveys based on different methodologies (see, for example, the difference in results between the census survey and the sample survey findings and in figures 1 and 4), and becomes even more so when different realities are compared, particularly nations. In the latter case, apart from possible methodological differences that occur in surveys, the socio-cultural construction of the concept of access itself which prevails in the population, or how access is institutionally conceptualized by agents responsible for the information, may interfere.

4. Successful models and innovative experiments

As this text points out, while water supply and sanitation experiments in Brazil might have been promoted more effectively than has in fact occurred, it is important to recognize that in terms of the population's access to services that protect human health and the environment, various localities have indeed found the capacity to excel in the quality of service they provide. The quality of service might vary in its characteristics, as in cases where agencies were able to achieve universal access, or where agencies, though they did not achieve this, did develop innovative public policies which worked in that direction, or where appropriate technological solutions with the potential to bring about greater social inclusion were found. The present section seeks to highlight four groups of experiments of this kind.

a) Municipal cooperatives

Municipal cooperatives in rural zones for water supply and sanitation was a model introduced in Brazil during the 1990's. It has been recognized as a successful form of organization of a group of municipalities for this purpose. The central idea of the model is that, given the difficulty a single rural locality alone faces in ensuring adequate delivery of service, particularly in light of its small scale, it should be possible for rural localities to group together based on geographical links, and to organize a supra-municipal authority with the technical and administrative capacity to provide the support they need. It is a form of self-organization of services, with little state and federal government participation. Movements across the country are coalescing in favor of expanding the experiment, and doing so for urban nuclei as well.

o CENTRAL, Bahia

One of these experiments was carried out in the state of Bahia via CENTRAL – the Community Association Forum for Water Supply Systems Maintenance [Central de Associações Comunitárias para a Manutenção de Sistemas de Abastecimento de Água]—created by agreement between the Bahia state government and the German bank Kreditanstalt für Wiederaufbau (KfW). It is a non-profit association open to the participation of community associations that monitor the operations of water supply systems. Its objectives are: I) financially ensure the systems' functional operations, via collection on the basis of tariffs for metered connections; II) promote ways of improving the affiliated community associations' operations in terms the systems' management; III) represent the associations and advocate for their interests before public and private entities. The affiliated community associations are responsible for operating the systems; CENTRAL is responsible for the systems' maintenance and for providing management, technical, and administrative support. There were 37 associations in 1999 (Prince, 1999a)

CENTRAL is administered by the following authorities: a general meeting, an executive board, a managing committee, and a finance committee. The executive board meets every three months and is composed of four representatives of the community associations, two representatives of the mayor's office, one representative of the CERB-Bahia State Rural Engineering Company [Companhia Estadual de Engenharia Rural da Bahia] and one representative of the German consulting corporation supporting the cooperative. All the members of the executive board and finance committee are elected at the general meeting from among the community associations' representatives. As of 1999 the cooperative was composed of five staff members in a well-rationalized structure (Prince, 1999a).

In an assessment of community participation during the introduction of four water supply systems (3), Prince (1999a) says that: when the project was being designed community involvement was principally in terms of communication, since there was only one technological solution to consider due to regional limitations on water use; that there was practically no participation during the system's installation, since construction was out-sourced to construction companies; that in terms of the system's administration and operations the community acted through the respective community association; and that the community participated via its association in matters of administration and the setting of tariffs. Overall, there was significant community involvement in sanitation education programs.

- **SISAR, Ceará**

Another institution which has received much national (9) and international (10) recognition is SISAR- Ceara State Coordinated Rural Sanitation System – [Sistema Integrado de Saneamento Rural, no Estado do Ceará], created in 1996 and heavily inspired by the experiment in Bahia, although SISAR included sanitation services as well. It has an independent legal status similar to that of CENTRAL's, and the following objectives: (I) to administer, maintain, and coordinate operations for all its associates' supplies of treated water, and sanitation systems (II) set, and secure payment for, realistic tariffs consistent with fundamentals of self-management, (III) represent the affiliated associations, and (IV) promote sanitation education, along with greater involvement in associations. Contracts with each system's operator are executed by the respective users' associations; in some cases the operator is employed by the mayor's office. In 1999 there were 32 associations affiliated with SISAR. Terms of adherence to SISAR's technical standards apply to any agency seeking membership in the organization (all building connections must possess a hydrometer; there must be a macro-meter in the water production unit and appropriate electrical facilities, and facilities must be free of problems in their physical construction), and agencies must have a suitably functioning users' association. (Prince, 1999b).

SISAR's supervisory bodies consist of a general meeting, a board of directors, a financial committee, and an auditing and managing executive committee. The general meeting consists of one representative of each affiliated association, and is responsible for selecting the board of directors and finance committee from among its members. The managing executive committee is charged with taking necessary measures to ensure the organization's functional operations, and is composed of a manager and professionals in the fields of maintenance, business, and education (Prince, 1999b).

Sarmento (2001) made a comparative assessment of six experiments in low-cost sanitation in poor communities. Four of them, including SISAR, were projects to introduce a condominium sanitation system (11). The three other experiments with condominium systems were conducted using different management models. In his conclusions, he testifies to the SISAR organizational model's contributions to the

success of technologies that called for active community participation and involvement. Strengthening a community by means of a users' association is considered a differentiating factor among the experiments. Of six experiments, SISAR was the only one that achieved service delivery to 100% of the population; second in how few users stated there were problems in system operations; first in user satisfaction with the service; and the only one to have a continuing program for community involvement and sanitation education in its administrative structure.

In its description of innovative experiments in urban services, IBAM (2006) called SISAR an "alternative to the privatization of sanitation services, providing a management model within the public sphere, and reaping the benefits of government/community partnerships.

- **Public consortium, Piauí**

This involves plans for organizing the urban areas of Piauí, currently operated by the state company—AGESPISA, into a public consortium, a model similar to that of cooperatives. The planning was carried out by the National Department of Environmental Sanitation [Secretaria Nacional de Saneamento Ambiental-SNSA], part of the Ministry of Cities, and the data used here was extracted from studies prepared by that department (PMSS, 2005).

Previous studies by SNSA itself have pointed out the "need for drastic changes in the company (AGESPISA) in order to attempt a restructuring sufficient to increase its technical and financial viability", given its low organizational quality. While formally responsible for water supply and sanitation throughout state territory, AGESPISA supplies water in only 161 municipal centers out of the current 222 (72.5% of the total). It delivers sanitation services only to the capital, Teresina, with systems covering only about 12% of the population, in addition to a few isolated residential complexes in the state's interior. Among the municipal centers where it does supply water there is a clear opting for those of larger scale; nearly all of those with an urban population above 5,000 residents are served. Of cities with less than 5,000 residents 35.1% are not served by the state company.

Based on this situation, SNSA's studies for reformulating the state's administrative model proposed a physical and population-based re-division of the municipalities, in which AGESPISA would retain responsibility for service delivery in the capital and in 35 municipal centers in the state's interior (1,358,000 users, or 75% of the state's urban population), geographically concentrated in an area running from the extreme North to the Southern-Central areas. In the remaining 187 smaller-scale centers, which together correspond to 465,015 users, the model would combine municipal intervention with administration by four yet-to-be organized regional cooperatives. The cooperatives are formally designated as "a

public consortium with state and municipal participation” and will be legally based on the Law for Consortiums (no. 11.107, of 06/04/2005), which regulates the joint administration of services via cooperation among federated entities. This law guarantees administrative and financial autonomy to such an organization formed under public law, along with the opportunity to assume functions characteristic of public authorities.

The studies reason that, among the institutional models that are applicable, those which rely on “entities solely of state nature, that is, under the exclusive aegis of the state government [...]. would not, generally speaking, be suitable in the present case of Piau , given the risks of their being tainted with the stigma of politics and the associated inefficient delivery of services—which could mean a mere repetition—now four-fold—of the AGESPISA model”. The study further proposes that the new operators “have their authority more ‘diluted’ between the states and municipalities, arrived at via consensus among a significant number of city administrations and the state government, which would allow for management that is more professional and democratic”. (original quotes).

The model posits, on the one hand, a division of duties between the consortia and member municipalities and, on the other hand, the use of a compound tariff prorated between the two management levels.

For water supply, investments would initially be made in each system for adjustments made to each system of distribution, the installation of water treatment facilities, the automation of electric facilities, and macro- and micro-metering of water. The municipality would then take over activities of a local nature, hiring and allocating the necessary personnel, to be trained by the consortium. These activities would include, among other tasks, daily operations, monitoring the more basic water quality parameters, collecting water samples and sending them along for analysis, reading hydrometers, and delivering bills, among other duties.

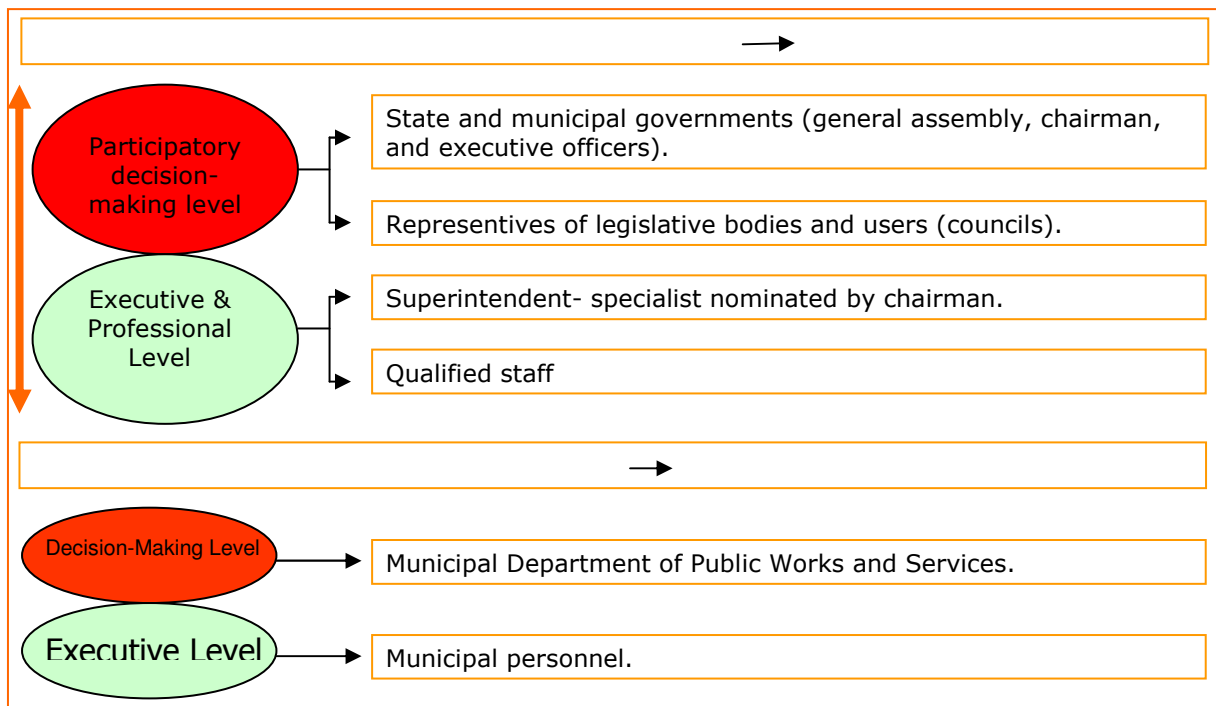
In turn the consortium would be responsible for activities of greater complexity, or those which offer economies of scale. These would include larger-scale preventive and corrective maintenance measures, monitoring water quality, monitoring non-compliance, planning and preparing studies and projects, licensing and concessions, supervising acquisitions and larger-scale construction projects, supplying chemical products, billing, monitoring tariff collection, and inter-institution coordination among state and federal entities

From a financial perspective, the model focuses on coping with the state company’s accumulated setbacks, and the fact that the small municipalities in question are those traditionally considered by state companies to be precisely those which are unprofitable, and whose profitability can only be guaranteed by the mechanism of cross-subsidies, through which they can benefit from the larger systems’ surpluses.

SNSA documents suggest that, in response, the model seeks to reverse AGESPISA's two main defects, "high salaries, [...] in company headquarters and also for local staff, even the small municipalities", and "the company's centralized operations, in which all support activities—corrective maintenance, water quality, and marketing and sales, among others—are executed out of Teresina, with large expenses for displacement". Given these factors, the new model begins with "personnel costs closer to the reality of the state interior", and envisions "the headquarters of the new operators, now four in number, [as] having more satisfactory logistical arrangements".

In organizational terms the consortia would have an executive team consisting of an executive director, a technical consulting staff for sanitation, two managers (financial-administrative and sales-operations) and an executive secretary. On the operational level there would be three teams: for administrative support, maintenance and quality control, and sales and marketing. On the municipal level there would be local teams of varying nature and size, depending on two factors: the system's size, and whether there needs to be more a complex facility for water treatment.

In general, the executive and operational authorities envisioned by the consortium in the southern region would be configured as represented in Fig. 8.



Source: PMSS (2005)

Figure 8 – Diagram representing operational and executive levels of the consortium for the region of South-Piauí and local sanitation agencies

Economic-financial studies prepared by SNSA conclude that average tariffs need to be such that, when applied to family consumption of 10m³/month, would result in monthly costs of between R\$ 8.10 and R\$ 10.20 (US\$ 3.70 and 4.60). The tariff structure currently employed by the state-company provider for the same monthly consumption is over R\$ 20.00 (US \$ 9.00). The studies only consider water supply, but they suggest that incorporating sanitation services would optimize structures and resources, making the model even more sustainable economically.

The model proposed for Piauí, while consistent with important premises such as that of strengthening local power and the decentralization and self-organization of service providers, apparently will soon be considered financially healthy as well, and employing a tariff policy that favors the principle of access to services even for the lowest-income populations. Indeed, the possibility of employing social (increasing-block, or subsidized) tariffs could even further increase the potential for universal participation in water supply and sanitation systems.

Several concluding observations may be made concerning the model of organizing through municipal cooperatives. Certainly this is a form of organization with significant potential for improving the delivery of services in small-scale communities which, by themselves, possess little technical-administrative capacity. The model truly employs—in the field of water supply and sanitation—the cooperative principle which has been successfully applied in various other sectors of society, and in different parts of the world. In Brazil the cooperatives have functioned for many years in sectors as diverse as the production and distribution of milk and the delivery of health services.

The recent announcement of specific legislation to form consortia for delivering services – Law no. 11.107 of 06/04/2005 – may serve as a legal basis and an incentive to muster support for the model. In any case, the three experiments described above do provide lessons which should serve to guide new experiments. Firstly, there is the importance of external financing, especially governmental, to allow for the organization's first steps and for introducing the units. Second is the importance of technical assistance in the areas of engineering, law, and administration in the first stages of organizing the cooperative, and also afterwards, until it achieves sustainability.

In sum, the model holds significant potential for scale-up in various regions of the country, whether in rural areas or uniting small, geographically-close urban nuclei—or even for organizations in charge of both urban and rural sanitation in a given region. But it would be mistaken to view this experiment simply as a model of social self-organization, over which the government has no responsibility. Here, as in various other aspects of water supply and sanitation, public

authorities have a central role to play in creating positive conditions for efficiency, effectiveness, and sustainability in the delivery of services.

b) Experiments in municipalities

As has been noted elsewhere in this document, beginning in the 1970's the model of municipal management of services found no support in the official policies of the federal government, which opted clearly for the state company model—a situation that has been changing only recently. The policy choice left nearly all municipalities, which had opted to continue managing their own services, without access to financing—a vital tool for coping with population growth and obsolete systems—or state or federal technical support for at least 20 years.

In spite of this, many municipalities managed to consolidate quality services, relying mainly on their own organizational and financial efforts.

In 2005, ASSEMAE – The National Association of Municipal Sanitation Agencies [Associação Nacional dos Serviços Municipais de Saneamento] produced a publication describing 20 successful municipal experiments (ASSEMAE, 2005). The experiments were selected through a process of consultation with specialists using the Delphi method; a questionnaire, answered in two stages, in which the principles adopted for characterizing an experiment as a success are laid out (12). Below is a brief description of some of the experiments included in the publication.

o Alagoinhas, Bahia (140,000 residents)

Alagoinhas, located in a disadvantaged region of the state of Bahia, north of its capital Salvador, has been able to overcome the obstacles its socio-geographic location presents, adopting a sanitation service that is participatory and committed to the population. In 2001 the municipality approved a law creating a municipal policy for environmental sanitation, believed to be Brazil's first of its kind. The law was formulated after a highly participatory process. Seventeen regional pre-conferences and four participatory thematic and analytical pre-conferences, in which 5,000 people participated, culminated in a municipal conference on environmental sanitation attended by 166 delegates, some of them elected in the previous stages and others appointed by the municipal government.

In a contractual arrangement with the Federal University of Bahia, the municipality developed a municipal plan for environmental sanitation to guide its actions. Thanks to these municipally-organized efforts there occurred a visible expansion in access to water supply—including the introduction of micro-metering—and sanitation services, and a significant reduction in infant

mortality—from 46 to 26 deaths prior to one year of age per thousand live births between 1999 and 2003. Advances such as these have received national recognition. One of the country's well-known magazines singled it out as “a revolution in the teeth of chaos”, given the adversity of local conditions.

- **Araraquara, São Paulo (200,000 residents)**

This city is noted for having achieved universal delivery of services. The entire urban population receives water that meets potability standards, with 100% micro-metering, and its wastewater is collected and treated. The investments that ensured this status have been drawn from its own resources, gathered from tariffs known to be modest and lower than cities of equivalent scale. Even so, the agency has been creative in its dealings with consumers unable to pay tariffs: it has created a social fund assembled from 1% of tariff receipts, which is used to redeem the debts of consumers who demonstrate their income is insufficient.

Appropriate administration, reinforcing the population's involvement in the process and organizing its initiatives with the help of master plans, is ensuring that services are sustainable. The excellence of this service delivery has been reaching international standards: water treatment and wastewater treatment have received ISO 9001 certification in recent years.

The local institution responsible, DAAE, scaled-up the scope of its activities starting in 2003, assuming complete administrative responsibility for urban solid waste, including health clinic waste. For this purpose, it has invested its own funds to introduce a recycling factory, for the creation of agency branch offices, for organizing the work of a recycling cooperative, for suitable operation of a sanitary landfill; and to acquire an incinerator for health clinic waste.

- **Ibiporã, Paraná (50,000 residents)**

SAMAE – the Ibipora Municipal Agency for Water and Sanitation [Serviço Municipal de Água e Esgotos de Ibiporã] has been a standout in the quality of its delivery of services, and is seen as a standard of comparison for other municipalities. It was the first municipal agency to win the National Award for Quality in Sanitation Services, presented by ABES – The Brazilian Association for Environmental and Sanitation Engineering [Associação Brasileira de Engenharia Sanitária e Ambiental], receiving ISO 9001 certification in 2003. It has achieved virtually universal service water supply and wastewater collection and treatment for the municipality's urban and rural population. In its rural areas work has been performed in unison with the state company in charge of technical assistance and rural extension. It has exceeded the number of water analyses required by Brazilian legislation for measuring potability, and includes additional complex analyses, such as those for agrotoxins and heavy metals.

The agency has a broad management and policy philosophy. It participated in the founding and establishment of the Intermunicipal Consortium for Municipal Sanitation Services in Northern Paraná [Consórcio Intermunicipal de Serviços Municipais de Saneamento do Norte do Paraná], inspired by federal legislation in 2005 for public consortia. Among its planned initiatives the consortium intends to: establish a common laboratory for water analysis, enter into agreements with engineering, legal, and surveying professionals in order to provide consortium members with technical assistance, and, most importantly, promote the exchange of ideas and experiences among the 11 associated municipalities.

- **Ituiutaba, Minas Gerais (90,000 residents)**

SAE –Ituiutaba's Office of the Superintendent of Water and Sanitation [Superintendência de Água e Esgotos de Ituiutaba] possesses excellent service delivery indices for water supply and wastewater collection for its urban area, treating about 70% of its collected wastewater in stabilization ponds. The excellence of its services have won recognition; it has won the National Award for Quality in Sanitation Service awarded by ABES –[Brazilian Association for Sanitation and Environmental Engineering], and ISO 9002 certification for its water treatment facility. The Office of the Superintendent places high priority on its program to combat losses in water supply, replacing systems and detecting leaks using modern techniques.

On the management level, SAE uses indicators for monitoring service; 100 management indicators are recorded and assessed monthly. It has emphasized its relationship with users of the services, encouraging its staff to follow through on that commitment and conducting post-service delivery studies that sample users who have requested local government services. According to its directors,

administrative efficiencies have made possible one of the lowest tariffs in the nation.

- **Penápolis, São Paulo (60,000 residents)**

Water supply and sanitation services in Penápolis was one of 15 experiments to be considered “fine sanitation practice” in a competition held by the WWF-Brazil in 2005 (WWF, 2005). The Penápolis Independent Department of Water and Sewers- DAEP [Departamento Autônomo de Água e Esgoto de Penápolis], responsible for municipal sanitation, has achieved imposing statistics in the national context. It universalized services for treated and hydrometered water supply, wastewater treatment, and waste collection, with a high level of selective collection—and maintains a sanitary landfill of recognized quality. It was the first municipal public sanitation entity in Brazil to gain ISO 9001:2000 certification.

It’s inclusive view of sanitation led DAEP to take charge of environmental education for the municipality in 1993, creating the Center for Environmental Education [Centro de Educação Ambiental – CEA]. It has also carried out initiatives for cleaning household water storage tanks and for vector control.

Its administrative process includes public participation via a review board including representatives of civil society, which has ensured continuity and sustainability for its policies. Members of the Board are elected in bi-annual Forums for Sanitation and the Environment. Additionally, the municipality has created the Ribeirao Lajeado Consortium, in order to protect the only water source supplying the city, demonstrating a concern to make its activities consistent with its vision for water resource management.

- **Porto Alegre, Rio Grande do Sul (1,400,000 residents)**

Porto Alegre, capital of the state of Rio Grande do Sul, is a beacon for municipal delivery of sanitation services, for at least two reasons. Firstly, it is the only Brazilian capital that did not lease its services to a state company, despite the implementation of PLANASA. Second, the city’s pioneering introduction of

participatory budgets is acknowledged worldwide. Inspired by the experiment, various cities across the world have adopted the practice.

DMAE – The Municipal Office of Water and Sewers [Municipal de Água e Esgotos], is the largest municipal provider of sanitation services in Brazil. Historically it has been committed to universal services, to serving its neediest population, and to democratic, participatory process. According to Maltz (2005), DMAE changed after it implemented a participatory budget. Its concept of how to serve the needs of a population was transformed, with the result that workers and all management levels of the department began to re-focus their activities towards prioritizing users' needs and public preferences and responding to their demands. Adopting the participatory budget process transformed the entity's financial management as well; the allocation of where resources should be applied is now based on public forums, bringing the DMAE closer to society and formalizing public oversight of its activities.

This strategy has yielded high levels of service to the city from water supply and sanitation providers. However, the model's degree of sustainability will need to be assessed in the future; the city's governing political party changed in 2004, bringing change to management methods as well. The practice of participatory budgeting, for example, has been discontinued.

- **Santo André, São Paulo (700,000 residents)**

The San André Municipal Agency [Serviço Municipal de Santo André—SEMASA] possesses emblematic status among Brazilian municipal agencies, to such an extent that ASSEMAE terms it the “showcase for sanitation”. The entity has a solid tradition of social oversight and of practicing what is termed *integralidade* [inclusivity]. In 1999 it took over municipal authority for water supply, sanitation, disposal of solid wastes and urban drainage and, subsequently, civil defense and environmental management, as well. This group of agencies, with compatible goals relating to environmental health and protection, generates economic advantages through an system of internal cross-subsidies and the extensive coordination of operations.

SEMASA's activities have allowed the city to post high service indices—with a program to fight leaks, the use of a modern system of automation, selective waste collection throughout its territory, permanent waste disposal of recognized quality, and an institution-wide commitment to users, as well as ISO 9001 certification—through a process of monitoring strategic indicators. The Executive Plan for Urban Drainage that the municipality developed in 1998 is considered

the first initiative of its kind in the nation and has led to a reduction in flooding and inundation points.

Yet the city is also emblematic in the political conflict between its state and municipal sectors over water and sanitation services. Santo Andre is located in the Metropolitan Region of Sao Paulo, which has complete systems for producing and transporting water, and for the transport and disposal of wastewater, operated by the country's largest state company, SABESP. The city receives treated water from SABESP into its main reservoirs, and has its wastewater received and (a portion) treated by the state company after collection in SEMASA'S system. But the relationship between the two governmental levels has been a relatively combative one. Thirty-five years after SEMASA's creation there is still no contract formalizing the relationship. There is not even an officially established tariff for the services.

It is evident that the experiments described above point to the possibility that local efforts, when they are undertaken with seriousness, administrative and technical competence, and commitment to the population served, can result in systems that are very efficient and effective. It bears re-stating that in the cases described this achievement was almost always the product of locally provided technical and financial resources, with little support from state and federal government authorities. Obviously many improvements still need to be made in some of these systems, for example those that have not attained universal service, or haven't made advances in sanitation. It should also be recognized that there are many municipal water supply and sanitation systems in Brazil that are far from classifiable as efficient and effective. However, the experiments described here do provide clear demonstrations of what potential the strengthening of local authorities has for transforming the present situation of service deficiencies in Brazil.

c) State company experiments

In contrast to the ASSEMAE initiative described in the previous section, there is no survey that uses the same methodology for selecting the best experiments among the country's state companies. There are competitions open to the participation of interested service providers—not exclusively for state companies—for the purpose of granting awards to the most successful systems.

The most established among them is the previously mentioned National Award for Quality in Sanitation Services given by ABES – the Brazilian Association for Sanitation and Environmental Engineering since 1997. More recently, the Ministry of Planning, Administration, and the Budget, under the auspices of its Program for Quality in Public Service- PQSP and its National Award for Public Administration, created the special “Sanitation” category.

The National Award for Public Administration in the Sanitation category has been given out only once, in 2005. It adapts that instrument, used to evaluate public administration in an inclusive way, specifically for the area of sanitation. For its assessment the award considers seven sets of criteria, analyzed from qualitative and the quantitative points of view: leadership; strategies and plans; citizens and society; information and awareness; people; processes; and results. The winning candidate in 2005, the Metropolitan Superintendent’s Office for EMBASA – The Baiana Water & Sanitation Company, S.A. [Superintendência Metropolitana de Salvador da EMBASA - Empresa Baiana de Águas e Saneamento S.A] is a unit of that state company, charged with “planning, coordinating, executing, and monitoring operations and commercial and administrative activities relating to the water supply and sanitation systems of Salvador and its metropolitan region”. This unit has posted the following indicators: 100% conformity with water potability standards (since 2002); 99.7% water coverage (97.8% in 2000); 65% wastewater collection coverage (38.2% in 2000); a 48.6% ratio between the volume of treated wastewater and that of water consumed (37.9% in 2001); a 3% complaint rate due to water shortage (EMBASA, 2006). The figures are not striking when compared with those of other state or municipal agencies, but the candidate profile for the Metropolitan Superintendent’s Office reveals a consistent effort at improving performance, particularly in planning, as well as in monitoring indicators.

The Brazilian Sanitation Association’s (ABES) PNQS awards, for their part, are also based on weighing indicators on the basis of the same seven groups of criteria, comparing them with reference or benchmark indicators. For 2005 the only experiment to win a level 2 award, the highest, was the Southern Business Unit of the Sao Paulo State Basic Sanitation Company [Companhia de Saneamento Básico do Estado de São Paulo-SABESP], which became regionalized according to hydrographic basins in 1995, and the units given financial and operational autonomy. The Southern Business Unit is “responsible for planning, operations, and maintenance of the systems for water distribution and wastewater collection, as well as sales and marketing of services in the southern region of Sao Paulo’s metropolitan area” (ABES, 2004). The unit provides water supply service for 3.4 million people (94.5% coverage) and wastewater collection to 2.4 million (67.3% coverage). It treats wastewater for 11.8% of the population in its area of activity (ABES, 2004). The positive indicators posted by the Business Unit are very likely the result of intensive investment in operational planning, using an expert management staff specialized in monitoring and operationalizing indicators.

Along with this top level award, the 2005 PNQS also gave level 1 recognition to three experiments in the interior of the state of Minas Gerais operated by COPASA-MG, two in the interior of Rio Grande do Sul operated by CORSAN, one in the interior of Bahia, and one unit in Salvador operated by EMBASA. The 2005 awards added one more category, entitled “Innovation in Sanitation Management”, which selects experiments such as rewards for performance, innovative management mechanisms, performance evaluations, the use of geographical data systems, and the management of urban solid wastes. All these administrative systems and mechanisms are the responsibility of state sanitation companies, which make up most of the applicants for the award, and who use it as a benchmark for their administrative goals.

These awards initiatives for quality-related criteria are originally based on paradigms for entrepreneurial efficiency, emerging from theoretical perspectives that are different, but always heavily influenced by the “entrepreneurial efficiency” concept. However worthy of merit the programs may be in the sense of recognizing positive experiments, and particularly for encouraging good practices, there has been a recognized need to build an intrinsic paradigm, more specifically applicable to organizations of a public character. It is therefore viewed as important to re-conceive the principle of efficiency in light of the role a public institution plays, and of its relationship to citizens and to society. Moreover, there is an understanding that, in the process of rewarding the criteria presently used, it might be healthy to include a practice in which the organization’s mission begins with society and is translated back into the organization, instead of an endogenous view—with the mission defined within and then translated out to society .

When assessing state experiments, one aspect that still needs to be firmly taken into consideration is the state’s relationship with what should be its principal interlocutor: the licensing authority, or, in the Brazilian model, the municipality that grants the concession. This remains a very sensitive relationship still, one prone to conflicts between interest groups, as has been demonstrated elsewhere in this text. Some initiatives with a more satisfactory relationship between the two entities have been noted in Brazil, especially at stages when concession contracts are being renewed.

One of the documented experiments in this direction has been taking place in Recife, Pernambuco, where the election in 2000 of a mayor from the Workers Party interrupted an effort to privatize the state company, the Pernambucana Sanitation Company [Companhia Pernambucana de Saneamento—COMPESA]. Since 1971 it has been responsible for operating the sanitation and water supply systems for this city of 1.5 million residents. It would seem that the justification for privatization was that COMPESA was incapable of providing adequate services

to the municipality, which posts weak indicators: only 27% of the population served by wastewater collection, less than 10% of wastewater being treated, 12% of the population having an irregular connection to the water supply system, and there is systematic water-rationing (Miranda, 2005).

Recife's new mayoral administration, with the support of a broad process of discussion with the public, proposed an alternative to the private model: formalizing a service concession grant to this company (something never done up to that point). The company would remain public and subject to social oversight as well as supervision by the authority granting the concession. A municipal authority would be created for planning, for supervising the concession and for performing complementary services—particularly in favelas. However, while there was extensive social mobilization and, at least initially, a solidly determined mayoral administration, the final agreement between the municipality and the state has experienced repeated advances and reversals, making it difficult to introduce the model and test it. It is one more demonstration of how the Brazilian political class perceives sanitation administration as an important form of power.

a) Condominial systems

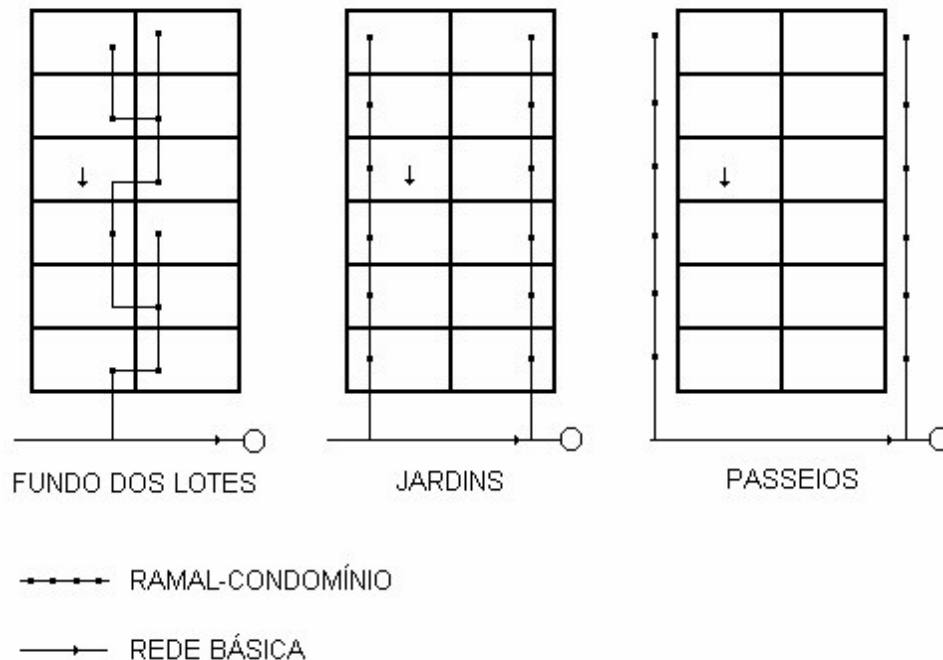
Condominial solutions adopted in Brazil starting in the 1980's—initially for sanitation and in a second stage for water supply—have been the object of various studies and applications, not only in Brazil but in other parts of the world. In 1996 (Melo, 1996) it was estimated that more than 500,000 persons in a hundred Brazilian cities were being served by this solution for sanitation, with experiments recorded for water and wastewater systems in El Alto, Bolivia (Foster, no date) and for wastewater systems in Pakistan (Mara, 1998). It clearly is a solution with revolutionary potential for serving populations, both in terms of its physical design and its management model.

From a physical perspective, the system recasts the traditional concept of a service-receiving unit. While in the conventional system service is provided to each household unit, in the condominial concept it is provided to blocks or groups of residences, similar to the model of vertical condominiums or apartment buildings. Consequently, the public system does not need to run through each lots or yard, or be present in all streets. The result is a reduction of about 50% in the length of the wastewater system and 75% in the water system (Melo, 2005).

The condominial system consists of a condominial branch, which is a network of simplified wastewater drains located inside street blocks and sidewalks (see Figure 8) or a water supply system located in sidewalks, and the main street

branch. Further, the system fosters the decentralizing of collection units, be they wastewater treatment stations or water reservoirs.

Overall, a concept of this kind provides significant cost savings when compared with the conventional sanitation solution (Mara, 1998).



Source: Melo (1996)

Translation: BACKYARD FRONT YARD SIDEWALKS

CONDOMINIAL BRANCH
MAIN SYSTEM

Figure 8. Siting options for condominial wastewater drainage branches

In terms of its administrative process the model provides for the formation of users' condominiums, which become responsible for the installation and maintenance of the condominial branches. This strategy encourages the community to organize around the issue of sanitation and brings service providers closer to users. According to the model's creator, "the condominium becomes not only a physical unit for providing services, but a social unit for facilitating collective decisions and initiatives to organize the community". The condominium members have to select the appropriate plan and organize themselves to perform complementary activities such as sanitation education and direct participation in construction and maintenance.

Yet it is precisely this last feature, community involvement, that can be the "achilles heel" of the process; if it is insufficient, and the continuity of the user's organization is therefore not assured, the system may be less sustainable.

Nevertheless the majority of reported experiments have demonstrated that the solution is broadly successful, judging by significant cost reductions achieved and by genuine community engagement. Experiments as diverse as those in Brasília, the capital of the Federal district, Salvador, capital of the state of Bahia, and Parauapebas, in the state of Pará, as recorded and published by the World Bank (Melo, 2005), illustrate this assertion:

- In Brasília, the intervention involved scaling-up wastewater drain services by about 500,000 people at reduced cost, including areas ranging from those of a very low socio-economic level to those with high incomes. Subsequent assessments showed that the level of maintenance required by the condominial system was no greater than that of the conventional system. An important explanation for the program's success lay in the strong institutional support provided by the state company in authority, the Brasília Water and Drainage Company [Companhia de Água e Esgotos de Brasília-CAESB].
- In Salvador an extensive intervention to introduce condominial wastewater drains reached over a million people in low-income areas, with a very uneven pattern of settlement and very unfavorable topographical conditions. Moreover, and different from Brasília's case, the experiment was characterized by a certain inconsistency on the part of the entity in charge, the Baiana Sanitation Company – EMBASA [Empresa Baiana de Saneamento]. The model was not effectively institutionalized, and there was a low level of community involvement. These factors were accompanied by other intrinsically unfavorable local conditions; most of the population already possessed intra-domicile facilities connected to the rainwater collection network, without having to pay monthly tariffs. Problems were therefore observed, such as low payment of maintenance tariffs and a low proportion of domiciles connected (around 30% in 2005). This is probably not an issue specific to the condominial model, but one that could occur in any solution for expanding wastewater drainage service.
- The Parauapebas experiment involved converting a water system to a condominial system. For this reason it is innovative, suggesting the potential of adopting the condominial system, as well as the challenge of urban water supply. The city, small but growing at an increasingly fast rate, mobilized large-scale community participation during the system's construction, and has brought about an expansion in water supply system coverage for less than 30 % of the projected cost of the conventional system.

Conceptually the model has the potential for scale-up, keeping in mind, however, basic conditions for guaranteeing its sustainability: the support of public authorities, financing for the system's execution, and the adoption of measures for sustaining community mobilization. The absence of these ingredients could, in the long run, jeopardize the continuity of systems of this type.

5. Scenarios and perspectives for a new politico-institutional framework

5.1. Institutional organization

Beginning with executive branch organization of this field: after taking power in 2003 the Lula government created the Ministry of Cities. Within that structure is the National Department of Environmental Sanitation [Secretaria Nacional de Saneamento Ambiental], whose website states its mission to be "ensuring the fundamental human rights of access to potable water and to life in a wholesome environment in the cities and countryside, through universal water supply and sanitation, the collection and treatment of solid wastes, urban drainage and the control of vectors and reservoirs of transmittable diseases". The department soon began to oversee other activities such as financing, assessment, implementation, and establishing administrative offices for sanitation, making it the hub for sanitation services at the federal level. Three other departments associated with sanitation became part of the same ministry: Housing; Transportation and Urban Mobility; and Urban Programs [Habitação; Transportes e Mobilidade Urbana; Programas Urbanos].

The National Department of Environmental Sanitation operates a broad range of programs that work with both concessionaires and municipalities. It formulates specific initiatives for particularly vulnerable regions and populations. Some programs are interministerial initiatives that include the Ministry for the Environment and the Ministry for Regional Policy Coordination [Ministério da Integração Nacional].

In addition to this structure within the federal government, the Council of Cities [Conselho das Cidades] was created as a consultative and decision-making body with the purpose of "proposing goals for the formulation and implementation of national urban development policy, as well as monitoring and assessing its execution" (Brasil, 2005). Its structure includes the Consulting Committee for Environmental Sanitation [Comitê Técnico de Saneamento Ambiental], which has an advisory function. It is intended that the same structure be reproduced at the state and municipal levels.

Sanitation policy is influenced by the deliberations of the Conferences of Cities, the first of which took place in October, 2003 and the second in November-

December/2005. The conferences attracted a broad spectrum of participants representing the various areas of urban policy. It passed resolutions on universal access and in favor of a greater commitment to society, particularly the most disadvantaged, in sanitation policy.

Initiatives are taking place in other ministries apart from those the Ministry of Cities is formulating. Among them may be mentioned: programs of the National Water Agency [Agência Nacional de Águas – ANA] in support of basin committees and for supervising water usage, as well as for water conservation, the planning of water resources, and economic incentives to introduce wastewater treatment units (Brasil, 2006). The Ministry of the Environment itself, with its mandate to implement Agenda 21 for Brazil and its localities, has a number of points of interface between sanitation and water resources issues.

On the state level, it is more often the case that formal entities within the executive branch that are dedicated to the area of water supply and sanitation do not exist. The function is in general limited to state companies. This model limits efforts in a given state to establish more universal and egalitarian service for its population, as already discussed, because the companies do not operate in all cities of a state.

On the municipal level, while the federal constitution establishes the municipality's authority over organizing and delivering services defined as local in nature, this right—this duty—is not always fully exercised. According to the prevailing model the municipalities must either directly operate water supply and sanitation services, or lease these services to third parties—but in the latter case it is hoped the municipal government will monitor the lease and require that the concessionaire provide service compatible with the population's interests. In the reality of Brazil today, municipal authorities are not always fully aware of that responsibility, and instead yield way to the concessionaire.

Still, in any analysis it is clear that the field of sanitation in Brazil has only haltingly evolved in a direction more consistent with the nation's democratic reality—particularly when compared with other areas of the public sector—since re-democratization in the mid-1980's. Social oversight and popular participation attained legitimacy with far greater speed and efficiency in the areas of health, the environment, urban policy, and water resources. In the same way, owing to recognition and stimulus to action at the municipal level, decentralization took place in the areas of health—with the municipal councils—and the environment. The field of water resources itself, when it adopted hydrographic basins as a planning unit and established the basin committees to administer them, showed unmistakable evidence of burgeoning local authority. A deficit of democratization therefore still exists in the area of sanitation, perhaps explained by the resistance of interest groups within the system to subjecting their power to oversight and control.

In terms of financing, the level of resources made available by the federal government for sanitation activities has rebounded after a phase of tight restrictions in the last years of the Fernando Henrique Cardoso government. Still, it must be recognized that there needs to be some regularity to this flow if the introduction and renovation of systems, as well as their maintenance, are to be sustainable. Moreover, it is both necessary and urgent that financial resources be utilized in a responsible and ethical way, with appropriate projects, i.e.; executing construction projects with the best engineering techniques, with budgets that are based on the real costs of services, and vigorous oversight of any form of corruption at the various stages of the process. Furthermore, the task of introducing a genuine system for supervising and assessing projects goes hand-in-hand with generating sufficient funds for the sector.

The funds needed to universalize services up to the year 2020 are estimated by SNASA at R\$ 184 billion (8); 169.2 billion for water supply and sanitation in urban areas; 9.2 billion for the same services in rural areas, and 5.6 billion for solid urban waste disposal. The figures seem high, but are in fact perfectly attainable if governments recognize the importance of these activities and prioritize them, given that the cost estimate for reaching those goals represents an annual investment of no more than 0.5% of GDP (Brasil, 2003).

Another aspect of this analysis concerns attempts to private services, especially via the model of concession contracts to private companies. This effort was associated with appeals and pressure on the part of multi-national agencies in favor of adopting a neoliberal macro-economic model for the country. Yet, the expansion of this model was less widespread than that seen in other countries. The explanation for this development cannot be traced to a single cause, but finds firmer ground when the combination and interaction of a group of factors is analyzed (Castro and Heller, 2006). On the one hand, the paralyzed and still pre-neoliberal atmosphere of Sarney's government, followed by the political disorganization of Collor's and the nationalist vision of Itamar's, had the result that further efforts to implant the neoliberal model in Brazil only began, in their most resolute form, under the government of Fernando Henrique Cardoso in 1995. By that time the greatest wave of enthusiasm on the part of private, multinational water-supply and sanitation companies had already passed, mainly due to political-economic instability in countries where they had been active, such as Argentina.

On the other hand, government initiatives to scale-up private concession contracts were slowed by the combined resistance of the most influential governors and the directors of important state companies, who refused to surrender the political and economic capital they represented; the technocratic workforce of these companies and its labor organization, which feared the loss of privileges; and organizations representing municipal services, who had always advocated that the services should be public. An additional factor which may have caused concern for investors was the absence of regulation that would

more clearly define the legal status of private concessions. Particularly in the metropolitan regions, there persists to this day a vagueness as to ownership rights to the services and whether they are retained by the states or the municipalities.

It should be noted, however, that these factors did not prevent some concession contracts from being concluded—for example in Manaus, capital of the state of Amazonas, in 2000 (15). Nevertheless, in 2006 the number of Brazilian municipalities with private concessions for water supply and sanitation services is little more than 1% of the total.

5.2 Regulation

Up to the present moment there has not, in Brazil, been the will to create a national regulatory agency for the field of sanitation. The national agency closest to the sector is ANA - the National Water Agency, linked with the Ministry of the Environment, whose mandate it is to implement the National Policy for Water Resources (Brasil, 2000) which regulates the use of river and lake water under the union's authority, and the National System for Management of Water Resources [Sistema Nacional de Gerenciamento de Recursos Hídricos], "guaranteeing the sustainable use (of water), avoiding pollution and waste and ensuring for the country's development water of good quality and in sufficient quantity for current and future generations" (Brasil, 2006). Which is to say that, no matter what its interfaces may be, this is an agency oriented towards the management of water resources. Its mandate does not envision regulating the delivery of water supply or sanitation services.

At the federal level, there are mechanisms for social oversight in the area of water supply and sanitation via the national councils and their organizational structures such as the Council of Cities and its Consulting Committee for Environmental Sanitation; the National Council of Health and its Inter-sector Commission on Sanitation and the Environment; and the National Council on the Environment – CONAMA, with its units of consultants [for] Environmental Oversight and Quality, Environmental Education, and Health, Environmental Sanitation, and Waste Management.

At the state and municipal levels there is no uniform model for regulation and social oversight. Several regulatory agencies have been created over the past ten years, grouped under ABAR – The Brazilian Association of Regulatory Agencies [Associação Brasileira de Agências de Regulação], but with models that vary greatly in their standards.

At least 11 states can be identified as having organized agencies with mandates that include water supply and, or, sanitation services: one specifically for water-related issues: water, irrigation and sanitation (Paraíba), some acting through

wide-ranging public agencies (Acre, Mato Grosso do Sul, Goiás and Alagoas), others through public services that are delegated or leased (Mato Grosso, Rio Grande do Sul, Ceara, Pernambuco, Amazonas and Rio de Janeiro). A greater concentration of these agencies may be found in states in the North, Northeast, and Central West. At the municipal level there are few agencies specifically for the sector. Some of them were created in order to regulate concession contracts (e.g.: Cachoeiro do Itapemirim – Espírito Santo), others to monitor the public municipal service itself (e.g.: Joinville – Santa Catarina), and others to monitor a concession awarded a state company, such as Campo Grande (Mato Grosso do Sul) and Natal (Rio Grande do Norte). (16)

One alternative model which some capitals, in a process of re-negotiating their relationship with state concessionaires, have adopted, is creating municipal sanitation councils made up of members from government, civil society and, eventually, the concessionaire. An example of this experiment is unfolding in Belo Horizonte, Minas Gerais, where COMUSA – the Municipal Sanitation Council [Conselho Municipal de Saneamento] was created; it is an authority responsible for monitoring relations between the concessionaire and the municipality. Among the roles envisioned in its bylaws are: (I) regulating, supervising, monitoring, and assessing execution of the municipal sanitation policy; (II) to monitor, set goals for, and make decisions regarding how funds from the Municipal Sanitation-FMS fund are to be applied; (III) approve a Municipal Sanitation Plan and supervise its implementation; (IV) analyze and provide an opinion as to the composition of tariffs or taxes levied on services; (V) approve and publish a report “The State of Environmental Health in the Municipality of Belo Horizonte” [“Situação de Salubridade Ambiental do Município de Belo Horizonte”] (Belo Horizonte, 2004). Technical and administrative support for COMUSA is provided by an arm of the executive municipal authority, named the Sanitation Management Group [Grupo Gerencial de Saneamento-GGSAN]. Clearly, this council amounts to a form of regulation, with the participation of society, that is distinct from the model of a regulatory agency independent of executive authorities. A similar model is due to be implemented in Recife, Pernambuco, as has already been described.

5.3 Legal mechanisms

In the politico-institutional realm, various initiatives were undertaken after PLANASA in order to establish a new legal and institutional basis for sanitation in the country, though these would not result in a new model that was both clearly defined and stable enough to resist changes by successive federal governments.

As a result PLANASA’s basic outlines still prevail to this day: the state companies and their concession contracts, the principle of financial self-sustainability, timid social oversight, the selective, privileged financing of water supply and sanitation activities, and little linkage with the public health, water resources, urban planning, etc., sectors.

At the beginning of the 21st century there is no available legislation, on the federal level, specifically for the organization of services—beyond very narrow references in the federal constitution which have formed the basis for distinguishing between the duties of municipalities and states, especially where ownership rights to services are concerned. The biggest debate in this area, currently ongoing, is over ownership rights in metropolitan regions, since there are few doubts as to the role of the municipality, and of the real owner of services, in other situations. Article 25, paragraph no. 3 of the federal constitution declares that “ the states may, via supplemental laws, establish metropolitan regions, urban agglomerations, and micro-regions composed of groups of contiguous municipalities to coordinate the organization, planning and execution of public functions [deemed] in the common interest”. This text has been interpreted by defenders of state-level involvement in metropolitan sanitation as delegating the power to act in these regions to that (state) level of the federation. Nevertheless, it appears clear that the spirit of the constitution gives the states the role of coordinating the organization, planning, and execution of services—not that of directly organizing, planning, and executing them.

Other pieces of legislation have—precariously—supplemented the sector’s legal underpinnings. For example, the law on public consortia - Law no. 11.107 of 06/04/2005, which sets the ground rules for the formation of consortia among municipalities, between municipalities and states, or even involving the union, for delivering services—principally for systems or units of systems that extend beyond the territorial lines of one municipality.

However, at the start of 2005 the federal government sent a bill to congress that was to become law 5.296, which aimed to establish “goals for basic public sanitation and for the National Environmental Sanitation Policy – PNASA”. This initiative is very important because it might cover a historic gap in the sector, making possible the creation of clear guidelines for the delivery of [sanitation] services that would help foster universalization and improvements in the quality of service delivered to the population (see box).

In addition to legislation specifically for sanitation such as that described, it should be pointed out that legal standards associated with policies for other sectors could influence the orientation and practice of sanitation in the country. In addition to legislation in the field of water resources, legal mechanisms in the areas of the environment, health, urban policy, housing, and agricultural policy, among others, interface with the sanitation sector at many points.

In addition to legal tools for sectors in the areas mentioned, it is worth noting other definitions of a more general nature which influence government structure. One of these tools, previously referred to in section 3.2, is Law 8.987/1995 – the Concessions Law . Its practical application in the area of sanitation could not only bring about changes in how state companies determine their activities in concert

with municipalities, but might broaden the delivery of services by private enterprises as well.

Another legal tool is that of public-private partnerships—the so-called PPP's – defined in Law 11.079/2004 and considered by the current federal government to be an important option for attracting private capital for executing public works projects. It is now in a phase of defining the structure of the so-called “guarantee fund”, without which the projects will not be launched. The bill appears to impact most on the area of transportation, and ultimately may not be an important alternative for attracting new resources to finance the sanitation sector, given the weak attractiveness the sector has held for private enterprise. Some locally-limited experiments may eventually take place—but these will not result in a new model that alters the structure of prevailing financing mechanisms.

Another piece of legislation which interfaces with these issues is the City Act, or Law 10.257/2001, which “sets guidelines, for the public sphere and in the interests of society, regulating the use of urban property to promote the common good and the safety and well-being of citizens, as well as environmental balance”” The legislation acknowledges the principle of “the guaranteed right to sustainable cities, meaning the right to urban property, to a residence, to environmental sanitation, to urban infrastructure, to transportation and to public services, to work and to leisure, for present and future generations”.

Bill to organize public sanitation services, submitted by the federal government.

From the beginning of its term in January, 2003 the current federal administration, via its National Department of Environmental Sanitation, has been working on a text for legislation that attempts to organize the sector—a clear need in the eyes of the group of actors who are its participants: operators, regulatory and oversight entities, user representatives, professionals, academics, etc. After various versions which were the product of contributions from the sector's branches and their actors, the bill was sent to the Chamber of Deputies for vote on an urgent basis, and was designated Bill n. 5.296.

The purpose outlined for the bill is to establish “goals for basic public sanitation services and the National Environmental Sanitation Policy – PNSA”. The initiative has the potential to bring about positive change in the sector, accelerating the universalization of services and improvements in quality of service to the population. Firstly, a new institutional order promoted by these goals could

provide benchmarks for the sector's regulation, which have been vague for almost two decades since the shelving of PLANASA. During that period, an atmosphere without clear guidelines left actors within the sector insecure regarding the future. This absence of clarity has particularly affected relations between municipalities and state companies—especially when concession contracts cease to be in effect—but also makes it difficult for state companies to plan effectively over longer periods, and for some municipalities to plan beyond the term of a municipal administration, as well. Particular tension exists in metropolitan areas, where a definitive interpretation of the constitution remains pending with respect to ownership rights to services, namely in cases where water supply and sanitation systems can be classified as in the common interest, and not as a local interest.

Among other aspects of bill 5.296, special attention should be drawn to: its democratizing nature, the affirmation of the role of public authorities in the field of sanitation, a broad, inclusive view of the concept of sanitation, and a systematic administrative orientation, including stages in the planning and assessment of services. Among the principles contemplated in the draft which attempt to body forth long-championed goals of the sanitation's democratizing wing, are:

- A broad concept of sanitation (defined in the draft as *basic sanitation*), including water supply and sanitation activities, disposal of solid urban wastes, and rainwater drainage;
- Affirming that the services hold their objective to be a healthy environment, as opposed to viewing sanitation as an economic good;
- Affirming the role of the government and the public significance of sanitation, as opposed to the concept of privatization as a means of universalizing service;
- A commitment to universal service, inclusion, and equity;
- Affirming the concepts of regulation, planning, and assessment of services as interrelated.
- Setting clear guidelines for delegating services, affirming the rights of a public authority granting a concession;
- Affirming the centrality of the municipality's role, reinforcing local authority;
- Supporting social oversight and supplying concrete mechanisms for its implementation;
- Encouraging low-income populations' access to services;
- Recognizing the need for a science and technology policy specific to the field

The bill is based on the law for public consortia (Law no. 11.107 of 06/04/2005), and aims to modify the behavior of state companies in the municipalities, providing clearer guidelines and recognizing the rights of the public authority granting a concession without, however, leading to a need for tender offers for concession contracts, which could lead to competition with private providers of services, as well as possibly jeopardizing certain processes of concession renewal.

The bill cleared its first hurdle of assessment in the Chamber of Deputies in December, 2005, after reconciliation with four other bills on the same subject which were then under consideration, and incorporating 862 amendments.

Among the bills under consideration was a bill parallel with that of the government's(17) – PLS 155/2005 – but conceived in a very different way that revealed the sector's conflicting interest groups. It was a bill that reduced the understanding of sanitation simply to water supply and sanitation services, echoing, on this point, a frequently-denounced distortion at the time PLANASA was formulated. In addition, it is quite apparent that the bill attempts to transfer to the state level—and therefore subtract from the municipal level – the responsibility for delivery of services in many situations, while applying its own perspective on the concepts of services of local interest as opposed to services in the common interest, [thus] reinterpreting the federal constitution.

It should be acknowledged that, in his/her report, the bill's assessor appears to take care to incorporate some key points from bill 155. In connection with ownership rights to services in metropolitan areas, the assessor's bill proposed the following alteration: “public services for basic sanitation in the common interest shall have their planning, organization, regulation, delivery, and supervision unified under the responsibility of the respective state, including the coordination of its activities and components, under the terms of state law”. Such an interpretation clearly sides with the interests of state governments and state sanitation companies against the interests of municipal representatives. ASSEMAE – the National Association of Municipal Sanitation Services, has registered its disagreement with such a formulation, arguing that “the question of ownership is a constitutional matter and may not be resolved by means of ordinary legislation” (ASSAMAE, 2006).

At the moment the future of this effort at defining a legal framework for sanitation in Brazil is not easy to predict(beginning of 2006). There is a visible polarization of interests within the sector, pitting state governments and state sanitation companies—with significant power to place pressure on parliament—against the federal government, municipal authorities, and a significant portion of organized civil society with ties to the sector (urban residents' movements, consumer defense groups, professional entities, etc.) This atmosphere greatly complicates the forming of a consensus around crucial points. Both the struggle among

interest groups, and the important niche of power the sanitation sector represents, are neatly exposed here.

Added to this conflict is the weakness of the federal government--which is returning with a serious political crisis on its hands and a troubled relationship with Congress--and the fact that 2006 is a year of widespread elections in the country (executive, federal and state legislative), elections which traditionally paralyze legislative work and introduce different variables of an electoral and clientalist nature into the decision-making process.

In view of these facts—and noting, as well, that the draft requires the approval of the Chamber of Deputies and the Federal Senate in a long process involving committees and plenary votes—it appears unlikely that any bill of this nature will be approved during this present term of President Lula's. The bill's assessor himself, deputy Julio Lopes, offered the opinion that the chances of the final text's being approved in 2006 were not great (Chamber [Press] Agency, 2006).

In the event the bill is not approved in 2006, various other factors will influence the prospects of clear guidelines for organizing the sector, one of them being the results of the elections for the presidency of the republic themselves. The deregulation that would result from one more long period without such guidelines could have a very negative impact on the effort to create a more favorable atmosphere for universalizing sanitation services, and for reaching the country's Millennium Development Goals, thereby ensuring quality in the delivery of services, respect for the user, environmental protection, and genuine advances in the population's health, particularly among those who are poorest.

6. Conclusions

The descriptions and analyses in this document of the historical course, current scene, important experiments, and future scenarios for water supply and sanitation in Brazil may lead to a few conclusions, however tentative:

- Historical analysis suggests that there has been a gradual change in how the national government has viewed this field, as public policy and the degree of responsibility it has assumed for it. This changing view has resulted from factors such as the focus on disease control, economic, political, social, and cultural processes, and the prevailing definition of the nation-state in each era. On the other hand, the nature of the sector itself has influenced the dynamic of other sectors and other aspects of the

- population's quality of life—for example, its impacts on health, the environment, and social and economic conditions.
- Present asymmetries in service provision contain a strong social component : the excluded predominantly have less income, live in smaller municipalities, and have a lower HDI.
 - The model foreseen in PLANASA, that of state company administration: favored water supply to the detriment of sanitation; did not succeed in expanding, as intended, to municipalities in the least developed regions; did not expand water supply greatly to municipalities with the highest HDI's; and gave less priority in sanitation to municipalities with under 20,000 residents. Ultimately, the entrepreneurial design of the plan has contributed to enlarging asymmetries.
 - The use of available quantitative indicators often masks the state of access to services; it should be constrained by methodological safeguards if it is to offer satisfactory descriptions, preferably combining different “lenses” such as quantitative and qualitative assessments, aggregate and disaggregated data, secondary data with field research, historical perspective with the current, or cyclical context, or politico-institutional analysis with the assessment of indicators. Such caution is important when the same reality is temporally compared using surveys based on different methodologies. It becomes even more so when different realities are compared, above all countries in which, apart from possible methodological differences in surveys, the very construction of the concept of access, and/ or its institutional conceptualization, may interfere
 - It is not easy to forecast what future there may be for the attempt to define a legal basis for sanitation in Brazil. There is a visible polarization of interest groups, pitting governments and state sanitation companies, on the hand, against the federal government, municipal authorities and a significant portion of civil society, on the other. This greatly impedes the forming of any consensus around crucial points. The situation neatly exposes conflicts between interests groups and the niche of power the sanitation sector represents.
 - History, and current tensions in the sector, show that taking charge of water supply and sanitation services has been the object of interest group ambitions because it is seen as a significant lever of power—political, economic, and social. As a result, disputes have broken out between representatives of the public and private sectors and federal authorities.

To conclude: we must emphasize the importance that efforts to shed light on the current status of water supply and sanitation in Brazil, and developing countries in general with similar constraints, have in helping to identify the best strategies for universalizing access. Suitable methodologies for this can be improved, using the combined pool of all research that aims at this assessment.

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