



Blue water green cities

An initiative from the World Bank
for integrated urban water management

Integrated Urban Water Management

Case Study

Sao Paulo



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SAO PAULO'S INTERCONNECTED WATER CHALLENGES

The Metropolitan Region of Sao Paulo (MRSP) is home to close to 20 million inhabitants and represents 19.4% of Brazil's national economy. It is the seventh most populous urban area in the world and the economic, financial and technical hub of the country. The water resources of this sprawling Metropolitan Region have been strained by dramatic population growth in the second half of the 20th Century (currently reduced to 0.65% per annum), unplanned land use, and rapid industrial development. These trends have contributed to rising pollution of drinking water reservoirs, growing water scarcity, and flood vulnerability. These challenges have been further exacerbated by inadequate provision of urban services and inefficient water use, setting a tall order for water management authorities.



Before and after slum upgrading intervention in favela Jardim Souza I.

Source: Secretariat for Sanitation and Water Resources-Government of the State of Sao Paulo.

Unplanned urbanization increases stress on water quality and availability

The main sources of drinking water within the MRSP are the Cantareira, Guarapiranga and Billings systems, which together provide the water consumed by 70% of the population. The Guarapiranga and Billings systems, in particular, have been negatively impacted by several decades of uncontrolled urban expansion without adequate water and sanitation services. Indeed, most of the approximately two million residents in the Guarapiranga and Billings river basins are poor and live in informal settlements. This illegal occupation of the area around the reservoirs and associated deforestation has led to rising sewage pollution, wastewater and garbage discharge, storm water run-off and silting.

The decrease in water quality has been accompanied by growing water scarcity: according to the technical note "Universal Water and Sanitation Services in the Metropolitan Area – 2018", from SABESP, the state water and sanitation company, water supply currently equals water demand at a value of around 70 m³/s. Due to continued population growth, renewed efforts are needed to avoid and curb water pollution and to improve water-use efficiency. The Alto Tiete watershed, which provides 15% of the MRSP's total water supply and encompasses 99.5% of the population of Greater Sao Paulo, has annual water availability of just 201 m³ per capita and is in the most critical condition of all the twenty-two watersheds in the State of Sao Paulo. In parallel, the densification and verticalization of urban settlement

in the environmentally protected banks of the water basins has resulted in the deterioration and increased impermeability of soils which, by some estimates, has led to the impermeability of 37% of land within the Alto Tiete basin. As a result of this change, storm water flooding has become more common. The primary victims are the residents of the informal areas in the basin, but the economic and social costs are also felt in all the MRSP area.

Negative effects to water quality are intensified by poor service delivery in low-income areas

The impact of informal settlements on water quality and availability is exacerbated by inadequate urban services in low-income areas. Although the MRSP has a strong track record in water supply and sanitation, many of the informal neighborhoods remain underserved. Overall, service coverage rates are relatively high: in 2012, 99% of the population had access to water through house connections and 82% of the population had adequate sanitation. In precarious neighborhoods (slums and irregular settlements), however, the picture is different as these areas often lack adequate sanitation services and discharge raw sewage directly into water bodies. In the case of the Guarapiranga and Billings reservoirs, as well as in the Baixo Cotia, Biritiba and Ribeirão dos Cristais Rivers, this has been directly associated with eutrophication.

Water quality is further compromised by defects in infrastructure for collecting and transporting sewage to the wastewater treatment plants, as well as dumping of industrial effluents and pesticides from agriculture. As of 2005, only 65% of sewage in the municipalities within the Alto Tiete basin is collected, and only 32% of this volume is treated. In addition, while the MRSP has reasonable rates of collection

and disposal of domestic solid waste, the amount that is not collected or disposed of inadequately (700 metric tons per day) is still significant, as it is often disposed in the region's water bodies. In the Guarapiranga river basin, for example, the water quality of the reservoir and rivers, creeks and other tributaries is declining given that only half of the dwellings have sewerage collection system and part of the solid waste continues to be disposed in rivers and creeks that lead to the reservoir.

Stress on water availability is aggravated by inefficient water management

In addition to investing in solid waste management and provision of sanitation services, there is a need for the MRSP to increase the efficiency of its water use. In 2011, average per capita water use in Sao Paulo was about 180 liters per day, which compares to an average water use of less than 120 liters per capita per day in Germany, for example. There are substantial efforts for water conservation in Sao Paulo which could be further boosted with the adoption of a tariff policy geared at providing better incentives for water conservation. Increased use of groundwater in the MRSP takes place under a setting of insufficient monitoring and control of groundwater use. The amount of groundwater recharge and extraction is estimated at 15m³/s and 10m³/s respectively, and the latter is expected to increase.

Water conservation efforts have had mixed success to date: while the unit water demand for residential consumption decreased from 17 to 14 m³/unit/month from 1998 to 2010, network distribution losses decreased from 30,5% to 25% from 2007 to 2010. SABESP continues to pursue the objective of improved operational efficiency and has a target of decreasing total water losses to 14% by 2018.

NEW CHALLENGES HIGHLIGHT INADEQUACIES IN TRADITIONAL WATER MANAGEMENT APPROACHES

Incomplete laws and institutional issues

The institutions created to ensure protection of water resources and adequate water management in the MRSP have only been partially effective. In great part because the laws leading to their creation didn't fully acknowledge the integrated nature of the challenges facing the water and urban sectors. In the 1970s, for example, the government of the state of Sao Paulo created a State Environmental Agency (CETESB) which enacted a state headwater protection law, to protect strategic sources for urban water supply. The law prohibited high-density residential occupation in 53% of the MRSP, and prevented commercial and industrial permits being issued in the areas. Legal actions had little or no effect, however, in preventing informal development and the proliferation of slums on the shores of the Guarapiranga and Billings reservoirs.

In 1991, the state government established Law 7,663, creating the State System for Water Resource Management. The system pioneered the shared decision-making in water resources management principles that are now embodied in Federal law. It established tripartite basin committees (State, Municipalities and Civil Society) for the 22 basins in the state. However, the system failed to attract an intense participation from one of its key actors, the state water supply and sanitation company SABESP, which has responsibility for water supply and sanitation in most of the municipalities in the MRSP, and which, together with the Industrial sector, had a key role in numerous contentious discussions on bulk water pricing.

Fragmented institutional management across municipalities and sectors

Fragmented institutional management in the cities that form the MRSP, in all services, is a significant barrier to resolving the main water and land use related problems faced.

In addition, Federal laws are not evenly implemented across states and municipalities, further complicating regional policy coordination. For example, Federal Resolution 54/2005 of the National Council of Water Resources states that direct non-potable treated wastewater can be re-used in a number of ways, such as washing public streets, agricultural production, or industrial activities.

This draft resolution is currently under consideration by several Sao Paulo Secretariats (including Health, Environment, and Sanitation and Water Resources), but the State still has no legal framework on this issue. At the same time, the Municipality of Sao Paulo, within the MRSP, issued its own regulations mandating the use of reused water for a number of activities; however, coordination with other municipalities within the MRSP would undoubtedly make for more effective resource management.

As it stands, the reuse of treated wastewater is still a novel concept in Brazil due to absence of a proper legal framework: only 2% of companies reuse treated wastewater, despite the fact that it costs only a fraction of the conventional potable water rate.

By working together in water management, municipalities within the MRSP would also be better equipped to resolve inefficiencies in the provision of water services. For example, while SABESP is currently implementing a ten year program (2008–2018) to control and reduce non-revenue water by

enhancing infrastructure, combating fraud and illegal connections, and improving staff training, there has been no comparable effort so far to reduce non-revenue water in municipalities that receive water from SABESP and distribute it themselves, significantly diminishing the value-added from the efficiency enhancements underway.

Lack of coordination is an even greater impediment at sector level. In the Guarapiranga and Billings basins, for example, water provision conflicts with hydropower production, while drinking water supply and irrigation compete for water resources across the Alto Tiete basin. Likewise, while a Macro-Drainage Plan for the Alto Tiete basin

was developed to diagnose problems and devise technical, economic and environmental solutions, this plan does not take into consideration the need for a change in urbanization patterns. This reflects complex institutional arrangements where land-use planning is the responsibility of the municipalities, while water resource policy is a responsibility of the State.

The municipal government of Sao Paulo has ample experience in slum upgrading interventions and related civil works, and this experience could be harnessed in the water sector to improve the planning of urban service delivery and the protection of threatened watersheds.

Bank Contribution to Multi-Sector Work

Completed World Bank projects in the MRSP include the Sao Paulo Water Quality and Pollution Control Project (1994–2000 called Guarapiranga), a \$387 million project co-financed by the State and the World Bank. This project initiated the study of the Guarapiranga river basin, strengthened the institutional capacity to manage the basin in an environmentally sustainable manner, and improved the quality of life of the basin's slum dwellers by providing them with water supply and sanitation services. The achievements of the Guarapiranga project included slum upgrading activities in 52 slums. The project contributed to increased community awareness, as reflected in the enhanced level of respect for public areas, equipment and amenities, in the upgrading of households with residents' own funds, and in the overall post-program increase in real estate values. Guarapiranga also helped show the way to integrated interventions within a complex institutional framework.

Ongoing projects implemented with World Bank support in the MRSP include the Integrated Water Management in Metropolitan Sao Paulo (Mananciais Program), initiated in 2010, and to significant extend a legacy and continuation from Guarapiranga. This is a \$238 million project co-financed by the State, SABESP, the Municipalities of Sao Bernardo de Campo and Guarulhos. and the World Bank, whose objectives are to restore and protect the rivers, dams and streams of the MRSP used for water supply, to improve the quality of life of the population living in watershed areas, as well as to improve metropolitan management and coordination in water resources management, water pollution control, land-use policy and basic service provision. Activities being undertaken by the Mananciais Program include slum and low-income communities upgrading, housing and parks construction, implementation or extension of sewage and water supply systems and improvement of water quality control.

MANAGEMENT APPROACHES ARE EVOLVING TO ADDRESS INTEGRATED CHALLENGES

Encouraging cross-sector work through a conducive legal framework

In response to the pressing need for municipal and sectoral collaboration, the MRSP has recently established a number of innovative laws and programs set to overcome existing silos in urban water management.

To build on some of the coordination difficulties mentioned above with respect to the 1991 State Water Resources Law, an integrated slum-upgrading program was developed on the shores of the Guarapiranga reservoir. This program was supported by the World Bank and Inter-American Development Bank, and brought together key institutional players in to develop an integrated response to pollution challenges under the coordination of a new Alto Tiete Basin

Committee, which was established in 1994. These included: SABESP, with responsibility for water supply and sanitation interventions; municipalities, which must ensure appropriate land zoning, building permits and solid waste management; and CETESB, which regulates industries that discharge wastewater into the river. The Alto Tiete Basin Committee has further developed two Master Plans to address the issue of urban sprawl (approved in 2003) and conflicts over water use (approved in 2009).

In accordance with Law 9866 established in 1997, which defines the standards and guidelines for watersheds protection and restoration, an specific law for each watershed in the entire state should be developed. State Laws for the creation of Recovery and Protection Areas in the Guarapiranga and Billings river basins were already passed in 2006 and 2009, respectively. Furthermore, the Pricing System State Law 12.183/05 determined that its

application to the Alto Tiete basin would be subject to the establishment of laws for the specific sub-basins of Guarapiranga, Billings, Cotia, Juquery-Cantareira and AltoTietê -Cabeceiras. Therefore, laws for the last three sub-basins (Cotia, Juquery-Cantareira and Alto Tiete – Cabeceiras) still need to be developed and approved for the effective application of proceeds of water pricing in Alto Tiete.

In a similar vein, in 2007 the state government passed the State Complementary Law 1,025 to better coordinate water management efforts by the state government, SABESP and municipalities. The law strengthens the State's regulatory and enforcement role, integrates planning and implementation activities, and promotes collaboration between the state, municipalities and civil society by creating a State Council for water supply and sanitation (CONESAN).

Numerous initiatives have subsequently been launched by a variety of actors, with notable positive impacts. Amongst these, the Córrego Limpo program is a R\$200 million SABESP-Municipality of Sao Paulo program initiated in 2007 to remove wastewater pollution from 100 urban streams throughout the MRSP. Likewise, the Pacto das Águas was initiated in 2009 by the State Secretariat of Environment to engage all 645 municipalities in the state, encouraging them to set goals for improving water management including sanitation and headwaters and spring protection. A program was also launched by SABESP in 2008 to control water losses under this framework. Together the stakeholders have addressed many of the urban water management challenges through massive investments in slum upgrading and wastewater collection and treatment.

Following on these advances, a particularly significant step towards cross-municipal collaboration was



Urban upgrading solutions: linear park along Billings reservoir.
Source: Secretariat for Sanitation and Water Resources-Government of the State of Sao Paulo.

taken with the establishment of the Macro-Metropolis Plan, a long-term plan to provide more water to the MRSP by tapping new water sources. The plan covers three metropolitan regions: Metro Sao Paulo, the meso-region of Campinas, and the coastal

metropolitan region south of Sao Paulo. Overall this macro-metropolis includes 152 municipalities with 30 million inhabitants.

Making financing mechanisms available

The success of many of the multi-sector, multi-actor initiatives currently underway within the MRSP has been greatly spurred by the support of Federal plans such as the Growth Acceleration Program (Programa de Aceleração de Crescimento - PAC). The PAC is an ambitious Federal program designed to direct investment to various important infrastructure sectors, in particular water supply and sanitation, slum and urban upgrading, and housing. PAC funds are provided to State and municipal governments on both a loan and grant basis. The availability of this financing mechanism has been conducive to active collaboration between various water management entities. In the MRSP, joint requests for PAC resources have been made to the Federal Government by the State Secretariat for Sanitation and Water Resources, the Sao Paulo Municipal

Government, and the State Housing and Urban Development Company (CDHU), with particular emphasis on slum and urban upgrading, expansion of solid waste collection systems and resettlement of families. External financing by the World Bank, the Inter-American Development Bank, the Japan International Cooperation Agency and other external agencies has further catalyzed such efforts.

Opportunities for emulation in other cities

In spite of an overwhelming array of challenges, the MRSP has substantially improved the management of its water resources and its provision of urban services in recent years by adopting an integrated approach to these issues. Most prominently, this has required the passing of laws and the creation of official institutions explicitly incentivizing partnerships across sectors and municipalities in tackling the problems at hand. With time, the continued success of such good practices may become a valuable learning opportunity for other cities in the region. ■

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