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Innovative Results-Based Approach to Tackling Water Scarcity in São Paulo

By Carlos E. Velez and Julia Tierney

Water is an essential part of supporting sustainable economic growth within a more equitable and inclusive society. Possessing about 14 percent of the world's water, Brazil is rich in water resources, but 70 percent is in the Amazon River and only 1.6 percent in the State of São Paulo, where 25 percent of the population resides and 33 percent of the country's GDP is generated. The Bank has recently approved the innovative ***São Paulo Water Recovery Project (REAGUA)*** which adopts output-based financing to tackle water scarcity. This is the first Bank-financed project in the water supply and sanitation (WSS) sector to implement a comprehensive results-based scheme. Its objective is to increase clean water availability in São Paulo but its lessons could be applied worldwide.

Water Problems in the State of São Paulo

The State of São Paulo is emblematic of the urban water challenges facing Brazilian cities. Over the past three decades, Brazil has undergone a rapid process of urbanization, catalyzing economic innovation yet bringing myriad problems. Nowhere is this truer than the State of São Paulo, with over 41 million people, of which 95 percent live in urban areas, including the metropolitan region which is one of the largest cities in the world with 20 million inhabitants.

Among the critical issues facing the State of São Paulo are water scarcity and environmental degradation, both of which are constraints on economic growth and environmental sustainability. Despite high urban coverage rates to potable water (98 percent) and public sanitation (75 percent), the State faces water scarcity and pollution problems due to the low availability of water, high level of demand and lack of wastewater treatment.[1] The metropolitan region's extremely low per capita water availability is comparable to the driest areas of the Brazilian Northeast.

In this densely urbanized region an increase in water availability, both through an improvement in its quantity and an enhancement of its quality, is of crucial importance, but more investment is not the panacea as past interventions have been insufficient in terms of amplifying water availability. It is important to go beyond works to improve the efficiency of WSS systems and promote the sustainability of investments.

Output-Based Financing

Against this backdrop, São Paulo and the Bank have agreed on a programmatic engagement in the WSS sector that addresses the challenges of attaining universal coverage, promoting the sustainable use of water resources, implementing an integrated WSS strategy and developing institutional and technical capabilities among service providers to improve their efficiency and ensure their compliance with planning and regulation requirements. As part of this evolving and dynamic partnership, the State and the Bank agreed to execute a pilot project using output-based financing to tackle the issue of water scarcity in concurrence with the *Mananciais* Program, which focuses on pollution control and slum upgrading within the metropolitan region.

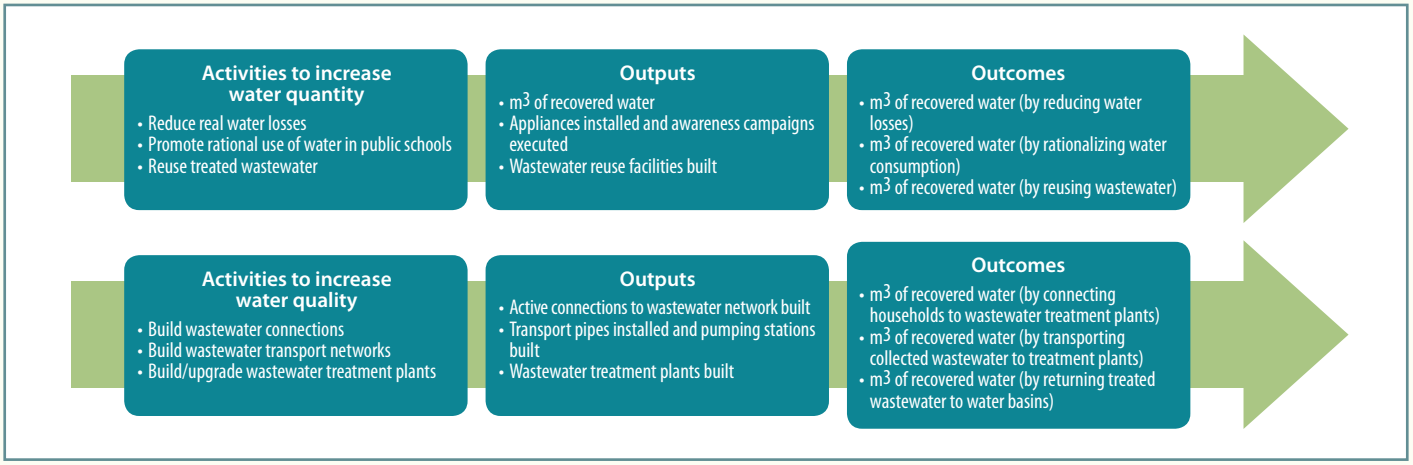
[1] Brazilian Institute of Geography and Statistics (IBGE) National Household Survey (2003).

REAGUA will use output-based disbursement to encourage investment aimed at increasing water availability in the State of São Paulo's most critical watersheds.[2] As opposed to the traditional input-based mechanism, whereby the Borrower finances specific investment expenditures (such as the inputs to build a wastewater treatment plant), the results-based approach finances outputs (the completed wastewater treatment plant) that are directly tied to outcomes (cubic meters of treated wastewater). Funds will be disbursed to state or municipal water service providers against independently verified outputs, effectively transferring performance risks to the service providers and explicitly linking funding to the achievement of project objectives. The disbursement of funds against outputs will sharpen the targeting of results in a more transparent, accountable and efficient manner. Public expenditure performance will improve as payments will shift financial and operational risks to those best positioned to manage such risks. Outputs will be verified by a verification agent to ensure that they are delivered according to agreed conditions and provide a critical fiduciary safeguard on accurate targeting of funds and evidence that public funding has been well spent.

The Bank is also moving in the direction of a more results oriented approach as it has expressed interest in eliminating the disconnect between programmatic engagement as reflected in the Country Partnership Strategy and the static stages of the basic project cycle.[3] REAGUA is a step in the direction of reform as it directly ties disbursements with results (outputs and outcomes) and facilitates a programmatic engagement by disbursing against agreed outputs rather than specific expenditures and moving to the use of government fiduciary and safeguards systems.

REAGUA Outputs and Unit Costs

REAGUA aims to increase clean water availability by focusing on increasing the quantity and enhancing the quality of water. Activities and their respective outputs and outcomes include:



The implementing agency is the State Secretary of Water Supply and Sanitation and Energy. It published a Call for Proposals outlining eligibility criteria: (i) activities had to target the five most water scarce basins in the State; (ii) priority had to go to serving the poor; (iii) activities had to be in an advanced stage of preparation; (iv) service providers had to be state or municipal companies; (v) service providers had to provide at least 10 percent upfront financing; and (vi) proposals could not involve resettlement or include procurement processes above the national competitive bidding threshold as this would facilitate implementation and avoid delays. All disbursements are in the form of subsidies from the State to the service providers. Although this was the State's first results-oriented scheme, the response from the service providers was huge, with US$275 million of proposals from over 30 service providers. These proposals were subjected to a rigorous economic, financial, technical, environmental and social analysis to determine their feasibility and select the highest ranking proposals for financing. The Bank will conduct a capacity assessment on all selected service providers to verify that fiduciary systems meet Bank standards to ensure that expenditures take place in lines with the principles of economy, efficiency, transparency and competition.

The calculation of unit costs to price the outputs was one of the most complex aspects of project preparation. An extensive selection of data from the National Information System on Water Supply, Sanitation and Solid Waste (SNIS); the National Water Agency's program partially subsidizing wastewater treatment plants by paying for results (PRODES) and the State Water Company (SABESP) was analyzed to determine the unit costs.

[2] The State has determined that watersheds are in critical condition when the relationship between demand and availability surpasses 50 percent, but because of the limited amount of project funds, investments will only be eligible if they target the most critical watersheds with a water demand/availability greater than 80 percent.
[3] Investment Lending Reform Concept Note discussed by the Executive Directors on February 12, 2009.

When calculating the unit costs for the water losses activities, where the cubic meters of recovered water is the output, the project team was reminded of the challenges of weight loss. Much like a weight loss program where shedding the first few pounds is relatively quick and easy but losing the remaining pounds takes longer, involves more strenuous efforts and requires a change in habits, the reduction of water losses is relatively easy for extremely inefficient service providers but more difficult for better managed utilities as these activities call for continuous, repetitive actions and a change in management focus to ensure sustainability. To account for the different levels of effort required to achieve substantial reductions in water losses, the service providers were categorized into four groups based on their technical performance,[4] with the inefficient ones receiving only R$1.80 for every cubic meter of recovered water but with the better performing ones, where further water loss reduction is the most difficult, receiving R$2.60 for every cubic meter of recovered water, as shown in Table 1.

Table 1. Calculation of Unit Costs for Water Losses

Technical performance category	Infrastructure Leakage Index (ILI)	Liters/connection/day (when the system is pressurized at a medium pressure of mwc=meters of water column)					Unit Cost
		10 mwc	20 mwc	30 mwc	40 mwc	50 mwc	
A	1 to 4	< 50	< 100	< 150	< 200	< 250	
B	4 to 8	50-100	100-200	150-300	200-400	250-500	
C	8 to 16	100-200	200-400	300-600	400-800	500-1000	
D	> 16	> 200	> 400	> 600	> 800	> 1000	
A	Further loss reduction uneconomic unless there are shortages; careful analysis to identify cost effective improvement						2.60
B	Potential for improvements with pressure management, better active leakage control practices and network maintenance						2.20
C	Poor leakage record tolerable only if water is plentiful and cheap; analyze level, nature of leaks and intensify reduction						1.80
D	Very inefficient use of resources; leakage reduction programs imperative and high priority						0.00

Intricate engineering modeling was also necessary to calculate the remaining unit costs. For example, to estimate the unit costs for the wastewater transport activities the diameter, depth, extension and initial wastewater flow for the gravity and forced transport pipes and the elevation and initial flow of the pumping stations, as well as the obstacles in the way of construction, affected the cost of building the network. As shown in Table 2 (on the next page), if the initial wastewater flow of the forced transport pipe is 40 liters/second, then according to the table of unit costs, the cost of the pipe is R$800/meter. For the pumping station with the same flow and height of 23 meters, the unit cost is R$780,000.

Verification and Sustainability

The Bank and the State have agreed on several safeguards to ensure that the agreed outputs are produced and delivered in an efficient, transparent and sustainable manner. All service providers will be required to enter into Project and Performance Agreements that set forth their obligations to: (i) deliver the outputs in accordance with timeframes, targets and sustainability conditions; (ii) follow fiduciary standards and comply with the Bank's social and environmental safeguards and anti-corruption guidelines; (iii) permit the verification agent to monitor outputs, indicators, targets and sustainability conditions; and (iv) refund intermediate payments if the final outputs are not completed in accordance with the standards specified in the Agreement. The midterm review will re-examine the unit costs, technical standards, performance indicators and targets to ensure that unit costs are in line with actual costs.

An independent verification agent will be competitively selected to monitor and verify that the outputs are produced according to standards established in the Agreement before the disbursement of project funds. Payments for completed outputs will be paid in two portions, a first payment (representing 70 percent of the value of the Agreement) for the delivery of the final output, and a second payment (representing the remaining 30 percent) for fulfillment of sustainability conditions.[5] This second payment will be withheld for a period to measure the sustainability of the outputs to ensure that they meet agreed technical standards, achieve performance targets and are operated and maintained to ensure continued service delivery.

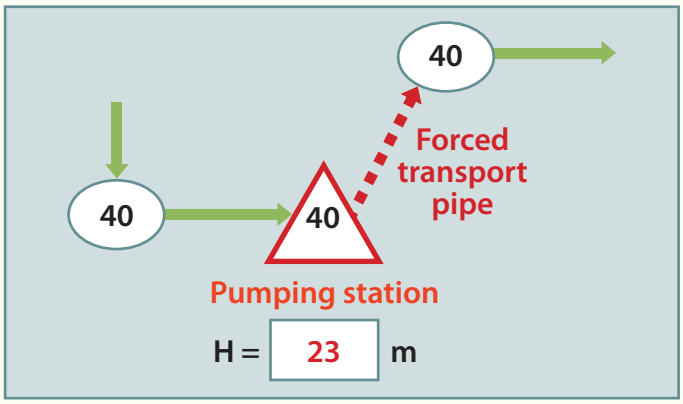
Lessons Learned

Incorporating lessons learned from the Mexico Decentralization Infrastructure Reform and Development

[4] Technical performance categories were developed by Liemberger & Partners based on criteria from the International Water Association, as referenced in *The Challenge of Reducing Non-Revenue Water in Developing Countries: How the Private Sector Can Help* by Bill Kingdom, Roland Liemberger and Philippe Marin. Water Supply and Sanitation Sector Board Discussion Paper Series, Paper No. 8, December 2006.

[5] In the case of water losses, the first payment will be 60 percent and the second payment will be 40 percent of the value of the Agreement to reflect the importance of ensuring the sustainability of activities to reduce water losses.

Table 2. Unit Costs of Wastewater Transport Network



Reference Unit Costs for Wastewater Pumping Stations								
Average Initial Flow	l/s	m^3/h	Height (meters)					
			5	10	15	20	25	30
	1.4	5	80	110	130	150	170	190
	2.8	10	110	150	190	220	240	260
	5.6	20	150	220	260	300	340	370
	8.3	30	190	260	320	370	410	450
	11.1	40	220	300	370	420	470	520
	13.9	50	240	340	410	470	530	580
	16.7	60	260	370	450	520	580	630
	19.4	70	280	400	490	560	620	680
	22.2	80	300	420	520	600	660	730
	25.0	90	320	450	550	630	700	770
	27.8	100	340	470	580	660	740	810
	33.3	120	370	520	630	730	810	890
	38.9	140	400	560	690	**780**	870	960
	44.4	160	420	600	730	840	930	1,020

Reference Unit Costs for Forced Wastewater Pipes		
Average Initial Flow		Reference Unit Cost (R$/m)
m^3	liters/second	
11	3	120
18	5	170
25	7	220
36	10	290
54	15	390
72	20	480
90	25	570
108	30	650
144	**40**	**800**
180	50	950

Loan Project, where unit costs were not predefined and required revision during implementation, REAGUA's unit costs have been methodically based on proven engineering models and subject to review and benchmarking by expert independent consultants. As one of the most important by-products of output based financing is the establishment of a clear results framework, REAGUA's outputs have been defined in the Project and Performance Agreements. REAGUA will disburse funds not against individual expenditures on the input side but against agreed outputs to avoid the problems of double accounting. REAGUA has also borrowed innovative features, such as the independent verification agent, successfully applied by the Global Partnership for Output-Based Aid (GPOBA).

REAGUA does not intend to be the solution to the problem of water scarcity in the State of São Paulo but to develop and implement a promising approach that through a longer time horizon and with appropriate financing may eventually solve the problem faster, safer and less expensively than through the conventional type of input-based financing. The project's results-based financing mechanism was designed in the expectation that it will sharpen the focus on efficient, transparent results that transfer risks to the service provider. Instead of the traditional rink-fenced infrastructure project based on inputs, REAGUA is focused on broader concerns with obtaining results, ensuring effective public expenditure and strengthening institutions. The hope is that in tackling the State of São Paulo's water scarcity problems from a results-based perspective, REAGUA provides lessons that could be applied worldwide to other urban areas grappling with constraints to growth, environmental degradation, lack of service access by the poor and inappropriate planning and management of WSS services.

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