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Case Study VI* - The Upper Tietê Basin, Brazil

* *This case study was prepared by Roberto Max Hermann and Benedito Pinto Ferreira Braga Jr*

VI.1 Introduction

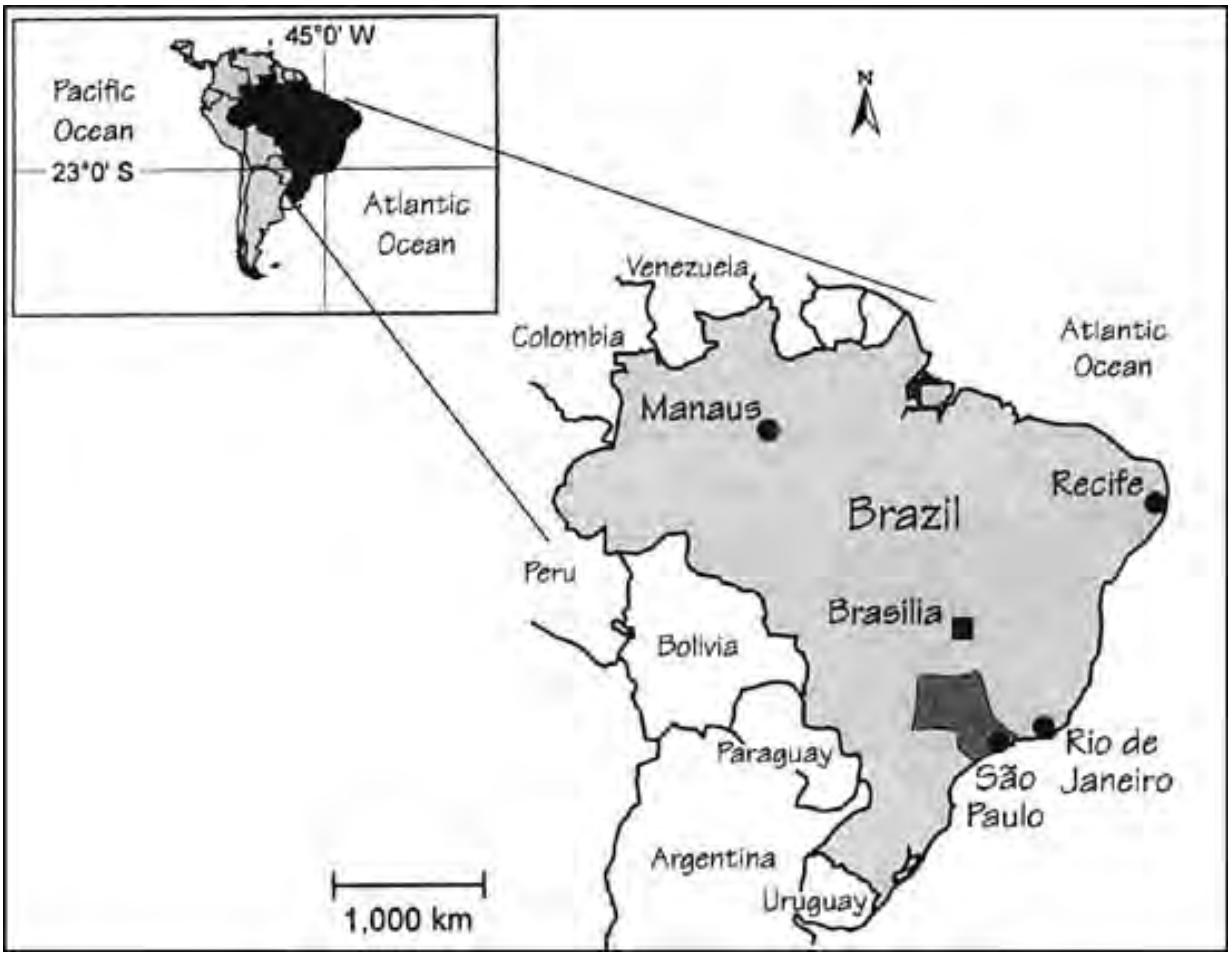
The São Paulo Metropolitan area, located in the Upper Tietê River basin, comprises 38 cities in addition to the city of São Paulo. The spectacular growth that has occurred in this area has been accompanied by an enormous increase in population and associated serious environmental problems related to water pollution. The water supply system provides about 60 $m^3 s^{-1}$ for this area, about 80 per cent of which is returned untreated to the main water courses. Water quality problems are compounded by the fact that the rivers form part of a system designed exclusively for electric power generation. This system requires the flow to be reversed and, consequently, a mixture of untreated wastewater and the natural river flow remain permanently within the boundaries of the metropolitan area.

Public outcry has forced the State of São Paulo government to take action towards improving the environmental quality of its waters. The Tietê Project was launched in 1991 with the ambitious goal of treating 50 per cent of the total wastewater by 1996. This goal would be accomplished with three new wastewater treatment plants, with the expansion of an existing plant and with the implementation of several others accessory works, such as sewer collection networks and interceptors. As part of this project, industries are also required to comply with emission standards set in 1976 and which have never before been enforced.

VI.2 The metropolitan region of São Paulo

The metropolitan region of São Paulo (Figure VI.1), which includes the city of São Paulo and 38 adjacent cities, occupies 8,000 km^2 of which 900 km^2 is urbanised. The whole area is situated about 700 m above sea level and is mostly part of the Upper Tietê basin. The Tietê River is the largest river in the State.

Figure VI.1 Location map of Brazil showing the Upper Tietê basin, State of São Paulo, Brazil

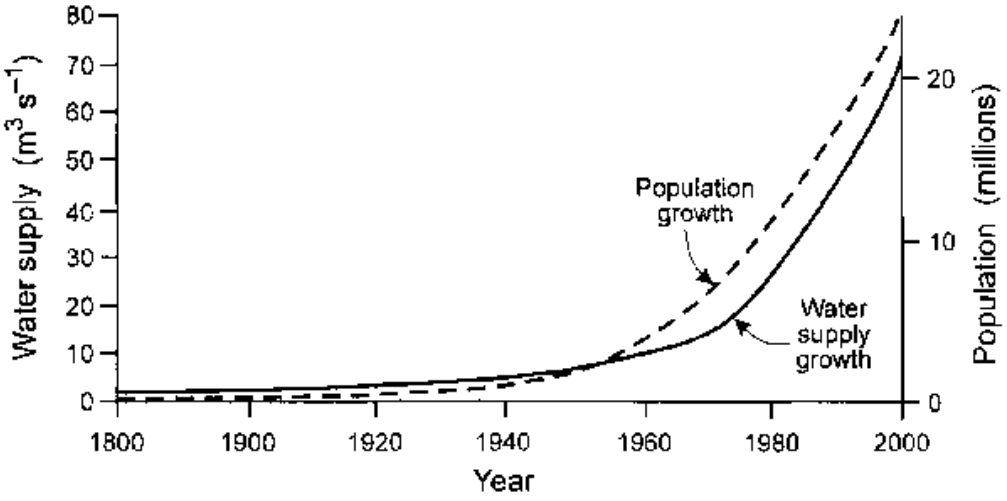


The present population of the area is about 16 million and is estimated to reach about 19 million by the year 2000. In 1880 the population was about 4,000, increasing to 200,000 in 1930, 1 million in 1940 and 6.5 million in 1970. This growth is also reflected in the urbanised area which, in 1880, was 2 km^2, growing to 130 km^2 in 1940 and 420 km^2 in 1954. In addition, the demand for municipal water supply is growing exponentially, from 5 $m^3 s^{-1}$ in 1940 to a projected 65 $m^3 s^{-1}$ by the year 2000 (Figure VI.2).

This region has the largest urban concentration in the whole of South America and the largest industrial complex in Latin America. The industrial output is 27 per cent of the national total and 62 per cent of the State total. The motivation for this rapid development arose during the 1940s in an effort to substitute imported goods with indigenous products. The consequences of this level of production and the concurrent population increase are a high population density (0.1 per cent of the total country area is occupied by 12 per cent of the total population), a high energy demand of 7,000 MW (25 per cent of the total Brazilian demand) and, especially, through several problems of conflicts over water use. The fast industrial development has resulted in rapid urbanisation, demanding electric power generation, water supply and flood control. A lack of capital resources has induced serious environmental problems. Only 10 per cent

of the total sewage is treated at secondary level and, as a consequence, the urban rivers are highly polluted with a variety of industrial and municipal wastes.

Figure VI.2 Past and projected growth in population and water supply in the São Paulo region

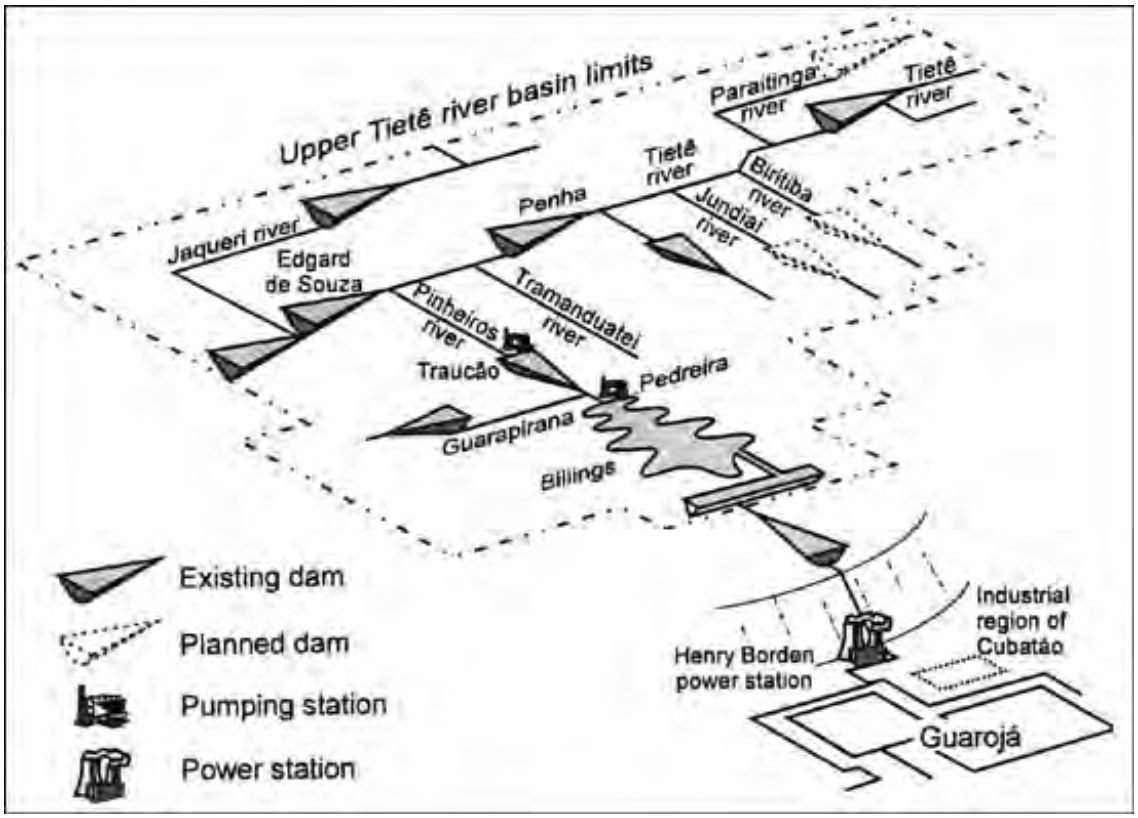


VI.3 Pre-intervention situation

Geography and history have been influential in shaping early water resources development in the São Paulo metropolitan area. The first large hydraulic project was conceived purely for the purpose of generating hydroelectricity and stemmed from the need to supply cheap energy for industry. The system was designed to take advantage of a hydraulic head of about 700 m and was completed in the late 1950s (Figure VI.3). It includes several dams, two pumping stations that reverse the flow direction of the Pinheiros river, and two power plants located at the foothills of Serra do Mar, at sea level.

The implementation of this system resulted in very low velocities in the Pinheiros and Tietê rivers, which between them receive almost all the sewage generated in the region. Only about 10 per cent of this sewage is treated at the secondary level and, therefore, severe environmental problems were experienced. The complexity of the system grew as the need to increase municipal water supplies resulted in some of the reservoirs (originally planned for hydroelectric generation, e.g. the Guarapiranga reservoir) being used to supply water. The untreated sewage, flowing through the main channels, was then used for power generation.

Figure VI.3 Configuration of the first hydroelectricity generation system in the Tietê basin



Several attempts have been made in the past to control water pollution in this river basin. As early as 1953 a plan involving the construction of six wastewater treatment plants at secondary level was proposed by the city of São Paulo. Many other plans have been proposed, but in the late 1980s and early 1990s construction started on the gigantic SANEGRAN Project. This project included, among other features, a wastewater plant with a final treatment capacity of 63 $m^3 s^{-1}$.

At present, the main rivers in the region receive a daily discharge of about 1,200 t organic load and 5 t inorganic load. Of these, about 370 t d^{-1} organic load and the entire 5 t d^{-1} inorganic load are believed to be generated by industry.

VI.4 The Tietê Project

Public outcry against the problems caused by the very poor environmental quality of the water bodies in the area reached a climax during the late 1980s. The media played a very important role in organising several objections against the degradation; a petition to the State Government demanding action had over one million signatures.

In September 1991, the State Government launched the Tietê Project, to clean up the rivers and reservoirs of the São Paulo area. Two publicly owned companies are involved in this process:

• Companhia de Saneamento Basico de São Paulo (SABESP) which is a utility company responsible for planning, building and operating the water supply and sewage systems in the state of São Paulo, including the São Paulo metropolitan area.

• CETESB (Companhia de Tecnologia de Saneamento Ambiental) which is in charge of environmental control at the state level.

To manage the Tietê Project, the government of the State of São Paulo created, by a special decree, a task force with selected professionals from both of these companies and six other State departments. The directive committee is chaired by the State Governor himself.

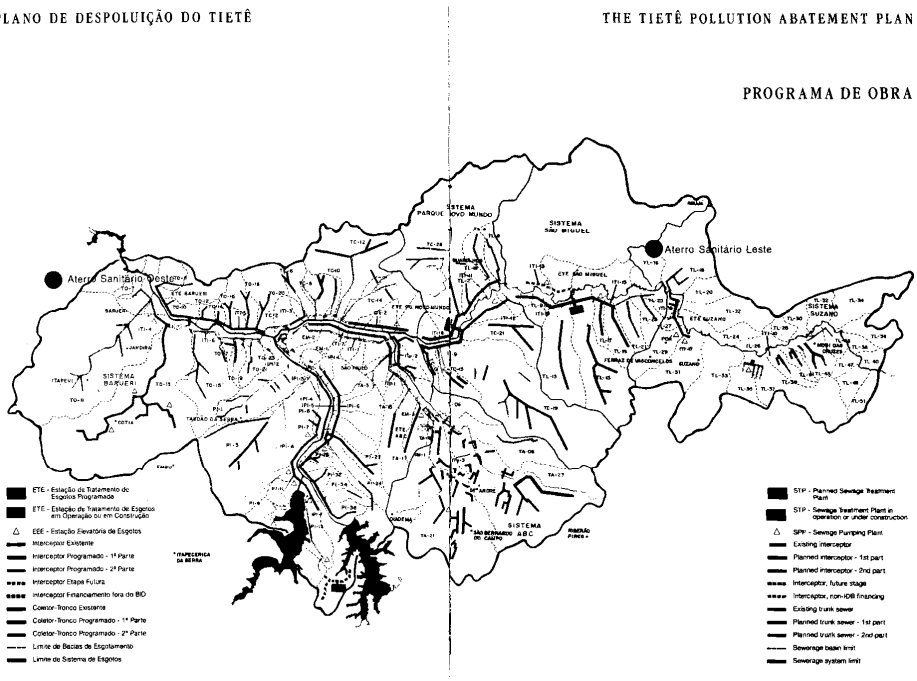
The Tietê Project began with a master plan for sewage collection and disposal which had been prepared during the period 1983-87. Under this plan, five wastewater treatment plants were considered with a total capacity of 53.2 $m^3 s^{-1}$. This first plan was reviewed and updated to increase the treatment capacity. Three new treatment plants were also designed and one of the existing plants was considerably enlarged. All five plants use the activated sludge treatment method. Sewer collection networks and interceptors were also enlarged. Figure VI.4 shows the Tietê Pollution Abatement plan as it is being implemented.

The Tietê Project is funded by a loan from the InterAmerican Development Bank (IADB) of about US$ 450 million and matching funds provided by the State of São Paulo of US$ 600 million over the three years from 1994 to 1996. During this period, the industries, which are being enforced through a special programme co-ordinated by CETESB, have invested about US$ 200 million in the implementation of treatment systems. The operating costs are also being met by the industries.

VI.5 Industrial wastewater management

Brazilian law requires industries to discharge their wastewater into the public sewer network whenever feasible. With the expansion of the collection system, a large number of new industries connected their sewage outlets to the public network and, as a result, overloaded the treatment plants. To avoid such problems and to preserve the treatment process, all industries are required to comply with permits issued against strict standards. As the agency in charge of environmental control at the state level, CETESB is responsible for enforcing state laws requiring permits for industrial effluent discharges into the collection system. Although this State Law, number 997, was passed in 1976 it was not strictly enforced until 1991. Starting in 1991, CETESB began a major programme to assess the industrial effluents of every industry located in the São Paulo metropolitan area. There are about 40,000 licensed industrial plants in the area but only 1,250 are believed to be responsible for about 90 per cent of the organic and inorganic loads. Based on information provided during the licensing procedure these 1,250 industries were selected for closer investigation. Intense negotiations were undertaken with all the 1,250 main polluters. They were asked to submit plans, and a schedule for implementing treatment plants, that would enable them to comply with the emission standards and permits required by the State Law 997.

Figure VI.4 The Tietê Pollution Abatement Project



After collecting all the information, CETESB defined a system called STAR (Sistema de Tratamento de Águas Residuárias, or Wastewater Treatment System) which is an information protocol establishing the treatment processes for each industry together with the schedule for the implementation of the treatment and the permit system, under the agreement signed by CETESB and the industries. The information gathered under STAR was stored in a data bank at the CETESB headquarters.

Industries were supported through loans, which were provided if needed, and were drawn from funds from two different sources: CETESB itself, which was in charge of managing a special line of credit directly from the World Bank (PROCOP), and BNDES, a Brazilian federal agency conceived to help industries to improve their performance. During the implementation of the treatment systems, CETESB monitored the effluent discharges closely using mobile equipment and also the receiving water bodies at fixed points. Industries are gradually introducing self-monitoring and CETESB is establishing a compliance monitoring system, in order to check the results reported from the self-monitoring as an aid to the implementation of enforcement actions. This procedure is followed continuously thereby assuring long-term compliance with legal standards. The process is illustrated schematically in Figure VI.5.

Figure VI.6 shows the number of industries with effluent control at different stages by the end of September 1994 and Figure VI.7 shows the gradual increase in the number of industries which had achieved the effluent treatment targets set by CETESB. Of the 1,250 targeted industries, 1,007 had their treatment systems working satisfactorily. The resulting decrease in pollution loads between 1991 and 1994 are shown in Figure VI.8. The organic load of 370,000 kg BOD d^{-1} at the outset of the process was reduced to

150,000 kg BOD d^{-1} in September of 1994. The inorganic load decreased from 4,700 to 1,600 kg d^{-1}.

Figure VI.5 Schematic representation of the pollution control process in the Tietê basin

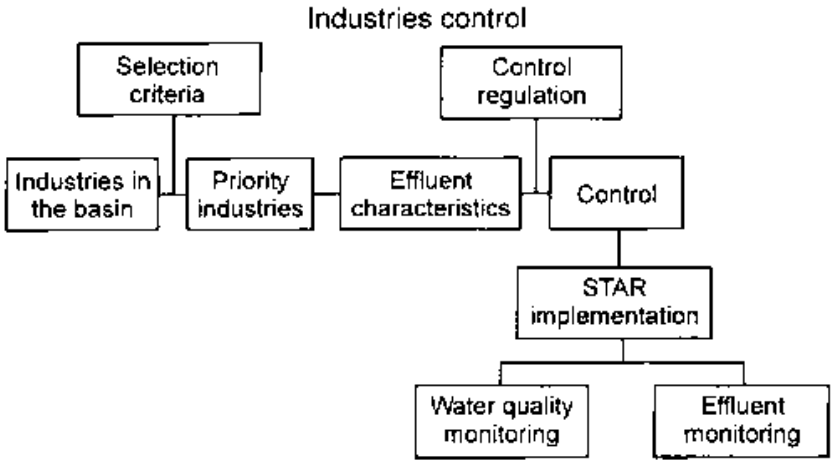


Figure VI.6 Number of industries with effluent control at different stages by September 1994

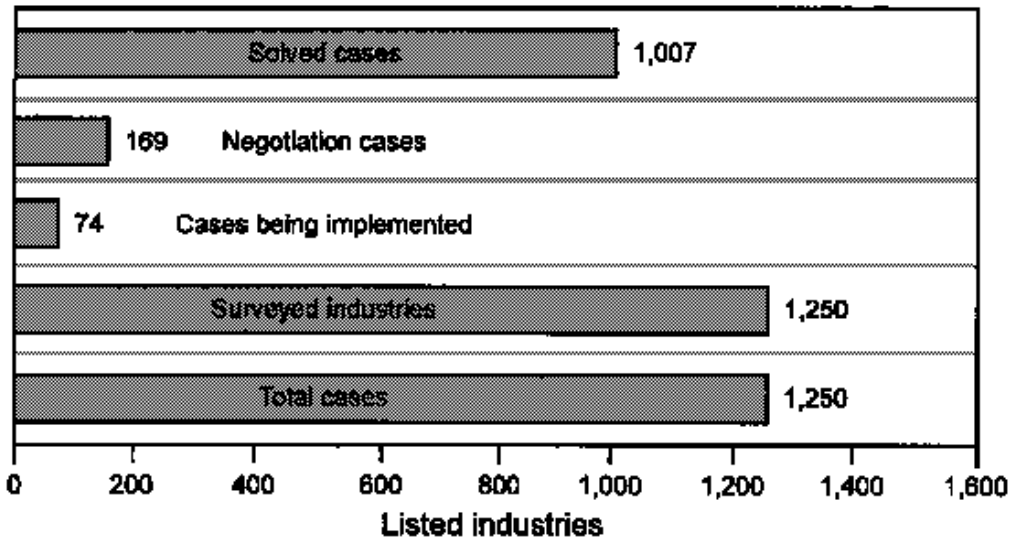


Figure VI.7 Progress in the implementation of industrial effluent control, 1992-94

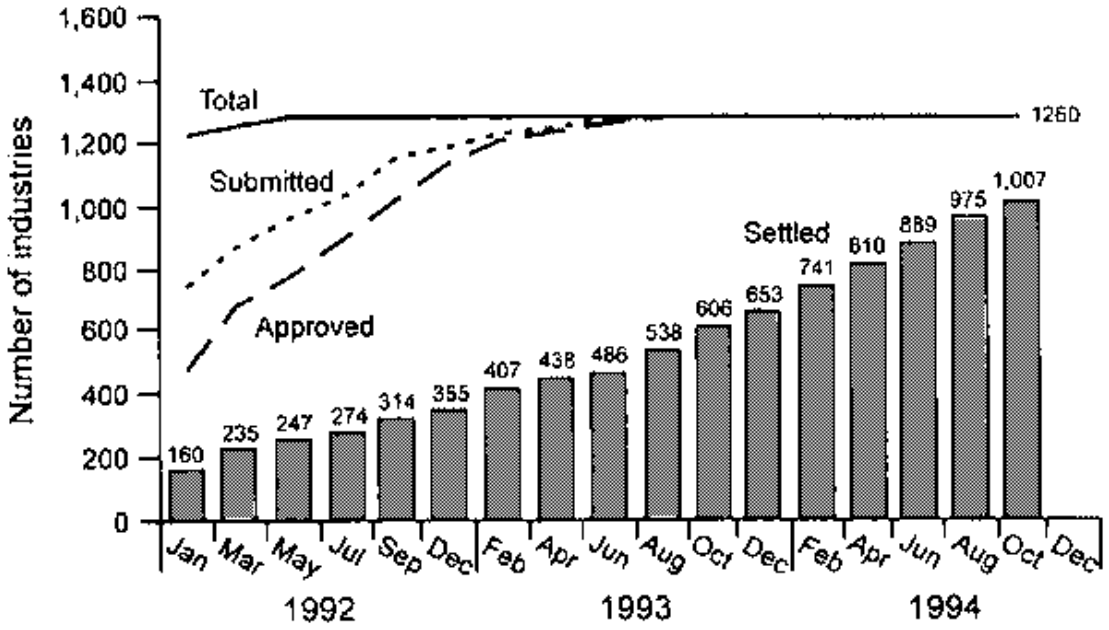
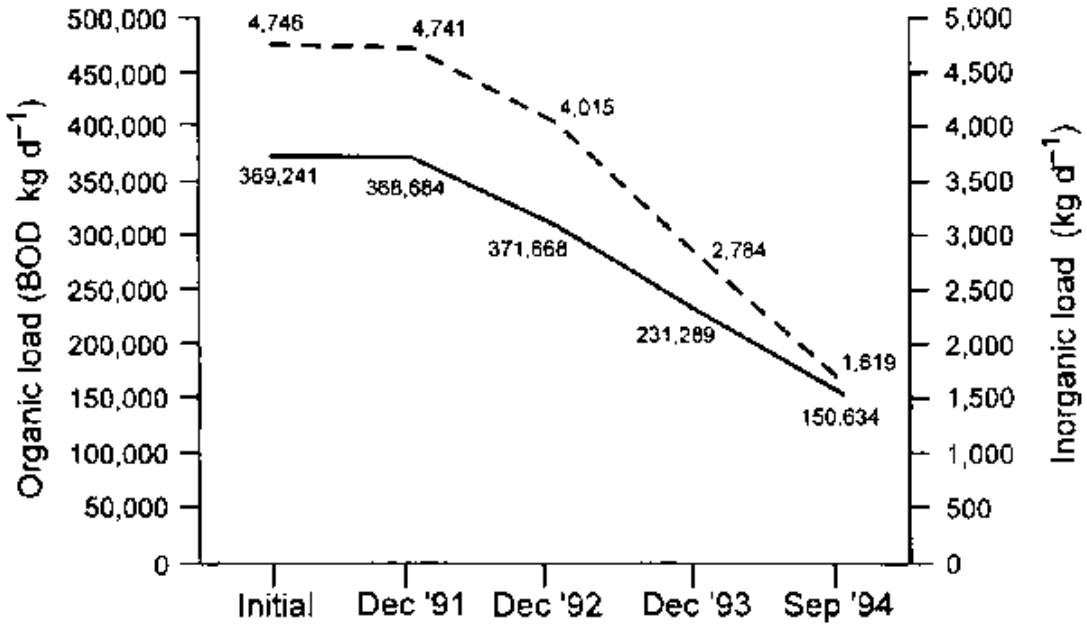


Figure VI.8 Decreases in industrial pollution loads resulting from the installation of effluent control, 1991-94



VI.6 Conclusions

This successful case study of industrial wastewater management and control illustrates the importance of public participation. Elected officials are particularly sensitive to public opinion, in order to satisfy their voters. From the late 1980s onwards, when citizens began protesting against the degradation of local water bodies, the permit system was

enforced and compliance action began to take place. This was possible under a State law that was passed in 1976 but had never before been enacted.

In addition, many industries decided to support the programme, by adopting efficient treatment methods to promote pollution control, and also to win a better public image as a result of public pressure. Finally, it should be noted that credit was available, where and when necessary, which made the investment decisions much easier.

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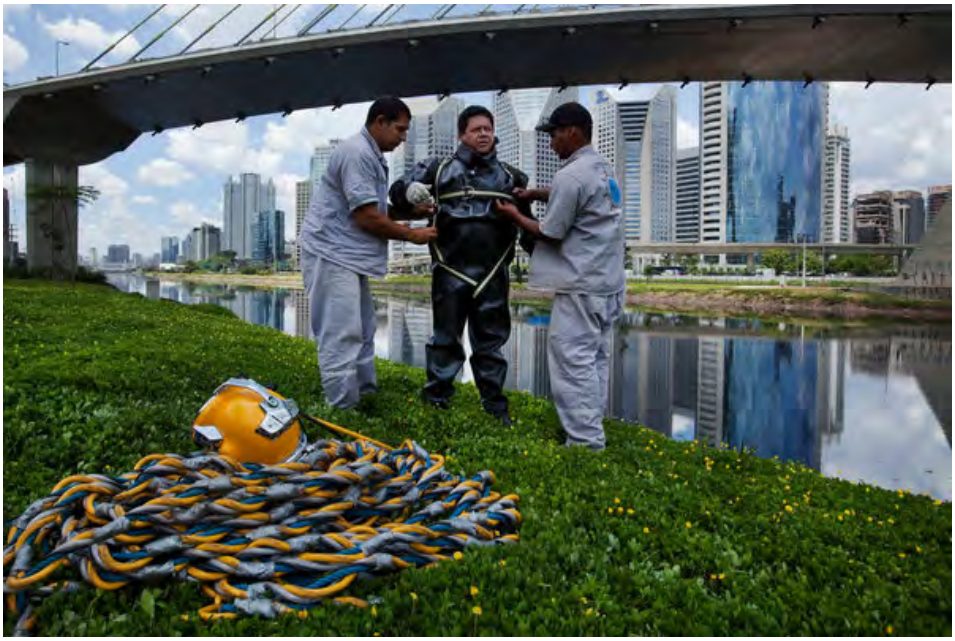

Lalo de Almeida for The New York Times

"It's like I'm in space, pondering a civilization which has pushed itself to the edge of destruction." JOSÉ LEONÍDIO ROSENDO DOS SANTOS

By SIMON ROMERO
Published: December 14, 2012

SÃO PAULO, Brazil

THE Tietê and Pinheiros Rivers, which cut through this metropolis of 20 million, flow well enough in some parts. But in certain stretches, they ooze. Their waters are best described, perhaps, as ashen gray. Their aroma, reminiscent of rotten eggs, can induce nausea in passers-by.

José Leonídio Rosendo dos Santos has been diving into both rivers for more than 20 years. Hired largely to unclog drainage gates, he scours the murky depths of the Tietê and Pinheiros, which have symbolized São Paulo's environmental degradation for decades, bringing to the surface a list of items that is eerie and bizarre.

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The Pinheiros has been polluted for decades; in some places, it has slowed to an ooze.

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Wild capybaras, the world's largest rodents, along the shore of the Pinhieros.

Over the years, his takings (which, as a contractor for public utility companies, he is required to hand over to the authorities) have included a suitcase with $2,000 inside, handguns, knives, stoves and refrigerators, countless automobile tires, and, in another suitcase, the decomposing remains of a woman who had been dismembered.

“I stopped looking for suitcases after that,” said Mr. dos Santos, 48.

He readily admits that jumping into rivers that rank among the world’s most polluted is not for everyone. But for Mr. dos Santos, a surfer who got into diving to pay for his wave-catching habit, his job has brought him an unusual level of notoriety and admiration from Paulistanos, as the residents of this hard-bitten megacity are called.

On the traffic-clogged highways that trace the rivers’ banks, some drivers stop their cars, taking pictures with their smartphones when they see him preparing to dive. Talk-show hosts marvel at his courage. One newspaper here, describing Mr. dos Santos in his futuristic diving garb, compared him to a “Japanese superhero.”

Part of the fascination with Mr. dos Santos has to do with how Paulistanos view their rivers. As the historian Janes Jorge recounts in a book on the city’s largest river, the Tietê (pronounced tchee-uh-TEY), it was adored by city residents as recently as the middle of the last century, when they fished, swam and held rowing competitions in its waters.

Then São Paulo rapidly expanded to become one of the world’s largest cities, its residents moving into high-rise buildings, gated enclaves and sprawling slums. Factories deposited their waste in the rivers. Flourishing districts in São Paulo’s metropolitan area expanded without basic sanitation systems, discharging sewage directly into the Tietê and Pinheiros.

The rivers now persist in Brazil’s popular culture as dystopian objects of derision. Rock bands like Skank composed songs about the seemingly impossible dream of cleaning up the Tietê. Laerte Coutinho, a cartoonist, created an entire strip, “Pirates of the Tietê,” in which marauders set forth from the malodorous river on raiding expeditions across contemporary São Paulo.

MR. DOS SANTOS, soft-spoken and bespectacled, insists that he has never seen any pirates navigating the Tietê or its tributaries. But he has glimpsed other living beings. Herons tiptoe along some riverbanks. He said that capybaras, the world’s largest rodents, roll in the mud along some stretches of the Tietê and Pinheiros. Alligators have been known to emerge from the rivers, weary but resilient.

One of the most astonishing sights of all, Mr. dos Santos said, was a man in São Miguel Paulista, a gritty district on São Paulo’s eastern fringe, who went by the name Pezão and dived into the Tietê without any gear in search of metal to sell to recyclers. “If there’s anyone who deserves recognition, it’s that guy, not me,” Mr. dos Santos said.

Still, he said he held out hope that the stubborn presence of life along São Paulo’s rivers might reflect the latest phase in their existence: the attempts to resurrect them. Since 1992, the authorities have been advancing with a painstakingly slow project to clean up the Tietê and Pinheiros.

Political leaders here contend that the cleanup effort, financed with loans from the Inter-American Development Bank, is going swimmingly. Gov. Geraldo Alckmin even said this year that by 2015, boats could start taking tourists down the Tietê for glimpses of São Paulo’s wonders. (“The problem is removing the smell,” he acknowledged.)

Brazilian scientists point to precedents of restoring vital waterways, as Paris has done with

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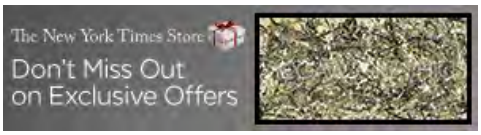
Rebound in exports signals hope in Japan



the Seine or London with the Thames, allowing salmon to thrive there decades after they had disappeared.

Cleaning the Tietê and its tributaries, however, offers complications that are in a league of their own, and paramount among them is access to sewage treatment. This deficiency plagues Brazil's only truly global city, in which hedge funds inhabit hulking postmodern skyscrapers, well-heeled consumers stream into luxury shopping malls and immigrants are as likely to speak Castilian Spanish as Quechua.

At the same time, four million people — about 20 percent of São Paulo's metropolitan population — still lack basic sanitation, according to Monica Porto, an expert on water reservoir management at the University of São Paulo. One area in metropolitan São Paulo, Guarulhos, with a population of about 1.3 million and home to the city's international airport, treated almost none of its sewage before 2011.

PROGRESS is slowly being made to hook up more homes to the sewage system. But São Paulo's hilly geography and its patchwork of squatter settlements, which persist in areas close to the rivers, make this a forbidding task. So the waste of millions, along with some industrial byproducts of dubious origin, still flows into the waterways once treasured by Paulistanos.

"We need to adjust our expectations," said Ms. Porto, who cautioned against projections that the rivers could soon have recuperated ecosystems. "By 2030, we could have rivers we shouldn't be ashamed of," she said. About Mr. dos Santos and his unusual vocation, she had just one thing to say: "Poor thing."

Still, Mr. dos Santos considers himself anything but unfortunate. The money is not great for diving in São Paulo's rivers, with a salary of about $2,200 a month, but the job has enabled him to raise a family and buy a home. He proudly owns his own Kirby Morgan diving helmet, and he never touches the water without being in protective plastic gear that is thicker than a normal wet suit and requires assistance to put on.

He says that stress is part of each dive. His vision is severely impaired once under the water of the murky rivers. The stench, he acknowledged, can overwhelm. Then there is the fear of tearing his diving suit on a piece of metal, which could lead to infection, or coming across carcasses. "After every dive, I have a glass of Montilla Carta Ouro rum," he said. "It helps me feel clean."

But Mr. dos Santos says there is also something special about his job, if only because so few people can do what he does. By his own reckoning, the city's rivers are a bit cleaner than they once were. He comes across fewer cadavers than in years past, and the Tietê, he said, now smells somewhat better than the Pinheiros, where he now does most of his diving.

His dives also give him a rare perspective on this intimidating city. "This sounds crazy, but the rivers are the most peaceful place in São Paulo," he said.

"When I drop to their depths, it becomes absolutely quiet," he added. "It's like I'm in space, pondering a civilization which has pushed itself to the edge of destruction."

A version of this article appeared in print on December 15, 2012, on page A7 of the New York edition with the headline: A Willing Explorer of São Paulo's Polluted Rivers.

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Brazilian Water Protection a $100 Million Market?

São Paulo state's Atibainha Reservoir feeds the Cantareira water system, one of Latin America's biggest. Water utility Sabesp says it helped to plant more than 500,000 trees in surrounding areas to protect water supply.

IMAGE COURTESY SABESP

By By Theresa Bradley
for National Geographic News

PUBLISHED JUNE 4, 2010

This story is part of a special series that explores the global water crisis. For more visit National Geographic's Freshwater website.

Helga Hissa used to get soaked to promote better water management. In presentations to groups of Brazilian small farmers, she'd stand tall as her boss dumped a cup of water on her head, pointing as her wild, curly hair soaked it up.

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He'd then pour some on a bald volunteer, watching it roll off the man's scalp and down his back.

The same happens when rain hits deforested land, Hissa's team at the state agriculture ministry argues. Without vegetation to absorb it, more rain rolls off soil, speeding erosion, polluting water with sediments, and preventing the speedy recharge of reservoirs that supply Brazil's biggest cities. Hissa and her colleagues want farmers to plant trees to prevent that.

Across Brazil, efforts are under way to recruit and reward rural residents to safeguard water sources and forests that normally retain water. Basically, they are paid to protect and plant trees.

Freshwater is one of Brazil's most plentiful resources, with the country holding about 15 percent of Earth's supply. But pollution and potential shortages are jeopardizing the farms and factories that drive the nation's booming economy. Paying for protection may be the cheapest way to both preserve and naturally purify water, without extra—and expensive—treatment.

Cash incentives also give farmers a reason to cooperate with conservationists and have the potential to jump-start a broader "environmental services" market that could generate more than $100 million (U.S.) a year to fund conservation projects in Brazilian water basins.

The country's biggest states and the national legislature are considering legislation to regulate such payments, while a dozen pilot programs are already spending tax revenues, environmental fines and water-use fees to encourage conservation.

"There are a lot of environmental problems that people aren't aware of, but they can see water pollution, they can see erosion; they're conscious that they have to do something," said Hissa, now technical coordinator at Rio de Janeiro state's program for sustainable rural development.

Valuing the Land's Environmental Contributions

Interest in "payments for environmental services," or PES, is growing worldwide, pushing landowners to protect forests not only by penalizing

illegal cuts, but also by paying for their properties' positive environmental contributions, including carbon sequestration, biodiversity preservation, and water filtration. Trees planted as buffers along streams, rivers, and lakes can significantly enhance water quality.

Carbon credits, one of the best-known PES vehicles, allow landowners to cash in on the carbon dioxide emissions that their trees absorb from the air, relieving the atmosphere of a portion of global warming gasses. Charging for erosion control or natural water filtration offers a comparatively concrete transaction, as local groups charge water utilities or municipal governments to preserve nearby basins, tapping what the UN calls a $2-billion-a-year (U.S.) market for global watershed services.

"You need to combine the carrot and the stick," said Marcelo Morgado, environmental adviser to the head of Brazil's biggest water utility, Sabesp. "A farmer won't just lie in his hammock and say, 'Oh, my trees are so beautiful, let me keep them.' You need to support people to do the right thing."

New York City pioneered watershed payments in the 1990s, when it avoided building a $4 billion (U.S.) water treatment plant by instead spending less than $2 billion (U.S.) to expand, and help upstate farmers protect, 2,000 square miles (5180 square kilometers) of land, lakes, and reservoirs that naturally filter water for 8 million city dwellers.

Brazilian officials are studying New York's model and soliciting advice from current and former Empire State officials. The architect of the New York plan, former New York City Department of Environmental Protection commissioner Albert Appleton, insists that paying for conservation rather than cleanup can save any city money—and create revenue for surrounding rural areas.

"Brazilians are beginning to realize that the environment can actually be good for the economy," Appleton said, recalling talks he had in 2009 with water officials in São Paulo.

Rise of Brazil's Water Committees

Brazil holds more water than any nation and 2.5 times the U.S. supply, according to the California-based Pacific Institute research center. But those resources are unevenly distributed, with three-quarters in the Amazon—home to just 4 percent of Brazilians—and one twelfth along the southeastern coast,

where 47 percent of the population lives, Brazil's National Water Agency says.

In São Paulo state, an industrial hub of 40 million people, pollution and sediment have caused water treatment costs to quadruple since 1996, utility Sabesp reports, while 30 percent of water is lost each year to leaks and theft in sprawling favela slums, where residents puncture passing pipes to siphon supply, according to state data.

Federal water policy initially ignored such problems, focusing instead on hydropower, which provides 85 percent of Brazil's electricity. But a 1997 law finally gave water economic value, creating a network of more than 80 local watershed committees empowered to charge and spend "water-use" fees levied on consumers.

Brazilians now pay less than 80 cents (U.S.) per cubic meter (35 cubic feet) of water, according to Ronaldo Seroa, an environmental specialist at Brazil's Institute for Applied Economic Research—slightly less than New Yorkers. Still, studies suggest that São Paulo's 22 watershed committees will together collect at least 140 million reals ($75 million U.S.) a year by 2011, which they could spend on preservation, said Renato Armelin, a technical manager at the state's Environment Ministry.

A bill now before Brazil's congress would promote that sort of spending, creating a PES registry and funneling part of the nation's swelling oil income to farmers who conserve forests. A vote is expected after general elections in October 2010. São Paulo and Rio de Janeiro are drafting similar laws, while Espirito Santo, a top oil-producing state, already sends 3 percent of oil royalties to a water fund that rewards conservation. National Water Agency programs also provide about $28 (U.S.) per year per acre of land preserved.

Environmental economists suggest using water fees to protect public property, too. Researchers found it would cost affected consumers an extra 41 cents (U.S.) per year—about 0.0001 percent of Brazil's minimum annual wage—to preserve Tres Picos, Rio's largest state park.

Such costs are too small to hurt individual water users, but in sum offer water stewards a real incentive. That combination of affordability and impact could make watershed services a key building block for the larger environmental services market, drawing unlikely partners to preservation, said Fernando Veiga, environmental services manager at The Nature Conservancy in

Curitiba.

“Now there’s common ground for agricultural and environmental guys to move beyond their old disputes about the environment versus development,” Veiga said. “This kind of watershed approach can actually bring us together.”

Theresa Bradley reported from Brazil as a fellow for the International Reporting Project.

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The Economist

Pollution in Brazil

The silvery Tietê

Cleaning up an open sewer

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A BRAZILIAN radio programme broadcast in 1990, "The Meeting of the Rivers", compared the condition of London's River Thames with São Paulo's Tietê. The Thames had been reborn, starting from when Joseph Bazalgette, a Victorian engineer, began to build sewers that diverted the filth downstream. The Tietê was choking in waste from 33,000 factories and sewage from 13m people, more than four-fifths of it untreated. The river was biologically dead as far as Barra Bonita, 260km downstream from São Paulo city.

The show struck a chord. Newspapers and NGOs joined the campaign to clean up the river. A petition attracted 1.2m signatures. Finally, in 1992, Projeto Tietê was launched.

Unlike many other infrastructure projects in Brazil, this one kept going through hyperinflation, financial crises and changing political leaders. Cheap loans helped the biggest industrial polluters to become cleaner. New water-treatment plants were built and sewage pipes laid.

Twenty years later, the Tietê is still stinking and filthy as it flows darkly through São Paulo. But not for much longer. Today 55% of the city's sewage is treated; by 2018, 85% should be. The state governor, Geraldo Alckmin, is trying to get the 35 municipalities in the Tietê's basin to co-operate: until 2010 Guarulhos, a satellite city of 1.2m people, treated not a drop of its sewage.

São Paulo's pollution now reaches only as far as Salto, 100km downstream. By 2018, says Monica Porto, a water-quality expert at the University of São Paulo, the benefits should be visible—and sniffable—in the city itself.

Cleaning up the Tietê poses more than the usual problems. São Paulo is just 75km from the river's source, so there is less water to dilute what it discharges. Mountain ranges block potential pipe routes to the sea. Average annual rainfall is 150cm and summer storms can bring 7cm in just a few hours. Impermeable roads and pavements aggravate flooding: this year, the river burst its banks three times. The city has grown eightfold since 1950, and much of its population lives in unplanned slums. Some of these are on riverbanks: water companies must often ask the government to remove people illegally settled where they need to work. And even when sewers are built, some households stay unconnected because they are unable or unwilling to pay.

But the virgin floodplains near the river's source are being turned into what officials claim is the world's largest “linear park”, 75km long, complete with cycle lanes so that bikers can keep an eye out for illegal settlements. Sabesp, a water company, is cleaning up 100 of the river's tributaries, building play areas and planting trees along their banks.

Paulistanos used to love their river, says Janes Jorge, whose book, “The River the City Lost”, tells its history. Artists painted it; swimmers and rowers raced on it; families had days out on its islands and banks. Now it would take a brave picnicker to cross highways flanking the river, let alone go for a dip. Sorting out the city's sewage is just a start, Mr Jorge says: much of what sullies the Tietê is rubbish thrown on the street and dust and oil from cars. “The river's problems are an expression of the city's problems—of poverty and environmental degradation.” Its clean-up may show that all this is slowly being overcome.

From the print edition: The Americas