

2010

Improving Life

A study into the sustainability of Brazilian Civil Engineering-related development projects



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dd.: June 2010

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INTRODUCTION

The Brazilian government is constantly working to improve life for the Brazilian people. Throughout the study tour, we will be visiting several – civil engineering related – projects that specifically aim to improve the local environment in some way. During the study tour and its preparations we examine the sustainability of a variety of civil-engineering related projects. In this report we focus projects that aim to improve the life of Brazilians. Therefore we selected three projects.

The first project is Guanabara Bay Clean up, this aimed at a better quality of life for both the city and the whole State of Rio de Janeiro. Launched in 1995, this project has already resulted in a 32% improvement of the sewage treatment system and, until 2010, more than 50% of all the sewage discharged in the Guanabara Bay will be treated. The projects aims at treating the discharged sewage in the Bay and this will improve the quality of the water.

The second project is the São Paulo coastal sanitation project. In the rapidly growing coastal region of the state of São Paulo –Baixada Santista - wastewater is discharged untreated into the river and sea. Eighty percent of the water monitoring points in this region fails to meet water quality standards, affecting the living environment of the local population ever more seriously. The sanitation improvement project for the Baixada Santista aims to improve and expand the sewage system, develop an environmental monitoring system and upgrade the living environment of the local population.

The third and last project is the urban renewal in São Paulo. From 1991 up to 2009, 150 thousand residents have moved from the centre of São Paulo to other regions. To implement urban renewal, COHAB buys commercial buildings, residential and old hotels in the central region, and replaces these buildings with 2500 houses. The new homes will be aimed at families with monthly income of up to 10 minimum wages. The goal of the program is to bring back the population that moved to other regions, but who still work in the centre. Bringing people back to the center can mean 7 thousand journeys by bus, subway and train less per day.

We defined five research questions to limit the scope of the research and to provide a structure for the study.

Research questions:

1. How does the development of water treatment facilities in Brazil compare to the development to the Netherlands?
2. What is the underlying motivation for starting water quality control projects such as the coast sanitation project and the Guanabara Bay Clean up program?
3. What are the projected effects of these projects are they truly sustainable?
4. How are water quality projects such as these financed, and what are the effects of this approach to financing? (Construction perspective)
5. Are projects like this controlled centrally from the government, and from what perspective are these projects started?

The report starts with an introduction of our understanding of the very word “Sustainability”. Then the report gives a brief overview of the development of water treatment in Brazil, and it compares with the Netherlands. Following this it will answer the research questions for each of the projects described. The report concludes based on the summarized answers of the research questions. In this way the study attempts to give an indication of our view on the projects in Brazil.

Due to the lack of information and knowledge of the Brazilian Civil Engineering sector we will not be able to give answers to all questions that arose during the research. Therefore we will formulate questions to ask when in Brazil, at the projects. The answers of these questions will be used in the final report.

SUSTAINABILITY

Numerous definitions and interpretation arise when sustainability is considered. For this research an interpretation is used in which not only environmental issues are examined, but a more broad view taken on projects, business strategies and policy, namely the concept of People, Profit and Planet as shown in figure 1. This concept was introduced by John Elkington and defines sustainability as a situation in which these three central points are in balance. If one of these aspects is neglected, something can sustain on the short term, but will not at the long term, because people will protest, the company will go bankrupt or the environment will no longer support the harmful activities. Another reason to use this concept is that Dutch companies often include it in their vision and strategies (Boomen et al., 2009).

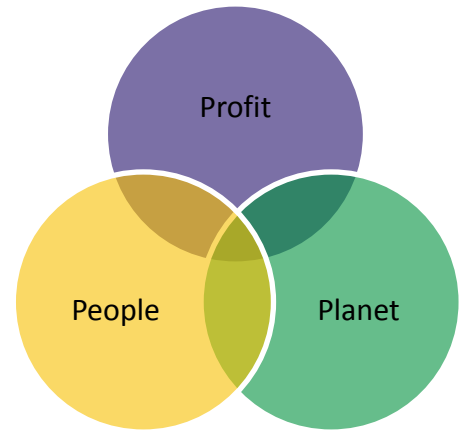


Figure 1: Three indicators of sustainability

GENERAL POLICIES

Current situation

Often Brazil is referred to as a well doing development country. The sewage sector can be seen in this line. It is doing quite well, but regionally there are large differences and the situation is still not equivalent to that in developed countries. Especially in rural areas the situation should be improved. This is shown in table 1 (JMP, 2010).

Table 1: Access improved sanitation

Country	Year	population			Access improved sanitation (%)		Usage Open Defecation (%)	
		total (x1000)	Urban(%)	Rural (%)	Urban	Rural	Urban	Rural
Brazil	1990	149570	75	25	81	35	4	40
	1995	161692	78	22	82	35	4	37
	2000	174174	81	19	84	36	4	34
	2005	186075	84	16	86	37	3	31
	2008	191972	86	14	87	37	3	30
Netherlands	1990	14953	69	31	100	100	0	0
	1995	15448	73	27	100	100	0	0
	2000	15915	77	23	100	100	0	0
	2005	16316	80	20	100	100	0	0
	2008	16528	82	18	100	100	0	0

As is shown, the urban areas in Brazil are quite well developed, because almost 90% has access to improved sanitation. According to JMP (2010) improved sanitation means that people have access to a flush toilet, piped sewage system, septic tank, ventilated improved pit latrine, or a composting toilet. In The Netherlands flush toilets are installed almost everywhere. Waste water is transported via pipes to a waste water treatment plant and purged. For Dutch standards the mentioned types of toilets are therefore still less desirable.

Moreover, the table shows how often people make use of open defecation. Especially in rural areas this has to be improved, because it is extremely unhygienic and is consequently a source of diseases. Furthermore JMP (2010) states that nowadays more than 30% only has access to another type of unimproved sanitation, which could be even worse than open defecation.

However, the above standing numbers contain large uncertainties. It is unknown whether informal areas like the favelas are included, because official data may only be based on official data. Furthermore it is unclear whether the data is really measured or just estimated. Usually, this data does not contain this kind of information (Oliveira, 2006).

In figure 2 the health risk due to poor quality of water is shown. This figure makes clear that the problems are regionally different. The coastal regions seem to have more problems, but it cannot clearly be allocated to a certain region. It is important to realise that this figure does not show the distribution of improved sanitation facilities, because if an area is densely populated, the health risk is larger than in rural areas.

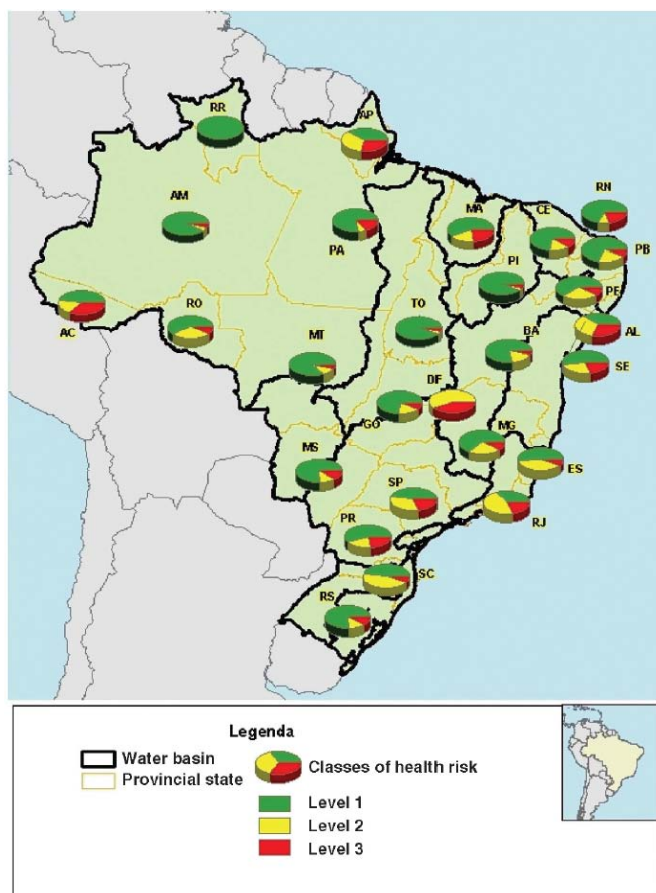


Figure 2: Health risk (from Heller, 2006)

In the Netherlands the development of the sewage system is much more advanced. As already explained it has national coverage of improved sanitation and the quality of the sanitation service is very high. The country is known for its high quality and high standards on collecting and purification. Dutch equipment and expertise on water treatment has set world standards. Especially the treatment of municipal waste water has been improved by using bio filter technology (NWP, 2009).

The municipalities are historically responsible and held responsible for waste water collection. However, since the 1970s the provinces are responsible for sewerage treatment. Most of the provinces delegated this task to the waterboards or other specialised organisations (Kuks, 2006).

Almost all sewage water is collected together with rainwater and treated in a waste water treatment plant. Only during high rainfall events, the capacity of the treatment plants is insufficient and effluent may enter the environment, causing temporary, minor problems. Therefore, at some places separate sewerage systems are installed, to collect rainwater separated from waste water from households. Furthermore measures are taken to retain rainwater in the area it falls (RIONED, 2007).

Historical development

At the beginning of the 20th century expansion of the sector was driven by the social awareness of required hygiene to prevent epidemics. This led to a further development of the sector. Between the 1950s and 1969 the sanitary policies separated from the health policy and gained a higher degree of autonomy (Heller, 2007).

During the military dictatorship (from 1970s on), the sanitary policy was reorganised in order to improve the services by introducing the National Basic Sanitation Plan (PRANASA) in the 1970s, on which the policy is based nowadays. Due to this plan the responsibility was brought from the municipalities and the national government to the administration of the provincial states. This was necessary to satisfy the high demands due to the enormous urbanisation in this period (Motta and Moreira, 2006). States and municipalities and state governments established contractual relationships more or less in the same way as the concession model nowadays. The plan resulted in several new water supply and sewage companies. Unfortunately, during the necessary fiscal reforms and economical crisis in the 1980s and 1990s led to a drawback in the development.

With the transition to democracy after 1985 led to an enhancement of the role of municipalities. They got larger political administrative autonomy, larger budgets and increased access to financing for the municipalities. The municipalities became responsible to give concessions to a company. Because most companies were public provincial state owned, these companies remained in service (Motta and Moreira, 2006). This caused the current undefined responsibility between the states and municipalities (Heller, 2007).

The development of the Dutch sewerage systems began earlier than in Brazil, namely in the 1850s. The need for higher hygiene to prevent epidemics, made city councils experiment with possible sanitation methods. Flushing toilets became common good and had to dispose of its waste water. Initially this water was drained of via the city canals, but in 1912 the first integrated sewage system was installed in Amsterdam. During the period 1900 – 1940 almost all Dutch cities were provided with sewage systems (Lintsen, 2005). From the 1930s on large scale sewage systems became implemented (ONRI-werkgroep riolering, 2009)

Before the 1970s most of the waste water returned untreated into the environment. This caused severe ecological problems. With pressure from the society, people realised that the waste water had to be treated. Almost all water is treated nowadays. More improvements can be made by improving the waste water treatment plants and the realisation of separated sewage systems.

Current governmental policy

In 1997 the National Policy on Water Resources has been introduced in order to get water and sanitation service more universally, proclaiming that that water is a common good of public domain. It aims at a sustainable water supply and sanitation, ensuring actual and future generations with water that meets both the quality and quantity required for the different uses. Though water supply is the focus of this policy, sanitation is intimately linked. To enforce this policy the national water agency, ANA, was set up in 2000. One of their tasks is to improve collaboration between states in solving water quantity and quality problems (ANA, 2010). Treatment of waste water is an important aspect as is emphasized by Oliveira (2005).

Furthermore, a program on water pollution abatement (PROBES) has been set up in 2001 in order to reduce pollution and promote environmental recovery. This program funds sanitation projects on a regular basis during several years and is based on predetermined standards. The ANA makes assessments of compliance of these standards for each project.

Since the arrival of president Lula da Silva in the policy on basic sanitation changed significantly. The ministry of cities was endowed with a National Department of Environmental Sanitation (SNSA), which has as its task to “ensure the fundamental human right of access to potable water and to life in a healthy 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 current policy in Brazil is still based on the situation that existed during the dictatorial period. The main responsibility is for the provincial state authorities, but more responsibilities were introduced for municipalities. Sometimes this is causing an ambiguity of the responsibilities. Then the provincial states may have paucity in legislation, through which the state water supply and sanitation utilities does not need to take their onus. The municipal authorities however may give concessions to sanitation companies, which makes them responsible for monitoring. This responsibility is rarely taken. New legislation should overcome this discrepancy (Heller, 2007).

This has led to a discussion about the efficiency of the sewage companies of provincial state companies and municipal sewage companies. Sabbioni (2008) concluded from his research that the Brazilian shows significant economies of scale. Economies of scale gives a substantial saving of costs for investments, far outweighing the extra firm-related costs. This implies that companies at a provincial state level reach a higher efficiency. This is confirmed in Motta and Moreira (2006).

Furthermore discussion is going on about whether the sector should be based on more competitive standards. Motta and Moreira (2006) states that private companies will be able to get the required money earlier invested in the sector to get it more developed. However efficiency between public and privately owned companies does not show significant differences and looking to privatised companies in England, Wales and France, the opposite might be the case (Kuks, 2006). The water and sewerage sector shows a rather low potential for competition, due to the fact that high fixed costs and fixed assets with a long lifetime make competition unlikely to happen (Tupper and Resende, 2004).

Unfortunately, although it is clear that new national legislation is necessary, it is difficult to get this through the political decision-making process, because municipalities are afraid to lose power. Several initiatives were attempted to install a new legal and institutional framework, but were not successful. For instance, an initiative law was vetoed by president Cardoso in 1995 for “economical reasons” (Heller, 2007).

GUANABARA BAY CLEAN UP, PROGRAMA DE DESPOLUIÇÃO DA BAIÁ DE GUANABARA

Guanabara Bay (Baía da Guanabara) is a bay on the Atlantic Ocean located in the South-East of Brazil, between Rio de Janeiro and Niterói. The bay basin covers an area of 4000 km² (Institute of the America's 2001), the bay itself covers 384m² and about 11 million people live in the Guanabara bay basin area (Lima and Legey 2010).The drainage basin of Guanabara Bay has an area of 4080 km² and this consists of 32 separate sub-watersheds with 91 rivers and channels (Kjerfve, Ribeiro et al. 1997).

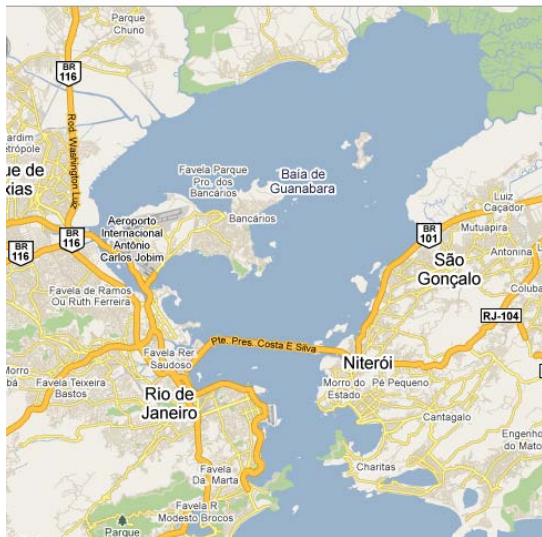


Figure 3 Guanabara bay and its surrounding cities (Google Maps 2010)

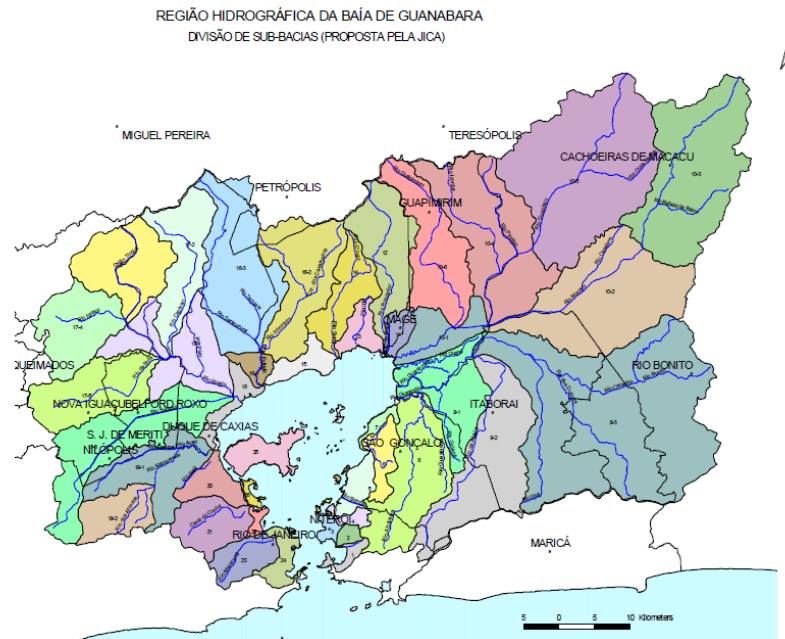


Figure 4 hydrographic region of Guanabara bay

Problem

The bay's ecosystem was once diverse, but eutrophication, pollution and deforestation induced serious damage. The eutrophication is mainly caused by anthropogenic sewage waste (Guenther and Valentin 2008; Maranhó, Abreu et al. 2009). This increases the risk for diseases like for instance dengue and yellow fever (Honório, Codeço et al. 2009).

Next to eutrophication, the bottom of the Guanabara Bay in Rio de Janeiro is also covered with a layer of highly toxic sludge, up to four metres deep. The sludge contains high levels of heavy metals such as zinc, mercury, and copper from industry. The metals enter the food chain and are very dangerous for the health of local people who depend on seafood from the bay for their sustenance.

Thereby the solid garbage is detrimental for the fish population. The bay's fisheries capacity has decreased by 90% because of the pollution, but there are still thousands of people who earn their living through fishing activities in this area. An estimated 5,000 to 18,000 fishermen are active in Guanabara bay, including both registered and unregistered (Jablonski, Azevedo et al. 2006).

The different causes for this level of pollution range from the bay's industrial zone, home to much of Brazil's petrochemical industry, to the sewage from the city and to the intense deforestation in the bay's catchment area (Italian Ministry of Foreign Affairs). The major environmental problems in the bay are caused by the eutrophication of Guanabara Bay, as a result of the nutrients in wastewater discharged to

the Bay, combined with the contamination of bathing waters with pathogens from the wastewater (Margulis, Hughes et al. 2002). Rivers flowing into the bay are highly polluted with wastewater and garbage. People throw almost everything into the rivers, for instance car tires, and even aborted fetuses (Osava 2007). Although several sewage treatment plants have been constructed in the past 20 years, increasing the total number to six, only 15% of the enormous amount of domestic and industrial waste discharged into the bay was subjected to any form of sewage treatment in 1991 (Kjerfve, Ribeiro et al. 1997). But in contrast to expectations, the city has a tolerable water supply, 84% of the population has access to fresh water and sanitary installations.

Next to a lot of minor oil spills from regular oil related activities such as oil transport and leakage, the bay area suffered from some large oil spills. In January 2000, more than 1,3 million liters of heavy oil leaked from a refinery pipeline (Maciel-Souza, Macrae et al. 2006), and in 2001 Manguinhos refinery in Rio de Janeiro spilled 100,000 liters of oil from a pipeline into Guanabara Bay (International Network for Environmental Compliance and Enforcement 2002).

This pollution in the bay is mainly caused by the dense population and the density of industrial activities in the bay area. In the bay there are 10,000 industries, 10 oil terminals, 12 shipyards and two oil refineries (De Sherbinin, Schiller et al. 2007). Urbanization and industrialization processes generate, respectively, diffuse and point sources of wastewaters and toxic effluents into the rivers to the bay. Thus, these materials are the principal reasons which cause changes in the level of water quality (eutrophication and contamination), and so impacting the economic activities dependent on water quality (fisheries and recreation—including tourism activities) (Bidone and Lacerda 2004).

Project goals

The Guanabara Bay cleanup program (PDBG) firstly aims to improve the life of the residents of the basin area. Besides this, it also aims to strengthen local government institutions whose activities can affect the Guanabara bay area positively (Ioris and Costa 2009). Most documents indicate that the aim is to increase national health through this project.

The project consists of the improvement of basic sanitation and water supply systems, to revert current degradation process in Rio de Janeiro metropolitan region, reducing uncontrolled domestic sewage, garbage and industrial waste discharge into the bay (Ortiz 2004). To achieve this goal, the Rio de Janeiro state Water Company (CEDAE) planned to construct a sewerage collection network and water treatment plants. Thereby it aims to improve the water drainage of the area, and to manage waste successfully to prevent effluent from flowing into the bay. Current treatment of wastewater around the Guanabara Bay is less than 10%; by the end of the first phase in 2003, approximately 55% of the wastewater should be treated and by the end of the second phase in 2010, this figure should rise to 80%(Institute of the America's 2001). By the end of the project, plants will treat 100% of the wastewater (Global water intelligence 2002).

The project is financed by the Inter-American development Bank (IDB), \$350 million, the State of Rio, \$206 million, and the Japanese International Cooperation Agency (JICA), \$237 million (Institute of the America's 2001; Margulis, Hughes et al. 2002).

Progress

In this section we analyze the contributions that the project has made to the cleaning up of the Guanabara Bay.

The cause of the problem, being unfiltered and contaminated water being expelled into the bay from surrounding industry and residences calls for improved sanitation and water supply services in the area as part of the solution to the problem. The initial priority of the first phase of the program, therefore, was

the construction of a sewerage collection network and primary treatment plants, so as to reduce the degradation of the waters of the bay. The studies involved indicated that the pollution generated in the bay itself, originating from primary activities, makes up a significant portion – around 60%, of the global organic pollution. This provided evidence for the need to remove nutrient discharges from effluents flowing into the bay, in order to reduce the problem of eutrophication and to recuperate the ecosystem. (World Bank, 2002)

When looking at the main difficulties with the project in its current form is that conflicting interests are undermining the overall effectiveness of the process. The main implementing agency (CEDAE) omitted to internalize the main objectives of the project, and only concentrates on its own interests in the project. The clean-up of Guanabara Bay is of little direct relevance to CEDAE, beyond the support it provided for construction wastewater treatment plants. (World Bank, 2002)

In the case of the PDGB, CEDEA as a state water and sanitation company was left with the responsibility of dealing with matters which fell outside its remit, although there were no incentives for the company to do so. Unlike SABESP, which directly benefits from the maintenance of good water quality in the Guarapiranga reservoir, CEDAE is not overly concerned about improvements to the water quality of the bay. This is true at least in terms of its fundamental responsibilities of water supply and for revenue generation. As for pollution control, the environmental agency FEEMA had been mandated to control industries and was allocated specific funds to improve enforcement. Meanwhile, urban discharges remained the responsibility of CEDAE, which paid scant attention to FEEMA regulations and standards, in the absence of the likelihood of rigorous sanctions. CEDAE was therefore in a position to decide its strategy for dealing with urban discharges without interacting with other agencies, except insofar as it was obliged to respect the agreements covered by the IDB financed project. Despite evidence that some of the proposed wastewater treatment measures foreseen in the project were technically weak, CEDAE has been reluctant to reconsider its strategy. CEDAE continues to follow its own traditional approach to sewerage collection and treatment, frequently incurring unnecessary costs and on occasions worsening, rather than improving, water quality in the bay.

Several high profile consequences of the poor structuring and planning of the project that occurred during the project are as follows:

- The solid waste treatment plants have effectively been abandoned;
- the large Alegria wastewater treatment plant is functioning well below project capacity, owing to the difficulties in installing trunk sewers in urban neighborhoods. The upgrading of this plant to secondary treatment is being planned for the next phase of the program, but no increase in tariffs is foreseen to cover the involved costs;
- the CEPT (Chemically enhanced primary treatment) plant is operating at half of its nominal capacity owing to problems in making domestic connections. CEDAE has no agreement with the municipalities of Baixada Fluminense to collect and treat sewage discharges which means that investments are being made with no guarantee on returns;
- the secondary treatment plant in São Gonçalo (on the East side of the Bay) with a nominal capacity of 780 l/s has been operating with 280 l/s, due to construction difficulties encountered in carrying out domestic connections and to the unwillingness of the local population (amongst the poorest in the metropolitan region) to pay for wastewater collection; and
- the most successful components of the program has been the construction of a submarine outfall linked to the Icarai WWTP to transport effluent out into the Bay, thus protecting nearby bathing beaches.

Control

When we look at the responsibilities in the project, we see that the original budget of the program in 1994 was 793 million USD of which 350 million was financed by the Inter-America Development Bank (IDB), 237 million by the Japan Bank for International Cooperation (JBIC) and 206 million from the state of Rio de Janeiro.

CEDAE (Companhia Estadual de Aguas e Esgotos, Rio de Janeiro State Water and Sewerage Company) will control the connection of 139 000 households to the sewage system.

Furthermore, CEDAE will develop an effective system to control production and supply of fresh water to the slums in the south of Rio de Janeiro. Also the deployment of 387 km of pipelines, 34 000 residential connections and 525 000 water meters is controlled by CEDAE.

To control the floods in one of the most affected regions of the state, SERLA (a water resources management agency, now merged into Inea) performs drainage work in the basin of Rio Acari. (PDBG, 2010)

Sustainability

People

When looking at the project from a people oriented perspective, we can conclude that the project hasn't been able to achieve all the targets, although its targets are partly focused on improving the quality of life of the inhabitants in the Guanabara Bay region.

The expected impacts of the program's first phase included direct benefits to the population located in the areas of project influence, the vast majority consisting of low-income people, diminishing the incidence of infant mortality and of waterborne diseases. Other benefits included the non-interruption of socio-economic activities following floods and improvement in water quality of the beaches in the interior of the bay.

When we look at the statistics displaying people's access to a sewerage collection network, we see that in the Rio de Janeiro state that, after the first phase of the project was completed, 10% of the urban, and 35.7% of the rural inhabitants had no access to the sanitation network (World Bank, 2001). This is a total of approximately 457.000 households in the Guanabara Bay Region without adequate sanitation. We question the accuracy and applicability of these statistics in the sense that we wonder whether unofficial households are included, as there are numerous favela's in the region. Additionally, the question remains whether these homes have access to rudimentary sanitation facilities such as septic tanks, which remove the largest health risks. This could undermine the goal of the project to improve the quality of life, in part by reducing the health risks prevalent in the area resulting from poor sanitation.

Throughout the project, one of the main issues with the execution of the project has been the cooperation of the local populace. People in the area are frequently unwilling or unable to pay for sanitation services that the project involves. This has resulted in significant overcapacity in the WWTP's. For example, the secondary treatment plant in São Goncalo with a nominal capacity of 780 l/s has been operating with 280 l/s. In addition, the placement of trunk sewers has proved more difficult than expected, due in part to a lack of involvement of the local population in the process.

Planet

When looking at the effects the project has had on the quality of the environment from a planet perspective, we can conclude that due to issues arising during the execution of the project, the project had not achieved its goals by the end of the first phase of the project in 2001.

Profit

When we look at the project from a profit perspective, we see that profit has suffered throughout the project in the interest of the other two factors of sustainability.

The project goals of the PDGB do not directly include an economic side. The project is financed by three parties, including the state government of Rio, the Japanese International Cooperation Agency (JICA), and the Inter-American development Bank (IDB). The division of financing and the multitude of organizations that are involved in the project, have led to difficulties in the execution phase of the project. Responsibilities are often unclear between the various parties, and we see that these organizations frequently feel a lack of project responsibility. This leads them to work independently of each other, with different goals in mind. In some cases we see that this can lead to a worsening of the pollution situation in the bay.

Local inhabitants are largely dependent on the fisheries in the area for sustenance and income. In the literature, it becomes apparent that some options such as dredging the toxic sludge can provide a quicker, more permanent solution to the pollution problem in the Guanabara Bay. This, however, will release the toxic materials into the water, to the detriment of the fisherman and local health. The choice not to dredge is clearly made on basis of economic and health concerns. Additionally, this choice is beneficial for the thriving tourism industry in the area.

BAIXADA SANTISTA COASTAL SANITATION, ONDA LIMPA BAIXADA SANTISTA

The Baixada Santista is a coastal metropolitan region (BSMR) in the state of São Paulo, it covers nine municipalities: Santos, São Vicente, Praia Grande, Mongaguá, Cubatão, Guarujá, Itanhaém, Bertioga, and Peruíbe. Baixada Santista covers about 2.372 km² (Deutsch Wikipedia 2010). The Baixada Santista region is, a tourism, industrial and port center. Santos is the administrative centre of the area it also has the biggest seaport of South-America. The Santos Estuarine is part of the Baixada Santista, the estuarine consists of three main channels; São Vicente, Santos and Bertioga (Ecomanage 2010).

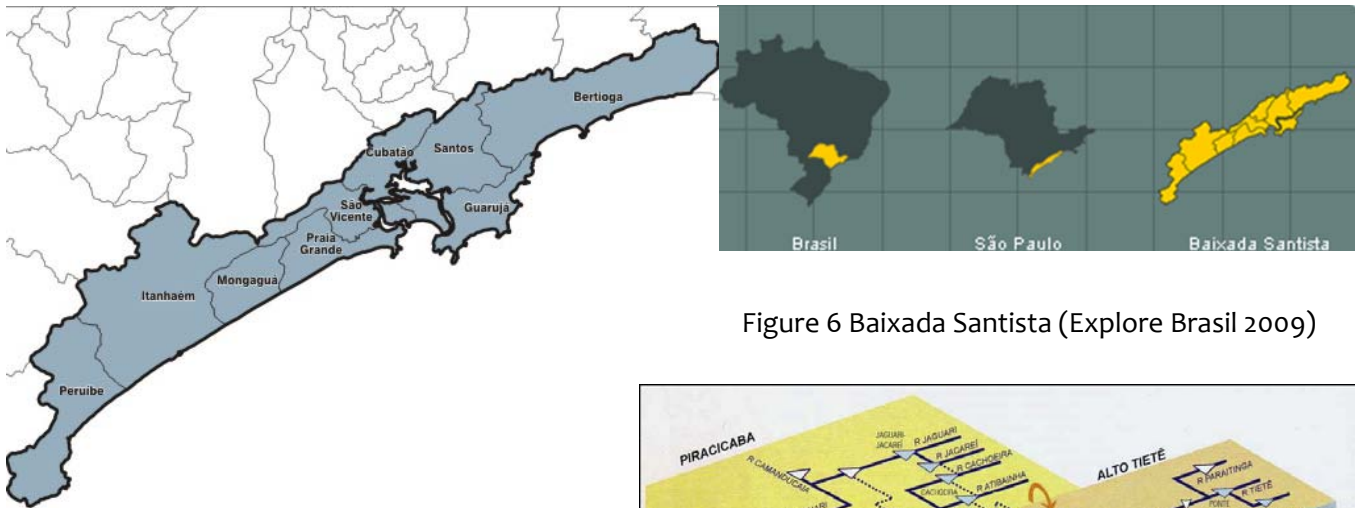


Figure 6 Baixada Santista (Explore Brasil 2009)

Figure 5 Detailed map of the BS metropolitan region (Governo do Estado de São Paulo 2010)

Problem

Baixada Santista is notorious for its high levels of pollution, which are related to industrial, port and urban activities. Around the industrial pole of Cubatão city, high nutrient concentrations are found (Braga, Bonetti et al. 2000). It is one of the most important industrial areas in Brazil due to the large number of industries operating in Cubatão such as steel, petrochemical and fertilizer industries (Rodrigues, Lamparelli et al. 1999; Ramos, da Silva et al. 2009). High levels of oxygen-demanding substances, phenols, metals (e. g., copper and zinc), and pesticides have been detected in the water in Baixada Santista, and metals and pesticides have been found in sediments. The pollution of the Baixada Santista area has multiple causes, analyzing the most important ones is a starting point in explaining the goals of the particular project we describe in this report.

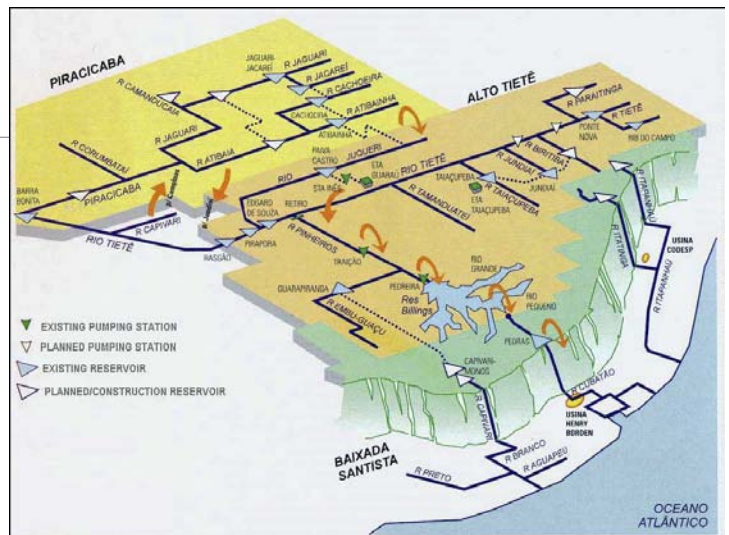


Figure 7 São Paulo Basins (Braga 2000)

First, Oil spills induced serious damage to the quality of the water in the Baixada Santista area. It is in Baixada Santista that most of the accidents in São Paulo state happen. Santos and Cubatão are the most affected by this kind of pollutant In 1984 a pipeline burst leading to the spill of about 700,000 liters of crude oil, this also caused a fire in Cubatão (Rodrigues, Lamparelli et al. 1999).

Second and perhaps more important is the lack of proper sanitation in Brazil and in the Baixada Santista Metropolitan Region (BSMR) in particular. Less than 13% of the municipal wastewater is treated before disposal in the surface water system (Sampaio, Mateus et al. 2008). As a result faecal pollution leads to health problems in the area, for instance yellow fever, dengue, malaria, and cholera (Garreta and Alves 2003). The BSMR is densely populated, but it lacks a sewage drainage network or sewage treatment facility, a significant part of the domestic effluent drains directly into the Santos Estuary (Abessa, Carr et al. 2005; Sampaio, Mateus et al. 2008). As a result of this lack of sanitation there is scarce freshwater in the area. So there is not much freshwater for drinking, and agriculture (Peters and Meybeck 2000).

The third source of pollution, the water in Baixada Santista contains high concentrations of metals. This can be attributed to weathering of naturally occurring ore deposits and waste resulting from occupation and industrialization (Rodrigues, Lamparelli et al. 1999; Peters and Meybeck 2000). The heavy metals accumulate in organisms such as fish and shrimps. In the eighties the water quality in the region improved, as a consequence the number of organisms containing toxic material increased, which was dangerous because people tend to eat them (Nauen 2003).

Project goals

São Paulo's state water company SABESP initiated a project to recover the environment in Baixada Santista (SABESP 2010). SABESP is Brazil's largest water utility in terms of users, serving 323 of São Paulo state's 645 municipalities. SABESP provides water to 25 million residents through a 54,000km network and sewerage service to 16.8 million residents through a 34,000km collection network (Business News Americas 2003). The project is scheduled to completion in 2011.

About three million people will benefit from the environmental recovery project, which at least, is the intention. The project is a collection of measures including: construction and expansion of sewage treatment and pre-processing, construction and expansion of pumping stations, construction and expansion of underground and underwater sewage systems, and construction and expansion of wastewater collection networks. This should increase the index of sewage collection and treatment coverage from 53% to 90%. Investments into the Project are expected to total R\$ 1.3 billion (about €0.6 billion), this is financed by the Brazilian development bank (BNDES) and the Japanese International Cooperation Agency (JICA) (BNDES Brazilian development bank 2010).

Discussion

This should result in a better public health, and attractiveness for tourism, and a recovery of the ecosystem. The improvement of public health is twofold; better sanitation results in less diseases, and the food does not contain as much toxic substances as before (Mateus, Giordano et al. 2008). Thereby the project results in 4000 temporary Jobs and 140 permanent jobs in order to keep the system in operation (BNDES Brazilian development bank 2010).

Control

SABESP (Companhia de Saneamento Básico do Estado de São Paulo S.A, State of São Paulo Basic Sanitation Company) is the company that organizes the controls the actions taken in the São Paulo region. SABESP controls the Onda Limpa project together with São Paulo state government.

Sustainability

The project is still at the start and therefore there are no clear numbers of the results of the progress so far. As a result we succinctly describe the expectations for the three P's of sustainability, people, planet, and profit.

People

Taking a people's point of view, the project is intended to be beneficial. The program is focused on recovery of the Baixada Santista environment, and this is a prerequisite for a public health. By increasing the sewage collection public health should improve.

Planet

As for the Guanabara bay project, the project should benefit to the environment, because it is intended to reduce the pollution of the water system in the area. But this did not play an important role in the project because the Baixada Santista isn't known for its biodiversity, it an extremely industrialized area, the biggest industrial area in Latin America.

Profit

The project is financed by the Brazilian Development Bank (BNDES) and Japanese International Cooperation Agency. The total financing is about €0.6 billion. As in the Guanabara Bay project this may lead to problems, because responsibilities of the various parties are unclear.

The economic side of the project lies in the fact that the region becomes more attractive for tourists when there is less pollution. But on the other hand one can also say that the Baixada Santista isn't a specific tourist region, when one thinks of beaches, he doesn't think about São Paulo but of Rio. But instead, the region might just get attractive because of the project.

SÃO PAULO CITY REVITALIZATION, RENOVA CENTRO

Goal

The goal of this program is to renovate the center of São Paulo. In the last 20 years, around 144 thousand inhabitants left the area. Bringing people back to the center of São Paulo can reduce the total daily amount of journeys by bus, subway and train by around 7 thousand. The first step of this program is the development of 2500 apartments, aimed at families with a monthly income up to 10 minimum wages. To be able to build the 2500 new houses, 53 buildings in the city center of São Paulo will be expropriated. Most of the buildings were built in the 1940's and 1950's.

The program is based on the successful example of the Riachuelo building (completed in 2008) and Asdrúbal do Nascimento and Senador Feijó (2009 by COHAB).



Figure 8 Asdrubal do Nascimento, before renovation

Control

A partnership between the city of São Paulo and FAU-USP (Faculty of architecture and urban development, University of São Paulo) has made up criteria for the selection of buildings which will be expropriated. The buildings are located throughout the center, but mostly in the districts Sé and República. The total investments for this first step of the program are estimated at around R\$ 400 million, which will be born together by the Municipality of São Paulo and the Caixa Econômica Federal (the second biggest Brazilian bank). (Música para o centro de São Paulo, 2010) The coordination of this part of the program will be done by COHAB (Companhia Metropolitana de Habitação de São Paulo, Metropolitan Housing Company of São Paulo). COHAB is a state company responsible for executing public policies for

housing in the city of São Paulo and its metropolitan area. The main goal of COHAB is to improve the access to decent housing for the lower income population. (História, 2010)

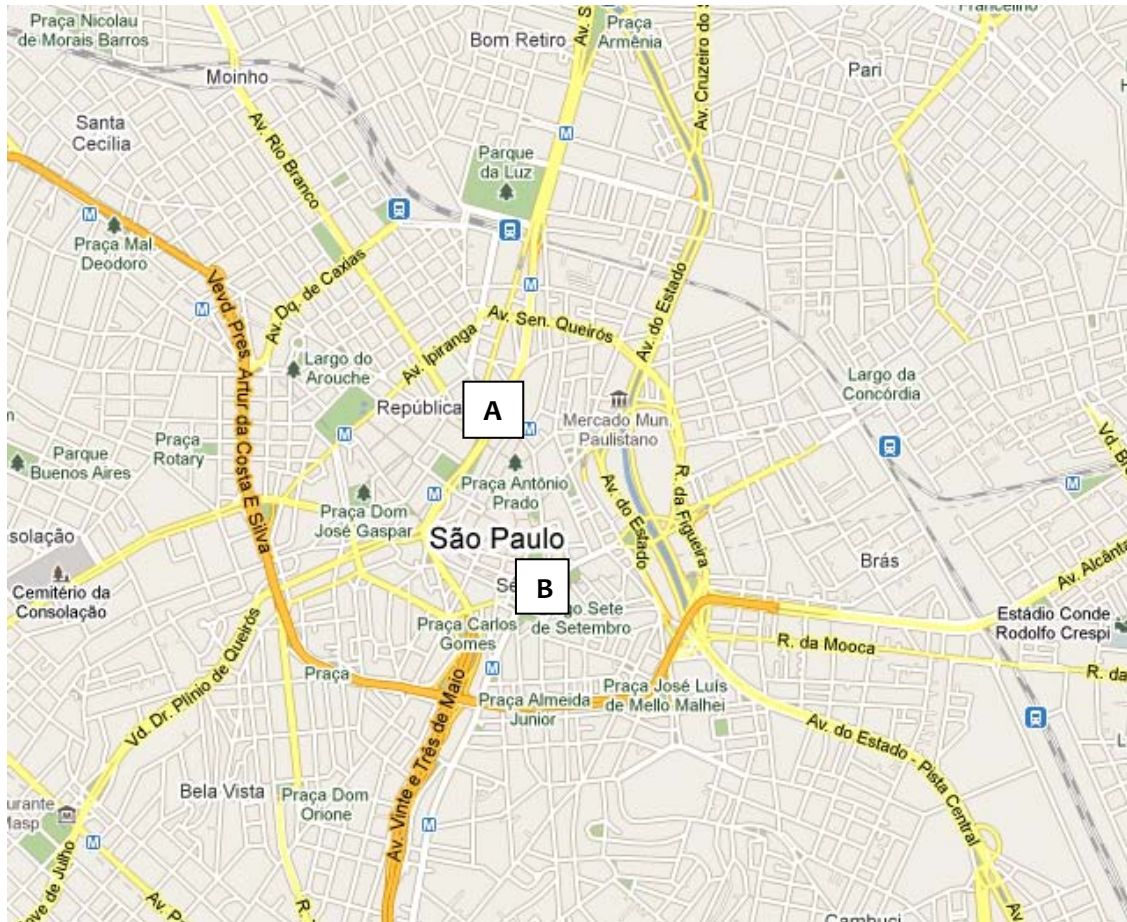


Figure 9 the renovation is mostly done in the districts of República (A) and Sé (B) (source: Google Maps)

Sustainability

The redevelopment of the old buildings in São Paulo is quite interesting. There are large budgets available to renovate the old buildings to lure back the inhabitants that have left the center of São Paulo. The total amount of people that have moved out of the area is around 144 thousand, while the total amount of people that live inside the favelas is estimated at around 19.8% (in 1993) of the total population of São Paulo. This means that around 2,2 million people live inside favelas. The note has to be made that the number of people that live in the favelas is underestimated, so the imbalance between the investments is even bigger. (Fix, Arantes, & Tanaka, 2003)

A lot of money is spent on the rehabilitation of relatively a few people. As all this money is spent, the impact is relatively low as only a small portion of the people of São Paulo benefit from the renovation. If the money would be spent to renovate and upgrade the favelas, the impact of the money spent could be of a greater magnitude. The main reason of the Municipality of São Paulo to renovate the buildings is to reduce the total amount of daily journeys. This reduces the emissions of and the pressure on the transport system of São Paulo. The question is, if this is sustainable. It improves the lives of a few people, but the planet doesn't directly benefit from the improved housing. Until now it is unclear if the

renovation of the buildings are combined with other “green action”, like proper waste water treatment, solar power etc. This could make the renovations have a real sustainable nature.

If the renovation would take place in the favelas of São Paulo, the impact on people and planet could be a lot higher. Mostly because the living conditions in the favelas are very poor and there are poor to non waste water treatment options available. This results in open sewage systems and bad living conditions for the inhabitants of the favelas. The poor water quality in the favelas also have a negative effect on the rest of the water systems in São Paulo. So if the municipality of São Paulo would decide to renovate and upgrade the favelas, a lot of these problems could be tackled at the source of the contamination and therefore the effect on both people and planet could be higher than only the daily trips that are spared with the Renova Centro program.

CONCLUSION

When we look at the three projects we studied, we can conclude the following with regards to our research questions:

1. How does the development of water treatment facilities in Brazil compare to the development to the Netherlands?

Like often concluded on other sectors in general, we can conclude that Brazil is doing quite well compared with developing countries. Regionally there are large differences and the quality of sanitation is below par. The actual situation is based on the developments during the dictatorial times. Then the responsibilities were given to the provincial state. Later municipalities got responsibility to give concessions to sewage companies. This has led to ambiguous situation where the provincial state and municipalities are both reluctant to solve problems. Additional legislation should improve this situation.

In The Netherlands, sanitation developed much earlier. In the 1970s almost all people had access to improved sanitation, but the wastewater was not treated. Since that time waste water improved significantly, through which the water is rather clean nowadays.

2. What is the underlying motivation for starting water quality control projects such as the coast sanitation project and the Guanabara Bay Cleanup program?

When observing the projects from an outsider's point of view, we see that projects such as the Baixada Santista and the Guanabara Bay cleanup programs are carried out mainly in the interest of public health. The high levels of pollution in the bay varying from toxic metals to the biological contamination caused by eutrophication is a severe threat to the health and well being of the surrounding populace. This has spurred the government into starting projects with the main goal of decreasing the pollution in these areas to directly influence public health.

With most of the effluent from the surrounding areas entering these bays untreated, the projects are integrated with projects to increase sewage accessibility in the area. However, we notice that this part of the projects often runs into resistance from the locals due to the lack of willingness to pay for sanitation services, especially from the poorest layer of the populace living in favelas. Additionally, we see that there are financial factors that play a role in the approach taken to the cleanup of the bays. In order to retain the capability for fishing and tourism, approaches such as dredging are prohibited for they reintroduce toxic materials from the sludge into the water and this poses significant health risks.

3. What are the projected effects of these projects are they truly sustainable?

When we look at the projected effects of the projects we notice that the main influence of the projects have impacts on all three facets of sustainability. These effects are projected as follows:

- Increased living standards, especially with regards to access to sanitation and an increase in public health. (*People*)
- An increase in the water quality of effluent discharged into the bays and an overall improvement of water quality in the bay with positive effects on wildlife as well as human activities in the area. (*Planet*)
- The water treatment projects do not specifically hold profit targets; the effects on the local economy however, may be profound. Side effects of the cleanup of the bays will include increases in utilization of the water, especially in the tourism and fishing industries. (*Profit*)

Overall, when we look at these projects from a sustainability perspective, we find them to be sustainable. All three aspects, people, planet, and profit, are influenced in a positive manner by the projects. In some respects, the projects are open to improvement, especially in the field of project control and divisions of

responsibilities. Due to most of the information we found originating from around 2002, the study tour will allow us to see what has changed in this regard.

4. How are water quality projects such as these financed and controlled, and what are the effects of this approach?

Financing for these projects all have similar structures in the sense that both private and public parties are involved. Main contributors to these projects are; The Inter-America Development Bank (IDB), the Japan Bank for International Cooperation (JBIC) the respective states and private parties such as housing corporations and water companies.

This form of financing has a clear influence on the various parties with control over the project in the sense that responsibilities are often ambiguously divided. This in turn can have serious effects on the execution of the project, and in some examples we see that it can lead to a worsening of the situation. For example: In the Guanabara Bay project, for example, local citizens were not consulted, and they are now unwilling to pay for the sanitation systems produced by private parties. However, due to the responsibilities lying elsewhere, the sanitation facilities are being run at very low capacities leading to

FURTHER RESEARCH

Following from our research, we have a list of suggestions for future research which will be discussed during the study tour. Answers to these questions are used in order to finalize the research, whereas we didn't have this information during the writing. Or whereas information did not exist during the writing, for instance numbers about the results of the Onda Limpa project.

- Are there already some results known (numbers and figures), from the Baixada Santista project?
- How are SABESP & CEDAE planning to connect everyone to the sewage system, especially people living in the favelas?
- Why do organizations as JBIC invest in sanitation projects in Brazil? I.e. what is their interest?
- Are people in favelas included in data about access to improved sanitation?
- How are SABESP & CEDAE planning to connect everyone to the sewage system, especially people living in the favelas?
- What is the importance of flora and fauna when planning projects as Onda Limpa & PDBG?
- Why do organizations as JBIC invest in sanitation projects in Brazil? I.e. what is their interest?
- How do CEDAE & SABESP deal with the ever growing favelas and other informal, unregistered districts?
- How do project organizations reckon with sustainability when planning and executing development projects?
- What are the opinions of involved parties on the current legislation on sanitation and what could be improved?
- Does the Renova Centro project or the city of São Paulo encourage the use of renewable energy sources such as solar or wind power?
- Would investments in favelas have higher impact per spent \$Real?

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