Sanitation in Rio de Janeiro: Come for the Beach, Leave for the Beach

“Our [Brazil’s] entire urban infrastructure was invented in a brief 12-year period at the end of the nineteenth century, before we were aware of the limitations on natural resources...The systems are linear so food, water, and energy flow through our cities and into the waste stream...The greatest opportunity to create sustainable systems will be in those cities of the global South, whose infrastructure is not yet fully in place and whose services now exclude large portions of their populations.”

The slaves brought from Africa to Brazil in the 1500s were primarily from West African territories. The Yoruba religion and culture that dominated the regional territories of Mali, Nigeria, and Guinea were transplanted to Brazil. There, after years of its repression, the inclusion of Catholicism, and generational shifts, the imported Yoruba traditions morphed into a distinctly Brazilian cultural phenomenon called Candomblé. This new fusion, an authentic creation of the meeting of African, Portuguese and Native Brazilian cultures, would be shunned for centuries, becoming quasi-validated only when the state embraced samba and Candomblé’s other cultural contributions under Gétulio Vargas’ regime beginning in 1930. The repression was primarily due to racism and an association of the religion and culture first with the colonial slave population and later with their descendants. An examination of water in Brazil, and particularly Rio de Janeiro, would be remiss without the consideration of the spirituality that the resource holds for Brazilians following Candomblé. In Yoruba, the orixá, Yemayá, or in Candomblé, Iemenja, (also called Reinha do Mar in Portuguese), is the mother deity who is also the mother of the sea. Iemenja is the picture of femininity, fertility and the motherly spirit. Ceremonious dancing to summon her involves women dressed in blue and white, her colors, making undulating motions with their bodies and flowing skirts emulating waves. Iemenja is called upon for health, maternal health, fertility concerns, women’s health, and cleansing purposes, with offers being made in the form of libations into a body of water.

The beaches of Copacabana and Ipanema are flooded on New Year’s Day with Cariocas dressed in white processing to celebrate Iemanjá and asking for blessing for the New Year. These long processionals wind through the streets of Rio de Janeiro, informally making a sinuous path

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to the deity, one filled with music, dancing, and the carrying of Iemanja statues and iconography. This cleansing ritual is a Brazilian adoption of ancestral Yoruba ceremonies on the other side of the ocean. It is a celebration of the most important feature of the city: the ocean. The coastal plot where Rio de Janeiro has developed was the characteristic that led to the founding of the city by the Portuguese in 1502. The presence of a port facilitated Rio de Janeiro’s connection to global markets, and enables modern tourism revenue. Rio de Janeiro’s identity is largely informed by its coastal locations, its beaches are internationally iconic for both their beauty and the culture that surrounds them, one of tropical leisure and vacation. Despite Iemanja’s gift to the urban municipality, the protection of Guanabara Bay, tidal marshes, the coastline and inland lagoons from large scale sewage dumping is not infrastructurally supported in Rio de Janeiro.

How is Iemanja treated? She is imitated during carnival (see figure 4), ceremoniously praised at New Years and by Candomblé faithfuls. Iemanja’s cultural history in the city confronts her modern day accommodation as her home in the waters of the region is threatened by sewage habits. While many cariocas may not faithfully believe in her power, her likeness is sold alongside Catholic saints and copies of the bible and can be seen framed in stores and restaurants throughout the city, an emblem still. The bay has given to Rio some of its most iconic features and has helped to create the beachfront city image it actively promotes. Issues with Rio de Janeiro’s sewage system goes beyond questions of access, as the majority of the city’s sewage is dumped untreated into Guanabara Bay. Rio de Janeiro’s sewage infrastructure is inadequate for the city’s population during normal times, let alone during times of mega-event preparation such as for the World Cup and Olympics and hurts the shores that contribute the most to Rio’s identity. Honoring Iemanja would require promotion of her beauty not just through the appeal that gives to tourists but also as it relates to her waters’ health. Iemanja is thought to be an ambient presence, very unlike the sewage network of Rio de Janeiro. An extensive sewage system is one feature of any global city that Rio de Janeiro must address if it wishes to gain that title. In truth Rio needs Iemanja not to be more tied to a cultural past-but a healthy beacon of a city that understands the connection between basic infrastructure-with universal access-and the label of modern.
The reality is that sewerage is viewed internationally as a public service, which should be maintained in equitable ways by the state for most modern municipalities. It’s a basic necessity; a “deficit of proper sewerage (can) lower the life expectancy at birth. Lack of sewage infrastructure indicates a real disconnect between the needs of the constituents and the elected officials.\(^2\) Sewage infrastructure has immediate and real impacts on the public health and contributes heavily to a vicious cycle of poverty when those struggling the most are also the most prone to illness. In 2013, a study showed that annually “217,000 workers in Brazil miss work due to gastrointestinal problems linked to poor sanitation.”\(^3\)

Rio de Janeiro is now popularly represented as tropical and sporty. Much of this reputation is due to a combination of its geographic situation and the work of an expanding economy whose political representation wishes to be internationally established, pursuing the hosting of mega-sporting events as one means to achieve such status. The mega sporting events held in Rio in the past, and soon with the 2016 Olympic Games, presuppose capacities and capabilities in the urban infrastructure that arguably are not physically present. As an illustration of challenges to Rio’s proclaimed presence on the global stage no aspect of basic urban infrastructure is better than issues of water access and sewage practices. To understand Rio de Janeiro’s place in an international narrative of urban sewage development will require some attention to the history of sewage infrastructure in Rio as well as the urban locations that influenced its modernization campaigns.

**History of Rio de Janeiro’s Sewage Interventions: The European Tradition**

Rio de Janeiro’s sewage system in many ways reflects the more general historical trends of establishing sewage systems. Water scholar and environmental engineer, David Sedlak, offers a useful breakdown of the archetypal storyline of urban water infrastructure’s 3,000 year history. He traces stages from “the achievement of effective water distribution on a citywide scale during the Roman era” to “advancements in water treatment that enabled the delivery of safe drinking water in the fast-growing cities of the 19th century...to developments in sewage


treatment that emerged during the 20th century to protect the larger water ecosystem.”

Unsurprisingly, since Europeans established Rio de Janeiro, all design and city planning, including modernization periods after Colonial rule, were modeled directly from European methods. As such, the sewage systems that exist in Rio de Janeiro today cannot be said to follow a truly Brazilian design (rather one originating without influence of a prior model), save for the off-grid creative solutions in the city’s informal zones. It is useful then, to understand the roots of European sewage measures and cultures that would infiltrate Rio’s system.

**Europe’s narrative**

In Medieval times, refuse was tossed from windows of residences, or allowed to run through open sewage pits; relieving oneself in public was not out of the ordinary or especially lewd. Rivers have long been used as cleansing technologies and Medieval sanitation measures were mostly a matter of moving physical waste to the periphery of the populated zone or to a river or stream. By the 1700s not much had changed for city waste, but wide scale paving led to grooved gutters and established drains to cities’ water systems. Additionally, the sewer and the refuse it contained began to form a new cultural space; practices of relieving oneself were increasingly made private and dirt was something that came to be a symbol of low political or economic status. Cultural changes occurred, for example, “in Western Europe, defecatory practices and verbal references to excretory matters were both subjected to increasing levels of repression from the early modern period onwards.” In addition, “faecal filth was associated in the bourgeois imaginary with the living of a morally reprehensible, improvident and lascivious lifestyle.” The street gutter through playwright Victor Hugo’s contemporary portrayal was “the conscience of the town, where all things converge and clash.” For him it contains the ‘truth’ that reveals the illusory nature of civilization.” Sewage came to be seen as a part of the infrastructure that did not need to be seen; to remove it from the senses was viewed as a civilizing step. The

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7 Inglis, David. "Sewers and Sensibilities" p. 109

8 Inglis, David. "Sewers and Sensibilities" p. 117

exposed sewer and sewage system of the European city was viewed as a danger and as the
“teeming, seething, festering underworld—the urban equivalent of the Freudian unconscious—that
threatens to irrupt and engulf the structures of the urban landscape above.” Parisian sewage
reform would usher in the next phase of systemic change and would become a model for urban
modernization.

Paris’ 1832 cholera epidemic, which killed 20,000 people, was met with public outcry
and the medical recommendation that Paris’ sewer system be greatly expanded. This trend would
continue and be adopted by other European cities leading to a continent-wide obsessions in 1852
dubbed “water mania,” which saw Paris emerge from a city with a meager sewage system to the
Second Empire of Napoleon III’s serious aspirations to make Paris the “Imperial Rome of our
time” through urban redevelopment and sanitation improvement. It was under the direction of
the Prefect of the Seine, Baron Georges Haussman, that a complete overhaul of the sewage
system in Paris occurred; the major result was individual direct residence sewer hookup
replacing cesspool infrastructure and increased girth and breadth of underground sewage
canals. This era of Haussman modernization would be a model for other European cities, but
also a direct influence on Rio de Janeiro’s turn of the century modernization. Ultimately, “[b]oth
in Western Europe and in the United States, most large cities had extensive modern sewerage
systems by the beginning of the twentieth century.” Rio de Janeiro’s journey to its formalized
sewage system followed similar trends, largely because its system’s innovations were informed
by European—and frequently French—precedent.

**Rio de Janeiro’s narrative**

The same coastal territories and inland lagoons that make Rio picturesque also have
played a role in making the area a unique tropical breeding ground for vectors that thrive in
stagnant water. Efforts to combat these mosquito and other vector breeding grounds began as far

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10 Coudert, Allison P. "Sewers, Cesspools, and Privies" p. 714
11 Reid, Donald. Paris Sewers and Sewermen: Realities and Representations. Cambridge, Mass.: Harvard University
Press, 1991. p. 29
12 Reid, Donald. Paris Sewers and Sewermen: Realities and Representations. Cambridge, Mass.: Harvard University
Press, 1991. p. 31
13 Inglis, David. "Sewers and Sensibilities: The Bourgeois Faecal Experience in the Nineteenth-century City." In
back as the 17th century after a virulent Yellow Fever epidemic in 1613 led to high mortalities in the city, especially among the slave population. Following such disease events, campaigns to “fill central lagoons and construction of drainage ditches” and protect public health were carried out by colonial authorities. In 1808 the royal Portuguese family transplanted their capital to Rio de Janeiro and the city’s landscape “began a process of monumental change that would extend well into the twentieth century.” Urbanization of the city was given a dramatic jolt by the Portuguese royal presence (a court of 10,000 Portuguese followed the crown) and corresponded to a population increase of 100% in the thirteen years following the relocation.

Other colonial-era sewage infrastructure occurred in the form of Roman influenced aqueducts. The Carioca aqueduct, whose construction was completed in 1750, was a colonial measure implemented to supply water to the city, and primarily the fountains at its center. The aqueduct, locally referred to as the “Carioca Arches,” took fifty years of slave labor to construct and drew water from the Carioca River into the city. Water delivery was not completely revolutionized by this localized intervention, however, and in 1812 water delivery often was carried out manually and was one role of “slaves, ‘who...serve all of the families of Brazil, bring their owners to church, to the theater, and fetch water at the fountains.’” The use of the Carioca Arches for water transport ceased in 1896 when rails were put in and the structure converted to a tram line that carried residents to the Santa Teresa barra. In 1821, a Portuguese revolt demanded King Joao VI’s return to Lisbon, and Brazil, with Rio as its port and capital, was left to be governed by the heir, Dom Pedro I, who would break from Portugal and establish an Imperial and independent Brazil beginning in 1822.

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Brazil was proclaimed a republic in 1889 and Rio remained the largest city and cultural hub of the country, having an annual growth rate of 7% from 1872 to 1900. Though under new rule, urban ills were pervasive and Rio’s colonial infrastructure was scrutinized under the dawn of new health and hygiene discoveries. Rio’s neighborhoods and colonial tenements were overwhelmingly crowded and “infrastructural deficiencies mounted in the provision of fresh water, sewage and transportation.” There was no official sewer system and dirty water was disposed of with a shout out the window, “Agua Vai!” and a hefty toss; sewage was carried off in barrels by slaves and a city by now of around 200,000 was forced to confront the waste daily.

The first attempts at a sanitation system were made by Rio’s municipal government in 1862, when a British firm, The City Improvements Company, was contracted to create waste treatment centers and install sewers in three districts of the city. This system was one designed under the influence of the most up to date European designs and was implemented by the government in a select few locations in the city. This system may mark the beginning of the divergence between the informal and the formal-between the local, often house by house, solution to sanitation in Rio and the official, government-implemented and often foreign-conceived sewage and water plants. Both continued to exist side-by-side, though with their distinct problems. The 1862 treatment plants used noxious chemicals, producing another set of assaulting odors with discovered public health consequences, and were by no means a solution, contributing to a phenomena already widely occurring at the time: large scale emigration of the city’s wealthy to Rio’s outskirts.

At the beginning of the 1870s, informal settlements created by the dislocated or emigrating poor were also beginning to take shape on Rio’s hills. These informal areas of development were a response to the lack of affordable housing in the city’s center and then large

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20 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 367
21 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 367
22 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 368
23 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 368
25 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 369
scale dislocation caused by the first true modernization movement in the city’s history: the sanitation campaign of Mayor Francisco Pereira Passos of the early 20th century. A population of over 800,000 now circulated through Rio de Janeiro, daily confronted by the obstacle to movement that dense colonial housing and haphazard development had created. This obstruction to urban circulation, along with the rising rate of epidemics and new knowledge of Pasteur’s “germ theory” and environmental causes of chronic illnesses, informed Mayor Passos’ 1902 urban reforms.26 These reforms were again directly influenced by the latest in European design solutions and borrowed quite explicitly from Haussmann's Parisian model.

Passos, and other reformist engineers and financial backers, saw Rio de Janeiro’s potential to be the “tropical Paris,” and they set off leveling most of the dense central housing and colonial buildings, replacing them with long and broad avenues, municipal theaters and official buildings in the Beaux Arts style of French en mode.27 The idea of civilizing Rio was in the mind of the reformers (under the heavy influence of physician and public health advocate Oswaldo Cruz and other medical voices of the city), inseparably joined to improvement in public health through sanitation and science. The central district of Rio was transformed, streets widened and neighborhoods leveled, and effort was put into filling in the marshy coastline of Guanabara, creating more area for city sprawl.

By 1930, a revolution had placed Getúlio Vargas in power and the progress of urban development took on a new role as both a social improvement tool and also an instrument of national identity building. Vargas’ rule was characterized by a growth in state power and the establishment of the new government regime he called “Estado Novo,” which facilitated the modernist boom that leaves its visible legacy on the city today. Between the 1930s and 1960s, Brazil, and Rio de Janeiro, experienced a state of steady growth that was not matched with housing, social service, or infrastructure growth in urban environments.28 Again done in part in the name of hygiene, massive renovations to the city were carried out, and by the 1960s, Rio de

26 Vojnovic, Igor. “Urban Renewal, Favelas, and Guanabara Bay” p. 369
Janeiro had an international presence and modernist aesthetic—which in many cases targeted for destruction the Beaux Arts, Haussman-inspired forms of Republican-era urbanism.

It was also during this time that the growth in favelas\textsuperscript{29} took off in the city and a socioeconomic divide between the north and south of the \textit{cidade} began to materialize more concretely. Guanabara Bay was caught between this division and suffered for it. “Squatter settlements throughout much of the Guanabara Bay basin, an almost complete lack of basic sanitation systems able to service urbanized areas, industrial pollution, landfills covering large areas of the bay, clear-cut hillsides, silting up and reductions in depth-all this took place during the 20th century, mainly from the 1950s onwards.”\textsuperscript{30} As the Zona Sul real estate was highly valued, the government sought to abolish favelas in this region and went about an aggressive favela removal campaign alongside the Bay, lasting into the early 70s. These reforms did not solve housing issues, but rather displaced favela communities to northern informal areas or elsewhere in the city.

The City Improvements Company originally hired in 1862 served a 90 year contract with the city that ended in 1947 and a federal service took over, the Water and Sewers Service. Between that takeover in 1947 and the move in 1960 of the federal capital to Brasília, the sewer network in Rio was 710 miles long, with seven treatment plants.\textsuperscript{31} Between 1969 and 1975, the Ipanema offshore discharge line was constructed, and to this day it is used to carry sewage 2.7 miles through piping out into the Atlantic Ocean. These infrastructural improvements made little difference in the lives of favela dwellers: in 1969, “water was available only at slowly dripping collective spigots at the bottom of the favela hillsides; and sewage ran down slopes in open channels, overflowing onto pathways and into homes during heavy rains.”\textsuperscript{32}

\textsuperscript{29} According to the Rio legislature’s definition 1837, a favela was “constructed of improvised materials”; the city left such areas largely to their own devices, not seeing a need to extend grid accessibility to the resourceful inhabitants (who were often, at this time, longstanding city residents who simply had changed locations).\textsuperscript{29}


\textsuperscript{31} Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p. 376

\textsuperscript{32} Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro. New York: Oxford University Press, 2009. p.228
The military administration of 1964 to 1975 largely ignored issues of urban development, but the 1988 constitution and democratic regime change “shifted the burden for urban development back to the municipalities.” It is from this point on that the sewage system in Rio would firmly be coordinated by the state. In some ways the situation reads almost that Rio, especially where the favelas and other poor regions are concerned, has never had a stable grid to keep modifying, but that instead it has been punctuated by private and, at times, municipal additions. This process began anew in the post-Dictatorship age, about thirty years ago. One exception to this relative lack of a coordinated grid was the 1968 CODESCO campaign Companhia de Desenvolvimento Comunitario (The Company for Community Development), which lasted a year in the impoverished Guaporé barra, with three government projects that “brought in heavy machinery to widen the main access roads for emergency vehicles and installed basic urban infrastructure-water, sanitation, and electrical wiring”\(^{34}\) This was a counter example to a century of policy that saw the favelas as areas to remove or take out, not as a place to invest resources into establishing.

**Rio’s Sewage Ills: A closer look at the Favela**

As mentioned before favela barras are neighborhoods notorious for their lack of services. Little has been done to make the areas more established or permanent that was not carried out by the residents themselves. Even in planned ways of dealing with favela construction at the end of the seventies, sewage remediation in these areas was not wholeheartedly undertaken by the state, and once again the favela communities relied on their own resourcefulness, even when acting with formal agencies. For example, Favela Central, a “planned” favela, has a drainage channel that runs through the sidewalk in front of row houses and drains the area. There are additional water and sewage pipes beneath this channel.\(^{35}\) The responsibility of the piping connected to each residence was left to the family; “[e]ach family was responsible for purchasing and installing the part of the pipelines in front of their own house.”\(^{36}\) The favelas would continue to await any input from the formal municipal services to help combat issues of sewage.

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35 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeirop. 54
36 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro. p. 54
Mangue “is located in a swamp that floods annually.” Its main corridors become rivers and streams during the January and February rains. In 1975, the residents of Mangue “had been waiting three months for the prefect’s office to approve paving the main street of the favela and enclosing the open sewer.”

Understanding the characteristic relationship between these “universal municipal services” and the reality of their exclusion in favela areas, “a commission from Mangue had presented a petition to the government asking for the raw materials and agreeing to supply the labor themselves.” The government promised a speedy response and the residents were left to continue hauling cement sacks to shore up their houses for flooding, knowing that, as usual, the government would not in fact come through. A 1975 commenter noted, “most improvements in infrastructure-water pipes, sewage lines, electricity networks, walkways, cement steps-are the result of investments of labor by favelados themselves.”

**Current Sewage System**

As mentioned above, at the end of the military regime, when the present form of democratic rule began in Brazil, sewer management was brought back under the responsibility of the state. Rio de Janeiro’s state company for water and sewage, CEDAE, was founded in August of 1975, and resulted from the merger of Guanabara State Waters, Guanabara Sanitation Company, and the Sanitation Company of the state. CEDAE is still engaged in operating and maintaining the state's water distribution systems, including collection, treatment and water supply, as well as the collection, transport, treatment and disposal of wastewater generated by 65 of the state's municipalities within its coverage area. CEDAE also develops water quality projects, such as the Guandu II hydro project, which includes building 12 pumping stations, 10 reservoirs and a 495km pipeline to increase the state's water treatment capacity to 42MI.

As urban development has occurred largely in the south of the city and in the more affluent areas, sewage and water infrastructure has been added there. However, the off-grid areas remain largely ignored and contribute the most to the amount of raw sewage that Rio dumps into the Atlantic annually, leading them to be unfairly, albeit accurately, judged as huge waste.

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37 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro. p. 55
38 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro. p. 56
39 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro. p. 154
problem areas. While there has not been a total lack of improvements in these informal spaces, improvements often come first to the favela areas that transition towards stability and formal inclusion, similar to processes of gentrification that characterize other growing cities in the 21st century. In fact, a 2003 study of sewage improvements showed an increase in indoor plumbing infrastructure percentage coverage from 59% to 99% after three generations of study; however, these results obtained only in “consolidated favela” communities primarily in the north and south zones and Baixade Fluminense. The study found that this improvement was “not the case for any new favela in today but, it is representative of...the favelas that have been in existence since the 1960s or earlier.” Yet such improvements are vital to the quality of life of residents. The reality is that the creation of valid infrastructure in the informal areas can make residents of such areas feel a part of the formal system; a Guaporé resident says “Better infrastructure confers greater dignity on us residents.”

In 2013, about 70% of Rio de Janeiro’s population was connected to a formal sanitation system; even so only 50% of total sewage generated by the city was treated before entering the Bay. These percentages are based on best estimates by the magistrate’s office, but Rio de Janeiro, due to the prevalence and volume of its informal neighborhoods is difficult to map or concretely account for. In 2013, the national sanitation information center in Brazil, SNIS, estimated that basic sanitation coverage was at 81% for potable water supply, and a strikingly low 46% for sewage collection and 38% for sewage treatment. A monthly scenario of water consumption of 10m³ (per person?) was checked across the country for the most expensive utility fees, and Rio de Janeiro’s Nova CEDAE state utility was one of the three top chargers. A 2013 projection found that the service charge from CEDAE for one resident living in the São Gonçalo neighborhood is around $100.00 a month. Presently, one of the large issues in CEDAE’s service is the need for an address. CEDAE has been under a lot of public scrutiny due

42 Perlman, Janice E. Favela Four Decades of Living on the Edge in Rio De Janeiro p. 86
to large scale failures of their infrastructure, pumps, and service. Only 39.2% of their 2013 registered customers were indeed connected to a formal sewage collection network. And an account of sewage overcoming scant CEDAE infrastructure causes bubbling over and pooling of sewage on streets of even “privileged” areas of Barra Tijuca. Additionally, having an address is a prerequisite for water billing-utility hook-up. Therefore, in addition to lack of infrastructure in informal areas, the cost of being “on grid” also is a burden on inhabitants. This harsh reality is made even more plain when considering that the vast majority of urban investment in recent times has been in connection with sporting mega events, and is surely compounded by an even worse problem for Rio’s sewage reality: the dumping in Guanabara Bay.

**Guanabara Bay: A decades old sewage solution creating more questions today**

Guanabara was the site of the Portuguese landing in 1502, a visit that spurred the city’s naming as Rio de Janeiro, as the sailors mistakenly took the Bay for the mouth of a great river. A combination of natural sediment deposition and city planning initiatives have led to shoreline expansion and reduced the size of the Baía from 180 square miles in 1500 to 154 square miles in 2000. The Bay is an oval narrowing to 1.1 miles in diameter where it meets the Atlantic and expanding to 15 miles at its widest. Because of this form, Rio’s port is protected from Atlantic storms. The tradeoff, however, is that the “ocean’s natural flushing action” is inhibited.

Land around the Bay has always been prized. Tamoios, the native people of the region, “clustered in agricultural villages around Guanabara” before the Europeans’ arrival five centuries ago. The Bay was the site of Rio de Janeiro’s founding and subsequent prominence as a Western port and slave hub in Colonial times. Even after the fall of the slave trade, Rio remained an

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48 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.359
49 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.359
important port and gateway to the natural resources of Brazil, a foundation that would lead it to its current modern position as a global city. On the path to this status, Guanabara Bay has remained a focal point of development for the city, simultaneously remaining a key part of the city’s identity, as it provides much of the internationally recognized iconic images and vistas. The Bay’s “margins are highly urbanized and contain most of the metropolitan population, industries, oil refineries, two major airports, the seaport and naval base, and the main campus of the Federal University of Rio de Janeiro.”

The city’s great Bay, a “breathtaking tableau,” has long been a dumping site. As Rio grew the Bay suffered, and the city’s industrial progress inversely caused a decline in marine habitat and water quality, and, as activity increased, “pollution by industry, shipping, oil spills, and untreated sewage rendered its once-pristine beaches unsafe for swimming.” Unlike the classification of much of the surrounding natural areas of mountains and national forests as national landmarks in 1973, Guanabara Bay remained without such a status. At present the Bay’s degradation and health are monitored by both state agencies and NGOs, namely the Guanabara Bay Institute founded in 1993, with all such bodies advocating for regulation and systemic changes.

**Rio de Janeiro’s Goal Setting**

In the 1990s, urban planning trends in Rio de Janeiro were influenced by the newly established democracy and the term “sustainable development” surfaced as the new goal. Rio de Janeiro hosted the Earth Summit in 1992 and began in 1994 to take a look at Guanabara Bay with a serious mind to correcting its ills, kicking off a 10 year Guanabara Bay Cleanup Program. The program aimed to reduce industrial pollution by 90 percent by 1999 and allocated half of its funds (raised largely by the U.S.’s Inter-American Development Bank), to residential sewage systems. The industrial reduction program did achieve some successes. However, the

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51 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.359
52 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.361
53 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.361
54 Vojnovic, Igor. "Urban Renewal, Favelas, and Guanabara Bay” p.376
residential program’s shortfalls would set the tone for a modern precedent of failed attempts and false promises for many favela and other Carioca residents. The failure of this program was largely due to the domestic installation and sanitation fees that could not be afforded by off-grid citizens and, as a result, the problem of informal street runoff disposal persisted and continued to streak the beaches. After the ten-year clean-up program ended, the rate of raw sewage dispelled into the Bay was at a 2005 level of 881,849 pounds. The untreated sewage largely comes from favelas and other infrastructure-poor, i.e. non-affluent, sections of the city, adding to the characterization of these places as burdensome on the city and physically filthy.

**The 2016 Olympics: pledged activity to confront environmental degradation**

When bidding for the 2016 Olympics, organizers pushed civic improvements and added a kick: hosting would provide for existent environmental projects in the city already engaged in remedying issues of sewage dumping in Rio’s Lagoons and, most notoriously, Guanabara Bay. Notably, a program mentioned before, Guanabara Bay Clean-Up Program (PDBG), that was begun in 1995, would capitalize on its marginal clean-up success of 32% improvement in amount of treated sewage entering the Bay thanks to an influx of capital pledged by the city with their goals for an Olympic timeline. CEDAE does claim that now 60% of Rio’s sewage is treated before entering the Bay. Another project that began in 2001 to deal with sanitation issues in Barra da Tijuca, the city's fastest-growing section and site of the 2016 Olympic village, the Sanitation Program of Barra da Tijuca (PSBJ), has implemented a submarine sewage processing system. It is making only small gains. Barra da Tijuca is home to one of the worst polluted sewage lagoons in Rio, Jacarapágua Lagoon, whose plan for cleaning up was also part of the 2016 Olympic bid. The slow progress of these programs is not surprising to many Cariocas.

1995 was a year of sewage attention by the government and the establishment of programs to address sanitation in the city and waste management in its Bay and lagoons. Most prominent among them was the federal Growth Acceleration Program (PAC). A recent Trata Brasil study has found that “of the 114 major sanitation projects promised as part of the PAC, only 7% were completed as of December, 2011.” This pattern has continued with the Olympic

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bid projects. The Plan of Urban and Environmental Legacy-Rio 2016 was explicit in detailing progress desires in the clean-up of “Guanabara Bay, Lagoa Rodrigo de Freitas and several lagoons in Barra de Tijuca. But the Plan’s ambitious goal of 80% treated sewage entering the Bay is stymied by a lack of real government intervention. PAC’s other goal of establishing 7 river treatment units (RTU), where mouths meet the Bay has not been met; as of 2013 only one had been constructed.

Gelson Serva, Rio’s Deputy State Secretary of Environment, claims that only 34% of Rio’s sewage is treated, and that plans for 80% clean-up of Guanabara are not likely to be accomplished by the 2016 games. However, he also reported that the government was investing in sanitation plans totaling one billion dollars.56 Many of Rio’s beaches, though they provide iconic imagery for the city, are routinely deemed unfit for swimming according to Rio’s Environmental Institute (INEA) weekly assessments. In fact, Botafogo beach, where Sugarloaf sits, did not have a single day in which swimming was permissible in 2013, due to surpassing faecal level thresholds.57 This poses a huge problem for Olympic aspirations because the Bay will be the site of many events, most prominently all sailing activity. Additionally, in April 2015, the World Surf League pulled a beach in Rio de Janeiro as a hosting site for its upcoming surfing competition in Rio. Sao Conrado, for example, was eliminated as a host for “pollution issues.” This stretch of the coast is below two favela hills where sewage flows directly into the water, and recently a “ruptured sewage main...unleash[ed] a malodorous fountain of untreated waste that is cascaded down a rocky outcropping an into the water creating a huge brown stain.”58

In total, Guanabara Bay is the recipient of outflow from a watershed with a combination of 55 rivers. The majorities of these rivers are now “dead” and are a source of mostly rubbish and refuse. The plans for clean-up on behalf of the government, though incredibly ambitious, were never at an adequate scale— for example, the use of 10 eco-boats for debris pick-up for the

entire Bay. Brazilian biologist, Mario Moscatelli, thinks that “[a]fter the Olympic Games, you can be sure that all the money and political will are going to vanish.”

**Invisible Cariocas: Rio de Janeiro residents living off and on-grid suffer most**

A 76 year old fisherman, Manuel Batista de Moraes, a native of the Vila Pinheiro neighborhood of the Complexo de Maré favela complex reflects that “[i]n the past we fished all kinds of species right here in this canal, (Cunha) now it’s just full of filth.” Fish like that caught by Manuel supplement the earnings of some favela residents and supplement the diets of the favela as well, as local pêixarias sell the fishermen's catches at prices lower than the grocery store.

One favela, Rocinha, has mobilized against the prioritizing of hosting international events over taking care of its local citizens. Rocinha residents, under the leadership of activist groups such as SOS Rocinha Saneamento, have protested the government’s failure to fulfill basic infrastructure promises as well as their choices in what to fund. Recently the implementation of a cable car line in the neighborhood, instead of much needed infrastructure improvements or implementation, has added to residents’ suspicion of federal corruption. A large part of residents’ criticism is that the improvements largely occur in “visible projects” that do not tackle the systemic changes needed most by the community.

Another hurdle to sanitation implementation in the favelas themselves is that the infrastructure systems required often need to be compartmentalized and localized; large systems would not be able to be imposed due to the form of the favelas. Additionally, once such infrastructure is in place, the continued maintenance of such systems has proven a logistical obstacle.. Mauro Kleiman comments on a historical precedent of government investment sacrificing sanitation infrastructure, seen to offer a low return on investment, in favor of projects to boost the economy; “There is a hierarchy of investments [in Brazil], industry first, then what is

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left over goes to urban projects, first in areas of high income, then finally with the poor always being the last to receive government investment. The president of a research institute, Instituto Trata Brasil, stated, “[t]he Brazilian population should not allow, once again, for sanitation to be forgotten at the expense of other investments such as stadiums, for example, that do not bring benefits to the entire population, as sanitation has been proven to bring.”

**Rio de Janeiro’s Modern Situation: geographically and developmentally**

Direct dumping is the modus operandi of the Brazilian sewage system. It occurs, as mentioned before heavily in favelas such as in the Zona Norte at a fringe of the city settled beginning in the late 1940s, called Complexo de Maré (Slum of the Tide), whose direct sewage discharge is into a Guanabara Bay feeder canal, Canal Cunha. However, there are other contributions that environmental degradation makes for sewage and runoff systems that are separate from the Bay’s health. “The rivers that drain the area receive vast volumes of rainwater that descends from the massifs in summer, which is a time of intense rainfall.” And, until the mid-20th century, Rio’s hills were still heavily forested, and the harvesting of them also has reduced the natural protection they held for storm water and rainfall runoff. Reducing that capacity means trouble during periods of heavy rain.

As infrastructure choices are made with the flurry of Olympic money and activity, Rio must concern itself not only with issues of favela access, but also to the other problems facing their system, especially as development into suburban zones grows. Flooding and storm water management are of heightened importance in communities that are proximate to canals in Maracanã, Sao Cristovao and the Port barras. Storm water and landslides threaten hillside favelas, especially Rocinha. High income neighborhoods and areas of burgeoning growth still face dire water issues such as the polluted lagoons in Barra da Tijuca. Barra da Tijuca, the

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http://issuu.com/pennplanning/docs/pages_rio_final_book_5.5, p.15
areas of fastest growth, which also will be home to the 2016 Olympic Village, is set to become condominiums post-games.68

Concluding Thoughts

A comprehensive water and sewage system is a feature of any modern city; such public services are commonplace in the developed world. Rio de Janeiro’s water access grid slowly has been improving over the last two decades, but it is not yet fully comprehensive nor standardized. The same can be said for its sewage landscape. This stands at odds with Rio de Janeiro’s efforts to have a global presence, one of a modern city capable of hosting mega events.

In 2011 Rio hosted a United Nations conference on sustainable development. From the conference an international document on such development was born with a section on water recommendations. UN water recommendation number five was that universal coverage of water supply and sanitation services must be a central development goal in the post-2015 period.69 Rio de Janeiro, and Brazil, would like to be an established member of these conversations and goals because this means playing a role in the global stage at the level of a developed nation and economy. To aid in that quest, Rio has adopted a sport hosting culture and has placed the advancement of infrastructural and social good needs of its citizens behind development projects that aid in its hosting abilities. This is counter-productive to their lofty aims, a solid foundation is what they need; as Richard Sedlak comments, water is “the element that holds a city together and allows it to grow.”70 Water and sewage infrastructure—not tourism dollars—will determine the city’s ability to grow; “historically, the ability to dispose of waste was a strong determinant of tolerable population densities in urban settlements and indeed often of survival itself.”71 Far from modern, Rio is operating as the city government of New York did in the 1820s and “[ra]ther than ensuring an ample water supply and clean streets, the government’s energies remained directed

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68 "Reimagining Rio: Planning for Development After the 2016 Games." p. 23
toward facilitating commercial growth.”

Not only have developments in Rio’s infrastructure been transparently aligned with mega-events, their history of sanitation interventions can be seen as methods of moving or dealing with the poor. The efforts currently being put into remedying the sewage problems of Rio hopefully will continue after the Olympic games. If not improved, these issues truly stand in the way of Rio realizing its ambitions. However, the outlook is grim and actions speak louder than words. In July of 2013, “the Brazilian government vetoed a UN initiative working to assess and improve water access and sanitation in Brazil.”

Iemanja may not remain in Rio de Janeiro, simply because the water may not be a viable home, and the only processions ending at the bay’s edge the sewage pipes.

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Figures

Figure 1: Rio de Janeiro, Guanabara Bay, Google Map

**Figure 2:** ArcGIS generated Rio de Janeiro Sewage problem map.

Earthstar Geographic’s:
http://www.arcgis.com/home/webmap/viewer.html?webmap=58b082c6c6154bbc8aef26ee160bae7b

**Figure 3:** Painting of dance for Iemanja

Image source:https://festivalgear.files.wordpress.com/2013/05/festa-de-ijemanja-medida-30x40.jpg

**Figure 4:** Carnival Float, Unidos de Vila Isabel Samba School, 2014

Figure 5: Guanabara Bay Shoreline, August 2014

**Figure 6:** Dead Fish near Tijuca Lake Outpour

Figure 7: Informal Gutter disposal canal, Favela

Image source: http://www.rioonwatch.org/?p=10892
Figure 8: Proposed sites of 2016 Olympic Sailing and Rowing Events