

Baixada Fluminense: Fluvial and Social Dynamics in the Constitution of a Territory

Baixada Fluminense: dinâmicas fluviais e sociais na constituição de um território

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RESUMO

A Baixada Fluminense tem sua identidade territorial marcada pelos rios, e seu nome está relacionado com a configuração fisiográfica da região. O artigo busca contribuir com a história da construção dessa identidade, no século XIX e início do século XX, sob uma perspectiva teórica que se situa na interface entre história ambiental e história dos sistemas sociotécnicos, possibilitando articular dinâmicas fluviais e sociais. O pano de fundo são as mudanças sociais e políticas no Brasil e no Rio de Janeiro no século XIX e até a década de 1930. A análise foi dividida em três diferentes períodos: (i) entre o início da ocupação do territó-

ABSTRACT

The territorial identity of Baixada Fluminense is marked by rivers, its name derived from the region's physiographic configuration. In this article we look to contribute to the history of how this identity was constructed in the nineteenth century and the beginning of the twentieth, adopting a theoretical perspective situated on the interface between environmental history and the history of sociotechnical systems, thus enabling an articulation of fluvial and social dynamics. The backdrop is formed by the social and political changes in Brazil and Rio de Janeiro from the nineteenth century to the 1930s. The analysis divides into three periods: (i) from the beginning of the ter-

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rio, no final do século XVI, até a primeira metade do século XIX, quando os rios possibilitaram a prosperidade de alguns povoamentos; (ii) a estagnação econômica e subsequente decadência da região na segunda metade do século XIX e o início de sua representação como local pantanoso insalubre no final desse século, tendo os rios como foco dessa insalubridade; (iii) grandes intervenções sobre os rios na década de 1930, realizadas pelo DNOS, possibilitando um novo ciclo de desenvolvimento econômico da região.

Palavras-chave: rios urbanos; Baixada Fluminense; história ambiental; história dos sistemas sociotécnicos.

territory's occupation at the end of the sixteenth century to the first half of the nineteenth century, when the rivers enabled some settlements to prosper; (ii) the region's economic stagnation and subsequent decline in the second half of the nineteenth century and its first depictions as an insalubrious marshland area at the end of the same century, with its rivers identified as the focal point of this unhealthiness; (iii) large-scale interventions on the rivers implemented in the 1930s, undertaken by the DNOS, which prompted a new cycle of economic development of the region.

Keywords: urban rivers; Baixada Fluminense; environmental history; history of sociotechnical systems.

The territorial identity of Baixada Fluminense is marked by its rivers. In the field of geography, the notion of territorial identity is formulated as the physical and symbolic relationship between a particular group of people and a territory, related to the dynamics through which they effectively appropriate this space (Haesbaert, 2007). The expression Baixada Fluminense (BF) – literally translating as the ‘Riverine Lowlands’ – derives from the region's physiographic configuration: a flat area, low-lying in relation to sea level or in comparison to the surrounding region, crossed by winding rivers and channels and with extensive floodplains. Indeed, the rivers and the problems caused by flooding have heavily shaped the region's history. In this article, our aim is to contribute to the history of how this territorial identity was constructed, adopting a theoretical perspective situated on the interface between environmental history and the history of sociotechnical systems, thus enabling an articulation of fluvial and social dynamics.

In a work published in 2008, Christof Mauch and Thomas Zeller turn to authors from across the field of history who have emphasized the importance of rivers for humankind, such as Lewis Mumford – who argued that major historical cultures prospered thanks to the movement of people, institutions, inventions and goods along the natural highways formed by large rivers – and

Roy Mann (1973), who analysed the relationship between rivers and cities, identifying the interventions made along the shores of the waterways – which represented a profound threat to the fluvial landscape (Mauch; Zeller, 2008).

It is only in recent decades, though, that historians have begun to pay attention to rivers themselves, exploring the environmental transformations made to watercourses, turning for their purposes to geomorphological and biological works that have studied the impacts of human action on rivers over time (Mauch; Zeller, 2008). These impacts may be direct (to the river course), indirect (beyond the river course) or even due to environmental changes that, although happening at some distance, may interfere with the quality of the water and the course taken by the river itself (Mauch; Zeller, 2008).

In the field of environmental history, studies of rivers have flourished in more recent years. In *Rivers of Empire: Water, Aridity and the Growth of the West*, Donald Worster examines how the State and capital combined to control water in order to promote capitalist accumulation. The book explores a modern hydraulic society, based on the intensive large-scale manipulation of water in an arid environment and founded on the belief that its technological control through irrigation would open up the American West to development (Worster, 1985).

The hydraulic society defined by Worster, capable of imposing large-scale sociotechnical hydraulic models, is not formed by a monolithic block of power, but by a convergence of interests among owners of rural properties and technical bureaucracy, capable of giving new form to nature and disciplining society in a project of conquest and domination – an agrobusiness bureaucracy that manipulates knowledge to control and dominate rural workers and rivers in order to maximize agricultural production (Worster, 1982, 1985). Beyond the US case, Worster demonstrates that demand for water for a variety of different uses irrevocably changed many of the landscapes and ecosystems of the West and led to a redistribution of power, including the emergence of new bureaucratic and economic elites (Worster, 1993).

Another pioneering work was undertaken by Richard White (1995), where the author explores the relationship between the natural history of the Columbia River and the history of whites and Native Americans in the Northwest Pacific region, arguing for the absence of any clearly demarcated boundary between nature and civilization. In White's view, twentieth-century rivers are human creations, but also have their own lives "beyond our control."

Rivers also became a topic of study in the field of the history of sociotechnical systems,¹ including works on the history of fluvial transportation, hydroelectric power production and water supply systems that fundamentally depend on rivers. Henshaw (2011), for instance, shows how the history of the Hudson River over the last 400 years has been linked to transportation and highlights the fact that large hydroelectric dams were built in the southern part of the lower Hudson in the 1950s to boost the supply of electricity to New York City. Backouche (2016), in turn, demonstrates how the Seine River ceased to be a vital space for Parisian life at the turn of the nineteenth century as it became a national navigation route increasingly separate from the city.

The boundaries between environmental history and the history of sociotechnical systems are fluid. The works of environmental history cited above reveal a rich dialogue with the field of the history of sociotechnical systems. Authors like Pritchard (2013) emphasize this fluidity, an approach still seldom explored in Brazil. These authors argue that the two fields can feed off each other, constructing new theoretical perspectives in the process. For example, understanding the production of technical knowledge of nature as a social process, studies relating to the training of professionals in specific fields like engineering and natural sciences, as well as research into the constitution of expertise in these fields, can all contribute to a deeper knowledge of how the ‘natural environment’ is perceived, constructed, contested and shaped by social actors.

Rivers provide a fertile area for the development of this approach. They are an object of study and intervention in both the natural sciences and engineering. In this natural element, which can be defined as a fluvial environment, the natural and human dimensions are fully intertwined. Rivers come to be understood not as a natural element, but as the result of a set of processes, in part shaped by human action, in part independent of this action, but almost always interwoven, such that they become inseparable (Castonguay; Evenden, 2012; Pádua, 2010; Worster, 1991).

In her study of the Rhône, Pritchard (2011) employs the concept of ‘envirotechnical landscape’ to translate this viewpoint, an idea that reflects the landscapes remodelling by diverse agents – politicians, scientific experts and lay people, spanning both institutional and informal transformations. The convergence of human and non-human factors, the mixture of ecological and technological systems, defines the Rhône as this kind of envirotechnical landscape. In her work, Evenden (2018) extends Richard White’s notion of an ‘organic machine’ beyond the ‘natural’ dimensions of ‘technology’ to question

the boundaries between these categories and artefacts (nature and technology).

Over time, the major engineering works that transformed the rivers for the installation of sociotechnical systems became an integral part of the project of nation building and synonymous with development and economic progress. Molle et al. (2009) argue that over the last 150 years, the transformation of water resources by the nation state within what Pritchard (2011) defines as institutional transformations, emerged as a political strategy to control space, water and people. This strategy is identified by authors as an important part of the structuring of modern states. They reiterate the interpretation of Worster, who pointed out that control of water led to the emergence of a powerful elite that “included scientists and engineers who achieved sophisticated ability to manipulate the natural riverine environment, an expertise they willingly put to the service of even more powerful authorities” (Worster, 1982, p. 505). Because they often worked for the state, becoming an integral part of modern bureaucracies, Molle et al. (2009) refer to this professional staff as a ‘hydrocracy.’ They also emphasize that by acquiring their own corporate interests – and with their influence strongly related to the considerable budget allocated to them – these hydrocracies accumulated considerable power in numerous countries. As examples, they cite the Federal Inspectorate of Works to Combat Droughts (Inspetoria Federal de Obras Contra as Secas: IFOCS) in Brazil, created at the start of the twentieth century to ‘combat’ droughts in the country’s northeast, later reformed as the National Department of Works to Combat Droughts (Departamento Nacional de Obras Contra as Secas: DNOCS). Although the topic has yet to be the subject of any major study in relation to Brazilian cities, the forming of a technical bureaucracy in the service of the state, focused on the design of canals and later the first water supply and sanitation networks, is clearly evident in Rio de Janeiro from the second half of the nineteenth century, both in leading names such as Pedro de Alcântara Bellegarde, Pereira Passos, André Rebouças and Saturnino de Britto, as well as the canal, tunnel and bridge projects that left new marks in the landscape and rivers.

In Baixada Fluminense, the local rivers are depicted either as serving as a means of transportation between the country’s capital and its interior, leading to the prosperity of diverse river towns in the region, or as a source of health risks – turning them into the target of large-scale interventions in the 1930s, by now as part of the activities of the DNOCS hydrocracy.

In this article, our aim is to comprehend the history of the region’s main rivers, understanding them as technological and environmental systems from

the perspective defined by Pritchard (2011). In the background are the social and political changes that occurred in Brazil and Rio de Janeiro between the nineteenth century and the 1930s.

Based in part on the work of Simone Fadel (2009), we divide this history into three different periods: (i) the first spans from the start of the occupation of the Baixada territory at the end of the sixteenth century to the first half of the nineteenth century, when the rivers enabled a number of the region's settlements to prosper; (ii) the second period is marked by the region's economic stagnation and subsequent decline in the second half of the nineteenth century and its first depictions as an insalubrious marshland area at the century's end, with the rivers identified as the focal point of these health risks; (iii) the third period begins with the large-scale interventions on the rivers implemented in the 1930s, undertaken by a hydrocracy, the National Department of Sanitation Works (DNOS), which enabled a new cycle of economic development of the region.

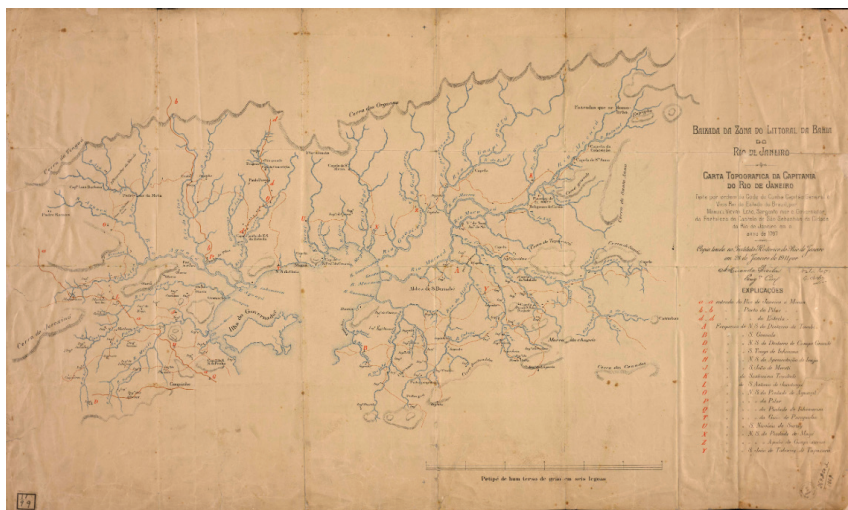
THE BAIXADA RIVERS AS NAVIGABLE CHANNELS AND WATERWAYS IN BAIXADA FLUMINENSE

Until the nineteenth century, occupation of the region that today forms Baixada Fluminense (BF) took place slowly. Lamego cites the granting of the first *sesmarias* (plots of land) in 1558 on the Guandu river in the Sepetiba lands; followed by lands on the Magé and Iguaçu Rivers in 1565; on the Magé River in 1566; on the Inhomirim River in 1568, and, that same year, a large *sesmaria* given to Brás Cubas (Lamego, 1964). These properties were mostly used to grow sugar cane with the plain eventually containing dozens of mills and plantations. Fragoso (2015) lists 160 sugar plantations in the Guanabara Bay area in 1680.

As shown in Figure 1, rivers played a central role in the process of regional occupation. Lamego refers to them as “admirable natural highways”:

It was by moving up the Meriti, Sarapuí, Iguaçu, Pilar, Saracuruna, Inhomirim, Suruí, Majé, Guapimirim, Macacu and Guaxindiba Rivers that the pioneers [*desbravadores*] were able to venture their way inland. Along these river shores, lines of plantations and farms sprung up and the agricultural produce of the bay area [*recôncavo*] was then sent downriver to Rio de Janeiro. (Lamego, 1964, p. 193)

Figure 1 – Topographic Map of the Captaincy of Rio de Janeiro, Manoel Vieira Leão, 1767



Source: Biblioteca Nacional.

The nucleus of São Bento, today situated in the municipality of Duque de Caxias, corresponded to the lands of Benedictine monks who administrated a sugar plantation there. In the Pilar zone, a chapel was already serving as a parish church in 1612. In 1820, Joze de Souza Azevedo Pizarro e Araujo – or ‘Monsenhor Pizarro’ – described the importance of the Parish of Our Lady of Pilar do Iguaçú (Freguesia de Nossa Senhora do Pilar do Iguaçú: today the district of Pilar in Duque de Caxias), the food produced in this area and the key role played by rivers in its transportation:

Just one sugar factory and another fabricating liquor are maintained in their territory whose rural production includes sugar cane, vegetables, rice, manioc and coffee. These products, and the output of the brick factories based there, can be quickly taken to any of the nine free ports and from there transported along the Mantiqueira, Bananal, Saracuruna and Pilar Rivers, all navigable by canoes and other larger vessels. The first two flow into the Couto River, converging in the Iguaçú River, which itself flows into the tidal bay where the boats and cargo-laden launches sail. The same canoes are then filled with diverse kinds of fish, which, fertilizing them abundantly, will satisfy the appetite of the country’s inhabitants.

Next to the main church, a pretty fishing village has formed with thatch-covered dwellings, inhabited all year round by a notable portion of people. There are over sixty houses. (Pizarro, 1820)

According to Soares (1962), the waterlogging of the large floodplains caused problems for everyone living in the region, though the latter also offered “other elements that would allow it to solve this difficulty. The myriad rivers that flow into Guanabara Bay, on whose shores the city of Rio de Janeiro is located, in the past enabled water transportation to be used to avoid the marshy area” (Soares, 1962, p. 6).

Despite the presence of the marshlands, the general perception and depictions of BF did not become negative until the start of the twentieth century. Analysing the accounts of travellers who visited the region in the first decades of the nineteenth century, Fadel (2009, p. 95) underlines that “absent from these [accounts] is any deprecatory description of the contemplated nature. The texts are full of words that convey the sense of enchantment and delight experienced throughout the journey.”

The Iguaçu River, with its sources in the Serra do Tinguá mountains, flowed in a south-easterly direction, stretching some 43 kilometres in total, passing close to the Farm of São Bento and merging eventually into Guanabara Bay. It allowed easy communication with the Pilar River where the Pilar guard and port were located, their importance augmented by the opening of the Caminho Novo (New Path) to Minas, used for moving troops and the transportation of gold to the coast, occupying a strategic position protected from attacks.

As the Caminho Novo began to be used from 1707 onwards, albeit still precariously, connecting the region to Rio de Janeiro, the Port of Our Lady of Piety of Iguaçu (Porto de Nossa Senhora da Piedade de Iguaçu) also prospered and benefitted from a series of improvements in the following decades. According to Pizarro (1820, p. 101), at the turn of the nineteenth century there was a “picturesque hamlet” surrounding this port with thatch-covered houses, two sugar cane mills and some brick factories. As well as sugar cane, manioc, maize, beans, rice and coffee were also produced there.

In the parish of São João de Miriti, Pizarro lists eleven sugar cane mills and three brick factories, as well as sugar plantation and fields growing other food crops. In addition to the Meriti River, the author highlights the importance of the Pavuna and Sarapuí Rivers for this district. From the Serra do

Gericinó “and other nearby mountains originate various rivers, which, abundant, transfer their fertility to the lands of this district” (Pizarro, 1820, p. 16).

Meanwhile in Santo Antônio de Jacutinga (today the municipality of Nova Iguaçu), Pizarro recounts that in 1820 there existed eleven sugar cane mills, a liquor factory and some clay factories, as well as a diverse agricultural production. Again he stresses the importance of the rivers:

Flowing through its lands are the Cachoeira, Santo Antonio do Mato, Douro, and Riachão Rivers, which, swollen by others from the Serra da Cachoeira and Serra da Tinguá mountains, dump large quantities of water into the Iguaçu, Guandú and Serapuy, navigated by boats, launches and canoes filled with effects from the Continent, receiving these cargos at the five ports found along the Iguaçu River, and the four along the Serapuy River. (Pizarro, 1820, p. 166)

The Sarapuí River – which rises at an altitude of approximately 900 meters in the Serra de Bangu mountains in the municipality of Rio de Janeiro – followed a meandering course that eventually flowed directly into the bay. Both the Iguaçu and the Sarapuí had numerous affluents,² but navigation and occupation of the shores of the latter were more problematic, since it formed swamps and marshes that only began to be canalized in the first half of the nineteenth century. Today, from its source to its mouth on the Iguaçu River, the Sarapuí flows around 36 kilometers.

The role played by the rivers was extremely important and their ports facilitated the transportation of gold and other produce to the port of Rio de Janeiro. As sugar cane cultivation developed, Iguaçu was elevated, in the year 1719, to the category of *freguesia curada*, a curated parish – that is, a parish with a local priest (*cura*) – demonstrating the colonial authorities’ recognition of its economic potential (Rodrigues, 2006).

In the mid-eighteenth century, the region was hit by the decline in the sugar cane plantations, which lacked the productivity needed to face strong international competition. The region, which had faded over the course of the eighteenth century, sought to rebuild itself economically in the second half of the century. This regeneration would only gain momentum, however, following the arrival and installation of the Portuguese Court in the city of Rio de Janeiro in 1808. Soares (1962, p. 166) indicates that the multiple commercial interests that linked Rio de Janeiro to the ports of BF allowed the population of the bay area to feel increasingly connected to the rapidly growing capital. Development, though, was limited, driven mostly by the fact that the region

was a route of passage, with rivers playing a central role through the fluvial transportation of goods.

Larger settlements developed at some of BF's rivers ports, their growth determined not by the organizational needs of the surrounding zone but by the need to move merchandise and travellers. The settlement around Nossa Senhora da Piedade de Iguaçu, for example, was elevated to the category of *vila* (town) in 1833. According to Soares, this change in politico-administrative status reflected the importance it had acquired in the traffic of goods and people between the port and its hinterland, recognizing that it lacked many of the characteristics that otherwise made a settlement a true town.

In the nineteenth century, the region's development centred around the coffee economy. BF became the distribution route for the production issuing from the Paraíba Valley. According to Lamego (1964), during the period when coffee began to be grown on a larger scale in the farms of the Paraíba Valley and in the Iguaçu River zone, the town of Iguaçu flourished, evident in the big warehouses and commercial establishments turning over large amounts of capital:

The town turned into a commercial trading post, since the traders established there, purchasing coffee that came from the uplands, supplied the farms of the hinterland with the goods necessary for their consumption and expenses, even though they faced competition from the trade taking place via the ports of Pilar, Inhomirim and Estrêla. (Lamego, 1964, p. 200)

In 1839, the Iguaçu River was used to transport goods and travellers to the region of the Estrada da Polícia (Police Road) and the Estrada do Rodeio (Ring Road) and, via these roads, to the region of Minas and the Paraíba Valley. This region, whose importance had escalated in the eighteenth century with the opening of the Caminho Novo (New Path) to Minas, benefitted from the commercialization of coffee, which enabled the emergence of the first Brazilian highway built for transportation of this crop – the Estrada Real do Comércio (Royal Trade Road) (Royse, 2009). The highway, which passed through the town of Iguaçu, completed in 1822, became the primary route for the transportation of coffee beans and other produce from the Paraíba Valley to the port of Rio de Janeiro. Although a new means of transporting agricultural produce had been introduced to the region, the latter did not become a major producer but rather one of the largest trading posts for coffee exportation.

Notably over the course of the eighteenth century, the rivers, despite their meandering courses, were not the target of large-scale interventions to

facilitate navigation. The area's rural character was a determinant factor in maintaining the hydrological structure of the rivers. In the nineteenth century, steam navigation – which transformed the dynamic of rivers in Europe and North America – was never adopted.

In Rio de Janeiro, steam engine power would be adopted instead in the implantation of the railway system. The Estrada de Ferro Pedro II (Pedro II Railroad), which linked Campo da Aclamação (today the Praça da República in Rio de Janeiro) to Belém station, inaugurated in 1858 in present-day Japeri, was built across the flat landscape of BF with the aim of transporting coffee production from the Paraíba Valley, thus replacing the system formed by the Estrada Real (Royal Road) and the region's rivers and ports.

It is worth remembering that over the course of the nineteenth century, BF's rivers were also used to supply water to the city of Rio de Janeiro. Antonio Rebouças coordinated the studies on the use of the water sources located in the area around the city (Silva, 1965; Telles, 1984). In the report resulting from these studies, the engineer identified the Ouro River as the most promising source, the only inconvenience being the distance that would need to be covered by the pipelines between the Serra do Tinguá and the city of Rio de Janeiro. Even so, the engineer believed that this requirement did not make the project unviable (Rebouças, 1880). In fact, these studies resulted in the Acari System, composed of five pipelines capturing water in the Serra do Tinguá. Nevertheless, these structures did not substantially alter the hydraulic structure of the rivers.

THE EMERGENCE OF RAILWAY TRANSPORTATION AND THE ECONOMIC STAGNATION OF BAIXADA FLUMINENSE

Until the mid nineteenth century, navigation and the works to capture water for the capital had not produced any large-scale alterations to BF's water courses. But even so the impact of the railways on the rivers was significant. The railway itself became a barrier to the drainage of water from the region. Furthermore, the deforestation to obtain firewood, used in the sugar mills and on the railways, also exacerbated the silting up of the rivers. In sum, the economic competition between railway transport and navigation, combined with the cost of the labour force needed to manually clear the rivers to allow fluvial transportation (until abolition, performed by slaves), led to a decline in the importance attached to the region's rivers.

According to Góes, BF's prosperity was based "on the sanitation of the land, realized by the powerful rural aristocracy that exploited it." The decline of this aristocracy and the end of slave labour were, the author argues, the main motives for abandoning the clearance of the rivers: "as the supply of manual labour dwindles, it is no longer possible to tend to the rivers, which are becoming increasingly obstructed..." (Góes, 1939, p. 15).

In analysing the impact of the railways, Soares shows that BF's rivers, by assuming the role of communication routes with the port of Rio de Janeiro, made an important contribution to the establishment and maintenance of a real and long-term connection between Rio de Janeiro and BF until the mid-nineteenth century.

This connection would only be jeopardised by the appearance of the railways. By directly linking the bay coast, and later the capital itself, to the foothills of the Serra do Mar mountains and soon afterwards to the upland plateau, the railways immediately began to help undo the deep ties that had bound Rio to the Baixada da Guanabara for three centuries (Soares, 1962, p. 166).

As well as the impact of the railways, the port of the Iguaçu basin suffered from the competition with the Estrela port, much closer to the central zone of the Paraíba Valley, including its use of steam navigation, "where the transformation of coffee would rise to 30,000 tons per year, brought down from the mountains on muleback and loaded there" (Lamego, 1964, p. 201).

Without any function, many river ports fell into disuse. The Iguaçu River became silted. During the rainy season, it began to overflow its narrower course, spreading across a vast floodplain. New swamps and marshes formed. During this period, therefore, the image emerged of an insalubrious Baixada Fluminense, a hostile environment where the floodlands were transformed into breeding grounds for mosquitos, a situation that persisted throughout the first decades of the twentieth century (Fadel, 2009).

This insalubrity was associated with an image of unproductivity. As the frontline of coffee production migrated to the valley of the Paraíba River, following the railways, the population hubs associated with the ports entered into decline and eventual ruin. This process of economic and demographic reduction and the eventual death of the old towns is comparable to the processes observed in other regions of Brazil, like the town of Airão (Amazonas), at the end of the rubber boom (Leonardi, 1999). As Soares points out, in the case of BF, these urban nuclei (port towns), mostly formed by a transitory population, never enjoyed the autonomy that turns agglomerations into true urban centres.

In the words of Maia Forte, cited by Lamego (1964, p. 201):

Iguaçu was a ghost town, abandoned, whose scarce population lived in the grips of malaria. Their existence was limited to the artificial life given by officialism, the Municipal Council, the judicial life, this for a few hours during the day. At night, Iguaçu was plunged into the restless sleep caused by the ruthless bouts of malaria.

As Lamego (1964, p. 202) emphasizes, this decline was not exclusive to the town of Iguaçu. It also affected the towns of Jacutinga, Pilar, Estrela, Porto das Caixas and Inhomirim, “all of them born, evolving and dying subject to the contingencies of a transport system that came to an end and routeways that were diverted elsewhere.”

This decline was also expressed by Góes (1939, p. 15):

Of the splendid past of Vila de Estrela, a beautiful river port, the terminal point of the road that crossed the wildernesses of Minas, Goiás and Mato Grosso, there remained just a single manor house, with crumbling walls that threatened to collapse.

Of the old and once flourishing town of Iguassú, there exists just one street, paved with uneven stones, which is little by little becoming absorbed into the surrounding forest.

Up to then, the imperial government had no clear political-economic project for the region.

LARGE-SCALE SANITATION WORKS AND THE TRANSFORMATION OF THE BAIXADA RIVERS

At the end of the nineteenth century, BF's identity had changed. In half a century it had passed from a prosperous region to an insalubrious area, economically depressed and assailed by frequent outbreaks of malaria. There are records of the imperial government's concern with the region's sanitation during this period, yet, despite some studies being carried out and a contract signed, only one-off projects were executed – either by the State or by the private sector.

In 1883, for example, Major Rangel Vasconcelos undertook studies on the *pirexias palustres*³ that afflicted the region and proposed solutions for sanitizing the Iguaçu, Meriti, Pilar and Irajá Rivers (Góes, 1934, p. 264). Vasconcelos's proposals never left the drawing board, however, due to a lack of resources.

Some years later, in April 1889, the imperial government agreed a contract with the engineers João Teixeira Soares and Joaquim Pereira dos Santos. This time, the contract was focused primarily on the north of Rio de Janeiro province. Once again, Góes (1934) records, nothing came of the plans and the tender was cancelled.

During the First Republic (1889-1930), the federal and state governments undertook a number of sanitation initiatives with the aim of re-establishing agriculture and human occupation of the region (Góes, 1939). These actions were, however, marked by state concessions that awarded private companies huge advantages and rights over the territory (Souza, 2006).

In 1894 the Baixada Study and Sanitation Commission of Rio de Janeiro State (Comissão de Estudo e Saneamento da Baixada do Estado do Rio de Janeiro) was created, initially headed by the engineer João Teixeira Soares, replaced six months later by Marcelino Ramos da Silva. In December 1888, by then at the end of the empire, Soares was contracted along with Joaquim Pereira dos Santos to drain the lands, dredge the rivers, and straighten, excavate and prepare the courses of the main rivers and affluents for navigation. Now under the republican government, as well as producing detailed studies of the hydrography, meteorology, economy and human settlement of the region, the commission, via its sanitation project, was tasked with enabling the use of the water courses for navigation and irrigation.

Despite the studies carried out by this Commission, the works effectively executed until it was shut down in 1902 were mostly one-off.

The services begun and concluded by the Commission were limited to dredging a channel in the Estrela River and a sandbank in the same river. In addition to these works, the commission initiated, but never completed, the dredging of channels in Piedade port, the Macacu sandbar and the Imbariê River (Góes, 1934, p. 325).

During the governments of Presidents Rodrigues Alves (1902-1906) and Afonso Pena (1906-1909) we can observe a certain neglect of BF by the federal authorities. They seemed to overlook it, despite the hygienist discourse that marked Pereira Passos's reforms in Rio de Janeiro. These were effectively limited to the territory of the former Distrito Federal (Federal District). In 1903, Rodrigues Alves and Oswaldo Cruz initiated the campaign to eradicate yellow fever in Rio de Janeiro, but BF was once again ignored. In 1918 the physician Artur Neiva Belisário published *Saneamento do Brasil* [Sanitation in Brazil], in which he highlights the failures in health policies of the period, concluding that – with the exception of São Paulo and to a certain extent Minas Gerais and

Rio Grande do Sul – Brazilian states, in practice, only intervened to remedy the sanitary conditions of the capitals, leaving the rural populations to their state of complete abandonment (Santos, 1985).

Indeed, it was only during Nilo Peçanha's mandate that BF seems to have acquired some degree of relevance, reflecting the advances made by the sanitary movement beyond the urban environment. An important ally was IFOCS, created in 1909 by Francisco Sá, then minister of Roads and Public Works.

In 1910 the Federal Government created the Federal Commission of Sanitation and Clearance of the Rivers Flowing into Guanabara Bay (Comissão Federal de Saneamento e Desobstrução dos Rios que Deságuam na Baía de Guanabara), the directorship of which was once more assigned to Marcelino Ramos da Silva, until his death, followed by the appointment of Fábio Hostílio de Moraes Rego. The commission made some advances, even utilizing the studies carried out by the 1894 Commission to draft its request for tender.

The company with the cheapest bid was chosen from among those with experience in sanitation works – namely, the German firm Gebrueder Goedhart A. G. (Góes, 1934). As well as straightening a section of the Sarapuí River, the company executed the clearance, unblocking and dredging of various rivers in Baixada Fluminense, as summarized below.

- a) Clearance and unblocking of the rivers of the Meriti River basin; the Sarapuí and affluents upstream of the Leopoldina Railway; the Iguaçu River and some rivers from the Estrela River basin – including the Saracuruna, Canal da Taquara, Imbariê and Inhomirim Rivers – as well as the dredging of the Meriti, Iguaçu and Estrela Rivers.
- b) Opening of channels in the sandbar on the Meriti River – which served to drain the swamp formed between the two rivers; a connecting canal between the Sarapuí and Iguaçu Rivers, a channel in the sandbar of the Iguaçu River; the channel of the sandbar of the Estrela River; the channel of the Mosquito – allowing the water from the 'Mosquito Marsh' to drain into the Imbariê River. (Góes, 1934)

The company concluded the contracted services in 1916 and the Commission was abolished. The objective of the 'sanitation' actions was two-fold: to improve the quality of the environment and to obtain lands for agricultural production. The sanitation consisted of dredging various rivers that flowed into Guanabara Bay and the elimination of the swamps, which were in reality natural overflows of the river courses. Considered a malaria hotspot,

these river floods became the target of criticisms, but the objective of the river channelling and straightening was also to make the lands attractive for agricultural developments. The argument of insalubrity gained prominence as part of a project to improve public health formulated by the national sanitary movement. Hochman (1998) describes this movement and its ideological base. According to the author, the contagious nature of the disease led to the imposition of an authority able to act over the entire territory and all its individuals – curbing individual freedoms, altering property rights and violating political self-governance, thus challenging both personal freedoms and the existing federal distribution of powers.

Another factor that reinforced this movement was, as Santos emphasizes, the arrival of the Rockefeller mission and the beginning of the Foundation's activities in Brazil in 1917. Its projects gained traction in the Federal District and in the hinterlands of the states of Rio de Janeiro and São Paulo, where it joined forces with the federal and state governments to combat hookworm and malaria.

The reports of the first BF Sanitation Commission (Comissão de Saneamento da BF) already indicated that the region's insalubrity was not natural – in other words, it was not simply a natural outcome of its topography, the high rainfall and the heavily meandering rivers. Human action is also emphasized, citing the construction works on the highways and railways that were undertaken without in-depth studies, resulting in these works creating barriers to water drainage.

The Commission's objective was economic integration of the territory, restoring the navigability of its rivers and creating the possibility of establishing agricultural activities (Fadel, 2009). Despite being abolished in 1916, the Commission left a detailed survey of the situation of BF's rivers with a set of intervention proposals.

The cultivation of oranges, introduced to Nova Iguaçu at the end of the nineteenth century, was widely encouraged given the suitability of the climate, relief and soil. Furthermore, the proximity to the main consumer markets (Rio de Janeiro and São Paulo), the possibility of railway transportation and government support – for both production and exportation – were also fundamental to the development of this new activity (Rodrigues, 2006). In order to encourage this activity and the region's development, however, it was necessary to improve its environmental conditions and reclaim the flooded lands.

In 1920, a new sanitation commission was therefore created: the Commission of Improvements of the Rivers of the Bay of Rio de Janeiro

(Comissão de Melhoramentos dos Rios da Baía do Rio de Janeiro). This time the services for the sanitation of the western portion of Guanabara Bay were awarded to the Brazilian firm Empresa de Melhoramentos da Baixada Fluminense (Baixada Fluminense Improvements Company). However, the initial scope of the proposal, which consisted of sanitizing around 2000 km², was never executed and the services that were actually carried out were limited to partial landfilling of Manguinhos in the city of Rio de Janeiro. Additionally, in 1921 the company expropriated the São Bento farm estate (located in what today is the Second District of Duque de Caxias) and began its sanitizing with the aim of installing an agricultural colony. After the contract was cancelled in 1931, the farm area became national patrimony (Góes, 1934).

Still in the 1920s, the Baixada Fluminense Inspection Authority (Fiscalização da Baixada Fluminense) was created, incorporated into the Rio de Janeiro Port Inspection Authority (Fiscalização do Porto do Rio de Janeiro) in 1932. This began to execute the regular services included in the contract with the Baixada Fluminense Improvements Company. In sum, we can note that until 1932, and despite the growth of the sanitary movement and the concern with the region's sanitation, no large-scale regional work was undertaken due to the political instability (Góes, 1934). Over the course of the 1930s, however, changes in the Brazilian political setting allowed the execution of large-scale engineering works that would contribute to the alterations in land use in BF thereafter (Quintslr, 2018).

The BF sanitation attempts undertaken until the 1930s enabled land subdivision and occupation of certain areas, notably those territories corresponding to the present-day municipalities of Nilópolis and São João de Meriti, as well as the southern portion of Duque de Caxias (Simões, 2006; Abreu, 1988). Nevertheless, Góes (1934, 1939) argued, the works executed up to then lacked studies capable of supporting their design, or a comprehensive vision of macrodrainage, meaning that they could not adequately assess their implications. Furthermore, the brusque changes in administration typical of the First Republic led to the successive creation and abolition of commissions and alterations to the directions taken, exacerbated by funding shortages.

In July 1933, seeking to definitively resolve the sanitation problems faced by the lowlands of Rio de Janeiro state and accelerate their integration into the national economy, the federal government created the Baixada Fluminense Sanitation Commission (Comissão de Saneamento da Baixada Fluminense), under the responsibility of the National Department of Ports and Navigation (Departamento Nacional de Portos e Navegação), headed by Hildebrando

Góes. In 1936, the Commission was transformed into the Baixada Fluminense Sanitation Directorate (Diretoria de Saneamento da Baixada Fluminense: DSBF), remaining subordinate to the Ministry of Roads and Public Works (Brasil, 1936). The following year the National Department of Sanitation Works (Departamento Nacional de Obras de Saneamento: DNOS) was created at national level and the DSBF became part of this body. It is worth emphasizing that until then the name Baixada Fluminense was used to designate all the coastal lowlands of Rio de Janeiro state located between the coast and the Serra do Mar mountain range.

The interventions carried out by the DSBF should be comprehended within the framework of the changes occurring in Brazil after the 1930 Revolution and the rise of Getúlio Vargas to the National Executive (Quintslr, 2018). The rejection of liberal ideology underpinned the state's increased participation in the economy and planning throughout the capitalist world (Ianni, 1979). Despite Steven Topik (1987) arguing that the Brazilian state was already the most interventionist of Latin America in the First Republic, this state intervention in economic activity expanded during the New State (Estado Novo) from 1937. According to Ianni (1979, pp. 50-51), in the 15 years in which Vargas was in power "new conditions were created for the formation and development of a kind of state technostructure in Brazil" – which involved the creation, by the Federal Government, of commissions, departments and institutes, and the formulation of plans aimed at studying and coordinating productive activities in general.

In accordance with these more general directives for stimulating and disciplining economic activities, then, the following powers were established for DSBF: the study and planning of sanitation works in the region; the study of hydrographic basins and the water course system; a property register survey; the elaboration of an economic development plan for BF; and the organization of an agricultural immigration plan for the entire region (Brasil, 1936).

The works conducted in the region in question included the recuperation of areas periodically flooded by tides, defence against floods, the dredging of new silted and/or obstructed river courses that formed marshes, and what Góes (1939) denominated "works of art," that is, bridges that needed to be rebuilt since some of them were obstructing the flow of the rivers.

A complex flood mitigation system was built, therefore, involving the construction of polders, dykes along the shores of the rivers and auxiliary canals. In some cases, the installation of pumps proved necessary to facilitate water drainage, especially when heavy rains coincided with high tides (Góes,

1939). In others, automatic floodgates were considered sufficient to ensure an adequate outflow.

Along the Meriti River, eleven kilometres of dykes and canals were constructed, “reclaiming an area of 6 million km², highly valorised, because it is located in the suburbs of Rio de Janeiro” (Góes, 1939, p. 30). The same system was implemented on the Sarapuí, Iguaçú and Pilar Rivers.

These works are described by Góes:

Dykes have been built along the river shores which prevent the flooding of the lands by tides. The top of the structure is generally set one metre above the maximum high tide level. Canals are dug on the inside of the dykes to collect the rainwater falling in the target area, which is channelled into them through the secondary network. This water then flows into the river through a series of pumps whenever high tide coincides with strong local rains, or through automatic tide-gates at low tide. (Góes, 1939, p. 30)

These hydraulic works still exist today on various rivers in BF. However, the virtual absence of housing policies for the popular classes over the decades led to the occupation of many areas of polders and even dykes in the region, not only jeopardizing these structures but also placing at risk the population living on them.

New courses were dredged in various silted rivers in the region, including the Iguaçú River, upstream of the Rio-Petrópolis highway, and the Pilar, Capivari, Babi, Botas, Velhas and Maxambomba Rivers. Thus, in the Iguaçú basin, 37 kilometres had already been dredged as of 1939. In the Sarapuí River basin, 10 kilometres had been dredged, while in the Estrela River basin (including the Inhomirim, Saracuruna and Imbarê Rivers), a 6-kilometre section had been dredged (Góes, 1939).

Among the results achieved were a reduction in malaria hotspots and a boost to the region’s “economic resurgence” (Góes, 1939, p. 57). Rural recolonization, however, another of the announced objectives, was fairly limited. In fact, the Rio state economy, especially agricultural production centred on sugar and coffee, was immersed in a long-term crisis whose origins lay back in the nineteenth century and that had worsened at the turn of the twentieth (Ferreira, 1994). Over the 1910s and 1920s there was no real economic recovery, save for some progress in coffee production. At the beginning of the 1930s, the coffee boom in the north of the state had petered out, along with the sugar agroindustry, due to the impossibility of exporting sugar and the shrinkage of

the domestic market. There seemed to be no economic alternatives able to inject a greater dynamism into the economy, despite the attempts to stimulate agricultural diversification made by Nilo Peçanha (Ferreira, 1994). Even so, it is worth emphasizing the proliferation of citrus crops in the territories of Nova Iguaçu, Belford Roxo and Queimados – which would prosper for some years until the crisis unleashed by the Second World War.

Góes's report also highlights the valorisation of BF's lands after the DSBF's works:

Following the government's example, large abandoned properties have been acquired by private companies, which, after the first indispensable improvements, divide up the large areas and sell the lots, facilitating long-term payment. Various companies have already organized around this objective, obtaining entirely satisfactory results. (Góes, 1939, p. 58)

Indeed, the works executed by the DNOS in the 1930s freed up large areas of BF for capitalist accumulation, enabling a parallel to be drawn with the situation of the American West described by Worster (1982, 1985). With the start of the land subdivision in plots the sanitized areas were gradually incorporated into the urban fabric of Rio de Janeiro city, beginning a process of metropolitan expansion.

The desire of state bureaucracies to control nature – principally expressed by the works of 'disciplining' the rivers that marks the BF sanitation works – was not disconnected from global trends (Quintslr, 2018). As Molle et al. (2009, p. 328) insist, large hydraulic projects were a political strategy used to control space, water and populations, as well as an "important part of the everyday forms of state formation" from the mid-nineteenth century. According to the authors, the hydrocracies that propelled these projects acquired considerable power in diverse national contexts.

In fact, the engineer Hildebrando de Araújo Góes, who headed the works of the Baixada Fluminense Sanitation Commission and directed the DNOS until 1946, became widely renowned and remained an important public figure in Brazil for many years. He participated, for instance, in the expansion of the Rio de Janeiro Port and in the implementation of flood control works in other regions. In 1945, after the end of the New State, he was elected Bahia's state deputy to the National Constituent Assembly. When Eurico Dutra became president, however, he renounced the mandate in order to be nominated

Mayor of Rio de Janeiro, the Federal District at the time. He was subsequently elected Federal Deputy for Bahia twice (Quintslr, 2018).

FINAL CONSIDERATIONS

In the European and North American contexts, the form of many rivers changed dramatically over the nineteenth and twentieth centuries. Transformed by specialists who in most cases acted in the name of the centralizing nation states in response to political, economic and social demands, the rivers incorporated new structures. Their courses were modified to become artificial canals, taken to be the best way of transporting goods. To accommodate the growing volumes of cargo and the larger barges, the widths and depths of the canals were standardized, which required the use of dredging at a then unprecedented scale.

In the context of BF, still during the imperial period, the rivers assumed the role of enabling navigation, but the costs and interests involved prevented large works from being undertaken by the state. Actions were limited to river dredging to facilitate the circulation of boats. Consequently, their courses remained unaltered and towns prospered around the fluvial ports established in various points of the region. After the end of river dredging works – usually undertaken by private interests – the courses of the rivers gradually became obstructed again and overflowed their banks, flooding large areas of flatland.

It was only in the twentieth century that central government formulated an economic project for Baixada Fluminense as a whole. Following the precepts of hygienist theories, the lands had to be sanitized, the rivers ‘corrected’ and ‘disciplined’ in order to allow the quickest possible drainage of water and enable agricultural occupation. With the initiatives undertaken by diverse sanitation commissions set up from the beginning of the twentieth century and especially with the interventions undertaken in the 1930s, the physiognomy of the rivers was transformed. New structures were incorporated into them (floodgates, dams, bridges, dykes, pumps and canals). As in Europe and North America, the construction of these structures became synonymous with technical and economic development and even the building of powerful nation states. Indeed, in Brazil this process was closely related to Vargas’s project of centralizing power in the federal executive, which involved the formation of a bureaucracy along Weberian lines and, ultimately, a hydrocracy that became consolidated through the application of rational technical knowledge to the rivers of diverse regions – including BF. It was from this moment and through

the action of the hydrocracies that these rivers can be said to have become what Pritchard (2011) defined as an “envirotechnical landscape.”

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NOTES

¹ The concept of sociotechnical system emphasizes the impossibility of separating the technical and the social, a notion that coincides with the works cited in this section.

² Affluents flowing into the left bank of the Iguaçu River include the Tinguá, Pati and Capivari, and, into the right bank, the Botas and Sarapuí. The principal affluents of the latter, for its part, at least until the nineteenth century, were the Socorro, Santo Antônio and Prata Rivers and various streams that were later canalized.

³ ‘Marsh fevers’.

