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The rivers of Duque de Caxias-RJ: past and present interventions, projects and utopias

Os rios de Duque de Caxias-RJ: intervenções do passado e do presente, projetos e utopias

Los ríos de Duque de Caxias-RJ: intervenciones, pasadas y presentes, proyectos y utopías

Ana Lucia Britto, PhD in Urbanism, Professor of the Postgraduate Program in Urbanism at the Federal University of Rio de Janeiro.
E-mail: ana.britto@fau.ufrj.br *https://orcid.org/0000-0001-6558-8405*

Maria Luiza de Souza Oliveira Ottoni, Master in Urban Planning, Graduate Program in Urban Planning, Federal University of Rio de Janeiro.
E-mail: mlottoni@hotmail.com *https://orcid.org/0009-0002-1614-364X*

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Abstract

This text addresses the rivers of Duque de Caxias -RJ. It brings a history of interventions carried out in the city's rivers, linked to the history of occupation of the territory, revealing the visions and concepts on which they were based. For a long time, rivers have threatened urban life, being natural elements to be controlled and modified.

New visions have recently emerged that incorporate, along with flood prevention, the need for environmental recovery of these rivers. Moving forward in this perspective, the paper proposes to recover one of the city's rivers, the Roncador, and the impasses in developing this type of project, which incorporates landscape values and ecological potential of this river.

Keywords: Urban Rivers; Duque de Caxias-RJ; Rivers Recovery.

Resumo

O presente texto aborda os rios de Duque de Caxias-RJ. Ele traz um histórico das intervenções realizadas nos rios do município, articuladas ao histórico da ocupação do território, revelando as visões e os conceitos nos quais elas foram baseadas. Ao longo da história, muitas vezes, os rios representaram uma ameaça à vida urbana, sendo causa de inundações; eram elementos naturais a serem controlados e modificados. Recentemente, surgem novas visões que incorporam, juntamente com a prevenção de inundações, a necessidade de recuperação ambiental desses rios. Avançando nessa perspectiva, o trabalho traz uma proposta de requalificação de um dos rios do município, o Roncador, e os impasses no desenvolvimento desse projeto, que incorpora as potencialidades paisagísticas e ecológicas desse rio.

Palavras-chave: Rios Urbanos; Duque de Caxias-RJ; Requalificação Fluvial.

Resumen

Este texto aborda los ríos de Duque de Caxias-RJ. Trae una historia de intervenciones realizadas en los ríos de la ciudad, ligadas a la historia de ocupación del territorio, revelando las visiones y conceptos en que se sustentaron. Durante mucho tiempo, los ríos representan una amenaza para la vida urbana, siendo elementos naturales que deben ser controlados y modificados. Recientemente han surgido nuevas visiones que incorporan, junto a la prevención de inundaciones, la necesidad de recuperación ambiental de estos ríos. Avanzando en esta perspectiva, el trabajo presenta una propuesta de recalificación de uno de los ríos de la ciudad, el Roncador, y los impasses en el desarrollo de este tipo de proyecto, que incorpora los valores paisajísticos y el potencial ecológico de este río.

Palabras clave: Ríos Urbanos; Duque de Caxias-RJ; Recuperación de Ríos.

Introduction

Rivers have extreme importance in the development of cities in Baixada Fluminense. Initially, in the 18th century, they served as pathways of penetration into the territory, with river ports like Estrela, Pilar, and Iguaçu serving as strategic points, facilitating interaction between the region and the capital. In the 19th century, railways replaced waterways, and the river ports ceased. Meandering rivers with extensive floodplains were considered obstacles to settlement, posing threats during floods — a problem to be addressed through engineering interventions. Engineering knowledge advanced, and concepts of sustainable drainage overcame the interventionist approach of river channelization. In urban planning, the relationship between urban occupation and rivers was also revised, giving rise to concepts like blue infrastructure and water-sensitive urban design, focusing on allowing space for rivers and valuing their scenic and ecological potential. However, within the context of Baixada Fluminense, the effective adoption of this new vision is yet to occur. Even today, municipal authorities implement river channelization and straightening projects as neighborhood urban improvement measures.

This text discusses Duque de Caxias and its rivers.

The municipality of Duque de Caxias is situated in Baixada Fluminense, covering an area of 467.6 km^2 and having a population of 808,152 inhabitants (IBGE, 2023). It comprises four districts: Duque de Caxias (1st district), Campos Elíseos (2nd district), Imbariê (3rd district), and Xerém (4th district).

The municipal territory lies within the hydrographic region of Guanabara Bay, the outlet for the main rivers traversing the municipality. Three major hydrographic basins drain the city: Iguaçu-Sarapuí, Estrela, and São João de Meriti, as well as several smaller basins with direct drainage into the Bay (Figure 1). These rivers have torrential regimes with significant erosive power until they reach the plains. In flat areas, they face difficulty in drainage due to the low terrain gradient, forming extensive flooded areas such as marshes and swamps (Prefeitura Municipal de Duque de Caxias, 2017).

The work is based on a review of plans, projects, and academic papers related to the analyzed territory and literature concerning the discussed concepts. It is supported by over 20 years of field research conducted within the territory. Grounded in this literature, the study presents a historical overview of interventions carried out in the rivers linked to the historical context of territorial occupation. It reveals the perspectives and concepts upon which these interventions were based while also addressing the dual perspective presented by the rivers of Duque de Caxias: on the one hand, they are seen as a threat to urban life, being held responsible for flooding; on the other hand, they possess landscape and ecological potential.

Figure 1: Watersheds of Duque de Caxias. Source: Municipality of Duque de Caxias 2017.

Ultimately, the article proposes a river requalification plan for one of the municipal rivers, the Roncador River, and concludes by discussing the possibilities and limitations of implementing projects of this nature.

Duque de Caxias and its rivers in the origins of territorial occupation

The Portuguese settlement of the Caxias territory began in the 16th century through land grants known as "sesmarias." In place of indigenous villages, sugar mills, chapels, monasteries, taverns, ports, and roads were established. As Souza (2002) noted, the region's topography was conducive to sugarcane cultivation, and the rivers facilitated the transportation of goods and communication with the city of Rio de Janeiro. Lamego (1964, p. 193) referred to the rivers traversing the Duque de Caxias territory, such as Sarapuí, Iguaçu, Pilar, Saracuruna, and Inhomirim, as "admirable natural roads."

One of the primary cultivation areas in Duque de Caxias was the São Bento Farm. The Iguaçu River passed near this farm, with one of its tributaries, the Pilar River, hosting a critical port called Porto do Pilar. In addition, other ports for agricultural product transport were located along the rivers that crossed the territory, including Porto Estrela, Porto da Chacrinha, and Porto de Pau Ferro (Souza, 2002).

With the opening of routes for transporting Minas Gerais gold, the "Caminho Novo" (New Route) to the mines turned the territory of Duque de Caxias into an essential

area for the passage and rest of troops via the Pilar River. In the 19th century, coffee cultivation, the new economic driving force in Rio de Janeiro, also utilized the rivers of Caxias and their ports. The coffee production from the Paraíba Valley was transported through the Ports of Estrela and Pilar (Lamego, 1964).

Soares (1962) and Lamego (1964) illustrate that the emergence of railways directly connecting the Bay's coastline and the city of Rio de Janeiro to the base of the Serra do Mar led to the abandonment of the river transportation system. The villages that had grown around the ports, such as Pilar and Inhomirim, declined due to the phasing out of the river transportation system (Lamego, 1964).

The loss of navigational function resulted in neglect of actions to maintain river navigability, such as dredging. The rivers overflowed their banks during the rainy season, occupying vast floodplains and forming swamps and marshes. This contributed to the image of an unhealthy lowland, a hostile environment where waterlogged lands turned into mosquito breeding grounds (Britto; Quintslr; Pereira, 2019).

The interventionist view on the rivers: the efforts of the Sanitation Commissions

During the Imperial period, a project was established to revert the stagnation in the region by invigorating the occupation of Baixada lands for agricultural purposes. In December 1888, the first contract of the imperial government was signed to drain the lands, dredge the rivers, and straighten the main riverbeds. In 1984, during the Republican government, the Commission for the Study and Sanitation of Baixada in the State of Rio de Janeiro was established. In addition to conducting detailed studies on hydrography, meteorology, economy, and settlement of the region, this commission aimed at utilizing the rivers for navigation and irrigation through its sanitation project. The works executed until 1902 (the year of its dissolution) were quite specific, limited to the dredging of the Estrela River. Apart from these, the commission initiated but did not complete the dredging of channels in the Porto da Piedade and Rio Imbraiê, both in Duque de Caxias (Góes, 1934, p. 325).

In 1910, the efforts were resumed by the *Federal Commission for Sanitation and Clearing of the Rivers that Flow into Guanabara Bay*, led by the Federal Government. The goal of this commission was to promote the economic integration of this territory with the capital, restore the navigability of the rivers, and enable the establishment of local agricultural activities (Fadel, 2009). Among the executed works, the straightening of a section of the Sarapuí River stands out.

Another significant factor was the cultivation of oranges, which began in the late 19th century and brought new dynamism to the Baixada Fluminense region. However, within the boundaries of the present-day municipality of Duque de Caxias, the

orange production did not expand. Subdivision and occupation occurred only in some limited regions in the southern portion (Abreu, 1988; Souza, 2002).

In July 1933, the Federal Government established the Baixada Fluminense Sanitation Commission, headed by Hildebrando Góes, which was transformed into the Baixada Fluminense Sanitation Directorate in 1936, with the same leadership remaining. This Commission developed a comprehensive flood mitigation system that involved the construction of polders, dikes along the riverbanks, and auxiliary channels. In the Sarapuí River basin, 10 kilometers of rivers were dredged, and in the Estrela River basin (including the Inhomirim, Saracuruna, and Imbariê Rivers), a 6-kilometer section was dredged (Góes, 1939). One of the immediate outcomes of these actions was the reduction of significant malaria outbreaks in the region (Braz; Almeida, 2010).

The activities of the Sanitation Commission were accompanied by the establishment of colonial nuclei by the Federal Government. In Caxias, the São Bento Colonial Nucleus was set up in December 1932. Souza (2002) demonstrates that in this area, isolation and the lack of funding and transportation for agricultural production led to subsistence farming only. As a result, many areas designated for cultivation were transformed into the first urban lots. Besides the location of the former São Bento nucleus, this initial urban settlement also extended towards Pilar.

Urban growth: rivers as a threat

Improving transportation systems and accessibility in the region led to the intensification of land subdivisions for urban uses. The Rio-Petrópolis Highway was inaugurated on August 25, 1928. In 1935, the railways were electrified, establishing a single railway fare that facilitated transportation between Rio and Duque de Caxias. In 1911, the continuation of the EF Leopoldina railway towards Inhomirim resulted in the creation of the stations of Gramacho, São Bento, Campos Elíseos, Primavera, and Parada Angélica within the territory that would later become the municipality of Caxias (Braz; Almeida, 2010).

The strong migratory wave during these decades multiplied the population of Duque de Caxias. It went from 28,328 inhabitants in 1940 to 92,459 in 1950. In 1951, the Presidente-Dutra Highway was inaugurated, providing access to the region through automobile transportation. By 1960, the population of Duque de Caxias had reached 241,026 inhabitants. The urban lots were primarily aimed at the poor workers and were sold in installments with self-constructed housing. No infrastructure was implemented to make the prices feasible while ensuring high profits for developers.

This process of urban growth unfolded without any public control and generated significant impacts on the rivers, including inappropriate occupation of the

riverbanks and poorly designed bridges. Simultaneously, the old hydraulic structures built by the Sanitation Commission were abandoned; polder areas were occupied, leading to frequent floods. Reports from that time indicated that during heavy rains, the waters of the Sarapuí River would rise nearly two meters. Nonetheless, the urban growth of the municipality continued. In the 1960s, the same urban pattern persisted, and the population grew to 431,397 inhabitants.

The occupation pattern, characterized by soil sealing due to paved streets lacking proper drainage systems and occupation of flood-prone areas, reinforced the previous perception of rivers as a threat to the population. While previously, the danger came from stagnant waters in low-lying areas and mosquito proliferation; it now stemmed from floods causing damage to homes and loss of furniture. Rivers were also receiving domestic and industrial effluents due to the absence of sewage systems.

It was not until the 1980s that the region began to receive more effective attention from the government through a project called the "Plano Global de Saneamento da Baixada Fluminense" (PEBs), developed between 1983 and 1986. The project aimed to implement sanitation systems (wastewater and stormwater in a comprehensive system separated) in a highly urbanized region that almost entirely lacked these systems. In Duque de Caxias, the projects benefited neighborhoods in the 1st District in the Sarapuí river basin with sewage networks. Still, the micro drainage network, which was essential to mitigate flooding issues, was not implemented.

In February 1988, the Baixada Fluminense experienced one of the worst floods in its history, caused by heavy summer rains, resulting in material losses and loss of human lives. The "Projeto Reconstrução Rio" (Rio Reconstruction Project) was developed to recover the affected areas and address the flooding problem. Its main initiative was the construction of the Gericinó Dam, aiming to prevent floods caused by the Pavuna and Sarapuí rivers from inundating different municipalities in the Baixada. Other interventions focused on dredging the Sarapuí, Iguaçu-Botas, and Pavuna-Meriti rivers and their channels.

The macro-drainage works were carried out based on three approaches: (i) enhancing the drainage capacity of rivers and channels, (ii) constructing two flood containment dams; and (iii) removing obstacles that hindered the natural flow of rivers. According to government calculations released at the time, the number of people affected by flooding in the Iguaçu/Sarapuí Basin reduced from 350,000 to 189,000 (Porto, 2003). This basin is the primary drainage area of the municipality, covering about 59% of Duque de Caxias' territorial area.

The "Reconstrução Rio" project (River Reconstruction project) highlighted the absence of land-use planning in the region, urban development without proper drainage infrastructure implementation, and the construction of bridges and other poorly designed structures up until then. To establish long-term planning, the state government then formulated the "Plano Diretor de Controle de Inundações para

a Bacia do Iguaçu" (Master Plan for Flood Control in the Iguaçu Basin), defining: (i) structural works or actions aimed directly at combating flood problems; (ii) actions to ensure the implementation of these works; and (iii) long-term support actions, focused on obtaining data and creating legislation that would serve as references for local municipalities. This plan indicated the need for the resettlement of riverside families, who were supposed to benefit from a housing construction program (Porto, 2003).

The study provided an essential diagnosis of the conditions of the Iguaçu-Sarapuí Basin rivers in Duque de Caxias and the flooding problem. The proposed solution from the 1933 Sanitation Commission was highlighted once again, involving the construction of polders that, at this point, were associated with reservoirs or lung spaces. Only land uses that could be temporarily flooded without causing disruptions to the population would be allowed in these areas. The project also identified areas that were either unoccupied or had rural uses that should not be subject to urban development under any circumstances, such as the Xerém and Tinguá areas, occupying parts of Duque de Caxias' territory.

In May 1989, the Tinguá Biological Reserve was created by federal decree. In 2013, the Iguaçu Environmental Protection Area (APA) was established, covering the areas indicated in the plan. However, the strategy focused on the Iguaçu-Sarapuí basin and did not address the other hydrographic basins within the territory of Duque de Caxias.

Despite the quality of the project, few of the planned measures and actions were implemented until 2017. Furthermore, the executed works deteriorated due to a lack of maintenance. The study conducted under the Iguaçu Project, completed in 1996, remained in the state government's archives until 2007. Only then, through the newly established INEA (State Institute for the Environment), a funding opportunity emerged through the PAC 1 (Growth Acceleration Plan).

Between 1996 and 2007, the problems related to the rivers in Duque de Caxias only escalated. New formal and informal settlements densified or emerged along the riverbanks and in areas where occupations should have been restricted. In the following years, heavy rains and the consequent overflowing of rivers again caused damages and deaths. During this period, as reported by Oscar Junior (2015), the following events stand out: December 18, 1997: 200 families were displaced by the rains; December 24, 2001: 184 were displaced and six deaths; February 2, 2002: Floods in the neighborhoods of Olavo Bilac, Imbariê, Saracuruna, Capivari, and Xerém, with 250 displaced and eight deaths; January 28, 2003: Floods leave 597 displaced; January 16, 2004: Floods and landslides leave 134 displaced and three deaths; February 5, 2005: Floods leave 81 displaced in Xerém.

The rivers continued to be perceived as threats to the population and were devalued elements in the urban landscape. Dealing with waters polluted by irregularly discharged domestic and industrial effluents became another

problem. An emblematic case was the Calombé River, which not only overflowed, causing floods, but occasionally, when the water volume was lower and could not dilute the chemically laden waste released irregularly by nearby industries, caught fire. The testimony of a resident whose house was destroyed by the fire in September 2012 highlighted the issue: "Flooding is normal; we can still manage that, but with fire, it's impossible."

Iguaçu Project: a new vision for the rivers of Baixada

In 2007, with funding from the Growth Acceleration Plan (PAC) and a contribution from the state government, the Iguaçu Project was resumed with a new name: "Project for Flood Control and Environmental Recovery of the Iguaçu/Botas and Sarapuí River Basins." The scope was expanded in the name to include "environmental recovery."

Between the first and second versions of the Iguaçu Project, 11 years passed. This period saw significant engineering, urban planning, and landscape architecture developments, particularly concerning urban rivers and river drainage systems. As a result, the first and new versions of the project showed differences, both in structural and non-structural measures.

The updated version of the project's structural designs moved away from concrete channelization and aimed to preserve the natural riverbed as much as possible. It involved designing sections with soil removal from constructions along the riverbanks and establishing riverfront parks to protect watercourses, expand public leisure areas, and, in some cases, temporarily mitigate floods (Coppe, 2013). Sixty-two structural intervention projects were identified, including channel and gallery dredging, riverbed regularization, dike construction, gate installations, auxiliary channel construction, reservoir construction, channel diversion, replacement or removal of outdated structures, and canal-avenue construction.

The non-structural measures of the plan encompassed land use regulation and control based on the creation of state-level protected areas, such as the Iguaçu Environmental Protection Area (APA) mentioned earlier; establishment of urban parks to safeguard watercourses; review and adjustment of municipal urban planning instruments; and the recommendation for the relocation of dwellings situated along the riverbanks.

The project highlighted the implementation of various riverfront parks and open areas in Duque de Caxias with urban amenities focused on leisure and social interaction. It emphasized the need to ensure these areas wouldn't serve any other purpose, suggesting their incorporation into municipal laws regulating land use, zoning, and providing legal protection. The project defined the Amapá and São Bento Riverfront Parks and identified areas for riparian preservation/

reforestation along different rivers (Coppe, 2013). However, the Estrela River basin and other smaller basins in Caxias were not included in this plan and were not covered by projects.

It is worth noting, however, that despite the conceptual advancements of the project towards integrating rivers into the landscape and preserving them, proposals for river requalification were not presented. River requalification involves the restoration of the "environmental quality of river ecosystems, aiming to recover natural values, while harmoniously and systematically integrating this process with the communities living around the river and the economic activities carried out there" (Veról, 2013, p. 45). River requalification also entails restoring a more natural river morphology and riparian vegetation, eliminating impacts on the river environment, and enhancing the river's value as a landscape element.

A project for the Roncador River: utopia and reality

Based on the belief that river requalification is achievable for the rivers of Caxias, a project was developed within the scope of Maria Luiza Ottoni's master's dissertation for the Roncador River, which is part of the Estrela River Basin.

The Roncador River (Figure 2) is in the third district, experiencing significant urban growth. It originates in Imbariê and flows into the Saracuruna River, emptying into the Guanabara Bay. It covers around eight kilometers, spanning an area of 17.7 km². The Roncador River is one of the significant contributors to the Saracuruna River (Prefeitura Municipal de Duque de Caxias, 2017).

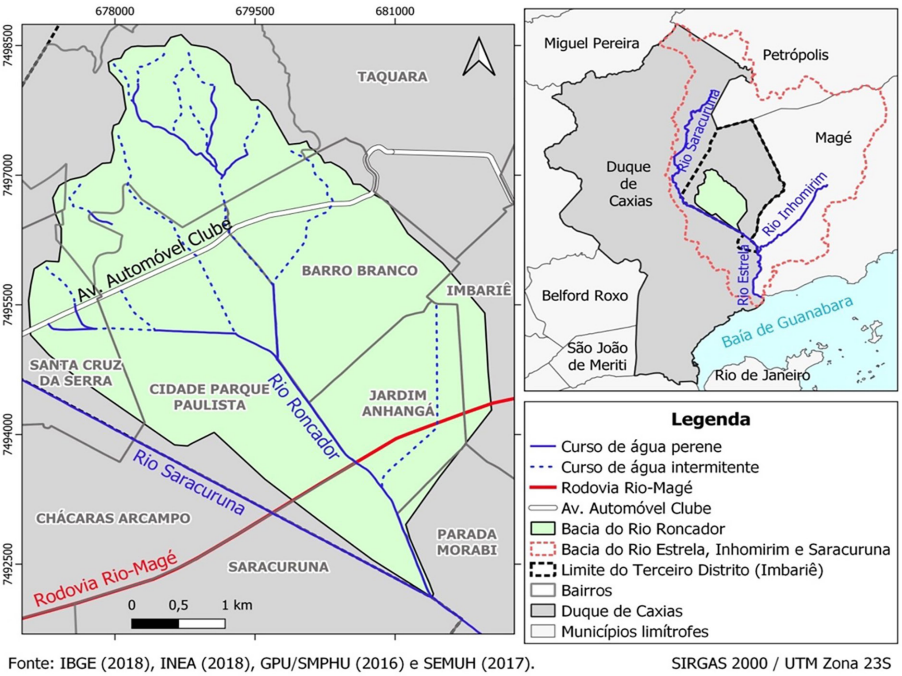

Figure 2: Location of the Roncador River basin. Source: prepared by the authors.

The Roncador River crosses an area of poorly drained lowland that experiences frequent flooding. It flows through densely populated urban clusters, primarily consisting of low-income housing. Its course runs from Avenida Automóvel Clube until its confluence with the Saracuruna River, flooding extensive marginal areas between its mouth and BR 116. This significantly impacts neighborhoods like Parada Morabi and Jardim Anhangá, which have a substantial population, in the Imbariê District. Floods even occur during lighter rain events due to poor canal maintenance, exposing residents to direct contact with polluted and sewage-contaminated waters (Santos, 2006).

A field research and a workshop conducted in October 2019 with students from CIEP Elias Lazaroni, a secondary school located along the Roncador River, helped identify the following issues: (i) water pollution from direct sewage discharge, given the absence of a proper sewage system in the neighborhood; (ii) river overflow during heavy rains; (iii) dumping of garbage directly into the river and construction materials onto its banks; (iv) foul odor and unhygienic conditions, posing disease transmission risks through contamination; (v) irregular occupation of sections of the riverbanks; (vi) insufficient crossings between the riverbanks.

Alongside problem identification, students also highlighted potentialities for the area, including (i) a bike path along the river due to the community's frequent use of bicycles for transportation; (ii) space for recreational areas and gardens; (iii) preservation and enhancement of the grove near Avenida Automóvel Clube. Additional elements towards the Roncador River requalification, gathered from the field survey, included: (v) the possibility of using plants, gardens, and filtering islands to improve water quality; (vi) the creation of polders; (vii) implementation of permeable pavements; (viii) bettering bridges; (ix) improved public lighting. Figure 3 maps problematic points and potentials in the region.

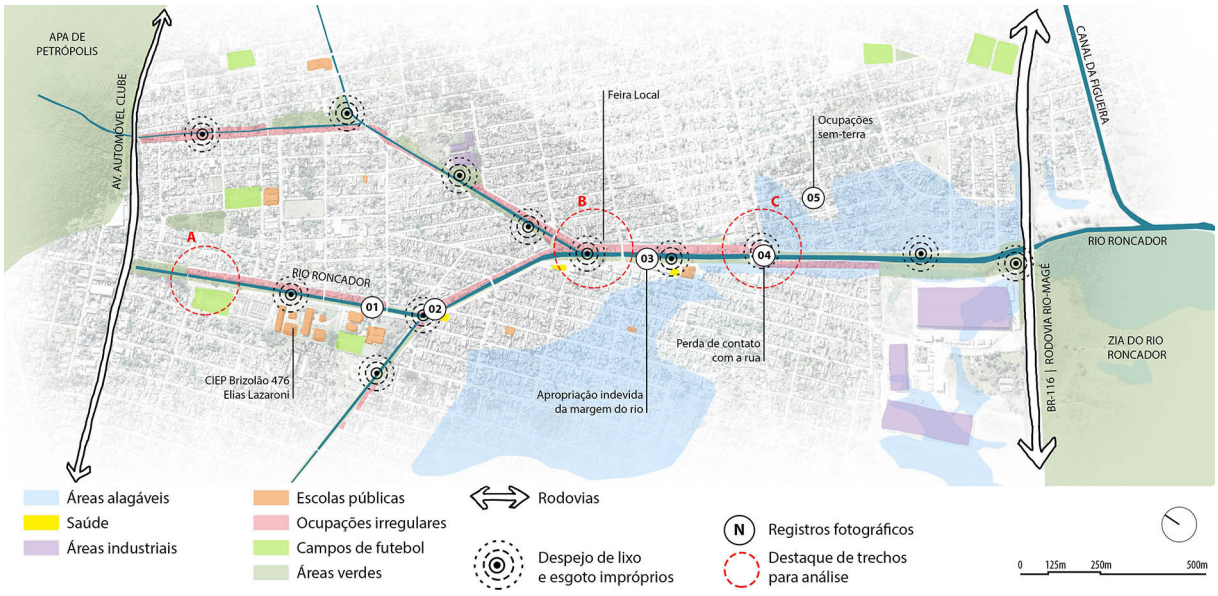

Figure 3: Identification of problems and potentialities in the Roncador River region. Source: Ottoni (2021).

Two scales of action were selected to analyze the context and the proposed river requalification project: a macro and a micro-scale.

On the macro scale, the Green and Blue Infrastructure (GBI) approach was applied to establish connections between existing green and blue corridors, aiming to integrate with micro-scale strategies. GBI can be defined as a network of green spaces (green), rivers, and aquatic systems (blue) that provide vital ecosystem services supporting life (Benedict; Macmahon, 2006).

On the micro-scale, Water Sensitive Urban Design (WSUD) guidelines were adopted, focusing on urban design and local scale issues. The central goal of WSUD is to reconcile sustainable stormwater management with urban planning and design, bringing the urban hydrological cycle closer to its more natural state (Hoyer *et al*., 2011). For this purpose, three sections, labeled A, B, and C, were selected for investigation and design strategies on the micro-scale (see Figure 3). These sections exhibited different vegetation characteristics, bank occupancy, density, and immediate surroundings.

The project intervention at both sales'considers four axes of action: (i) source-outlet, to promote connectivity along the longitudinal axis of the watershed; (ii) between banks, to generate transversal connectivity of the river and connect fragmented urban fabrics with fluvial ecosystems; (iii) surface water-groundwater, to increase soil permeability and improve water quality; and (iv) river-community, to encourage river appreciation and foster reconciliation between the community and the river (Figure 4).

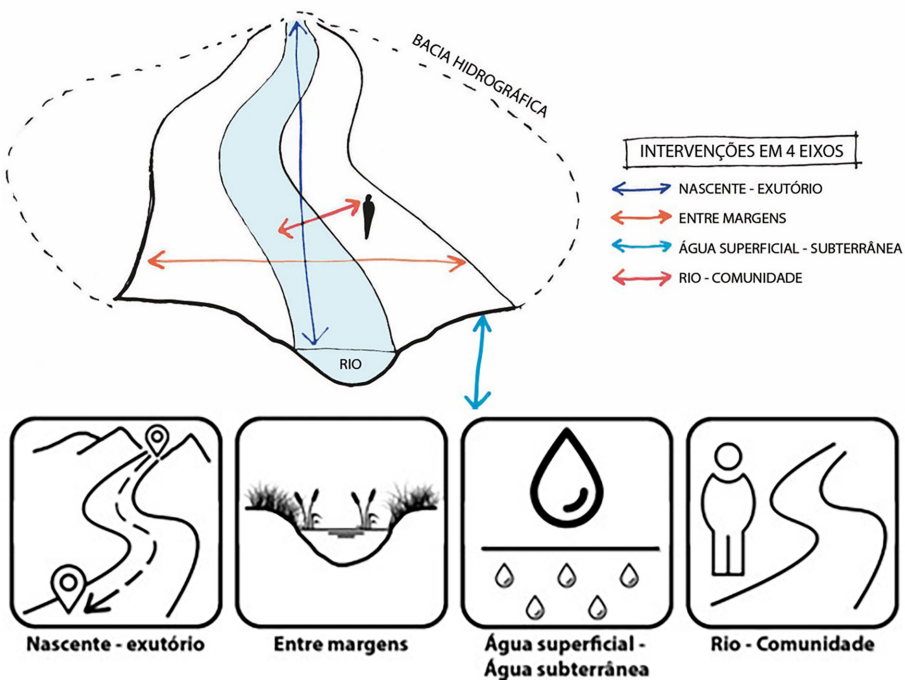

Figure 4: Implementation of four axes to achieve connectivity. Source: Ottoni (2021).

The measures adopted in the project included shoreline treatment with the restoration of riparian vegetation along the riverbanks; increased soil permeability; introduction of green streets or rain gardens to enhance soil permeability; floating treatment islands and wetlands to improve water quality; detention and retention basins; installation of detention and retention basins in public recreational spaces (such as parks and soccer fields) to manage flood control; river crossings and bike paths; creation of river crossings and bike path; placement of points for selective waste collection and composting; and community gardens that could integrate with local economic activities.

The project also includes developing an interconnected system of green areas connected by the Roncador River, introducing new recreational, leisure, and contemplation functions to currently vacant spaces. These measures contribute to the enhancement of the waterbody's value.

Figure 5: Depicts the implementation of the river requalification interventions on the macro scale and highlights segments 01, 02, and 03 on the micro-scale.

Implementing decentralized stormwater management strategies in this region promotes connectivity and multifunctionality and brings more green spaces to the city. Figures 6, 7, and 8 show cross-sections at different segments of the Roncador River, applying design strategies for river requalification.

The river requalification project for the Roncador aimed to restore the river's morphology partially, recover the fluvial ecosystems and local biodiversity, reduce flooding, reclaim protective riparian zones for conservation, leisure, and recreation, reestablish connections, and enhance local identity and memory to reconcile the river with the city.

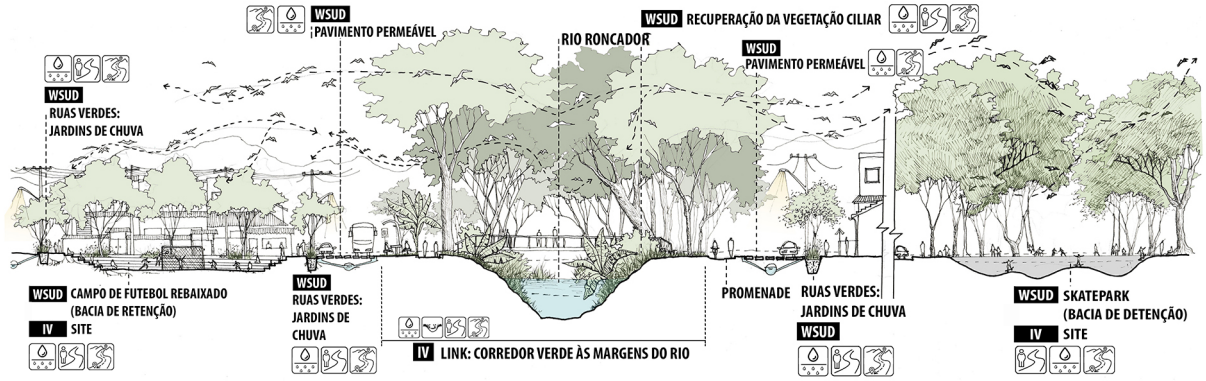

Figure 6: Cross-section of segment 01 showing the requalification of Roncador River on a micro-scale. Source: Ottoni, 2021.

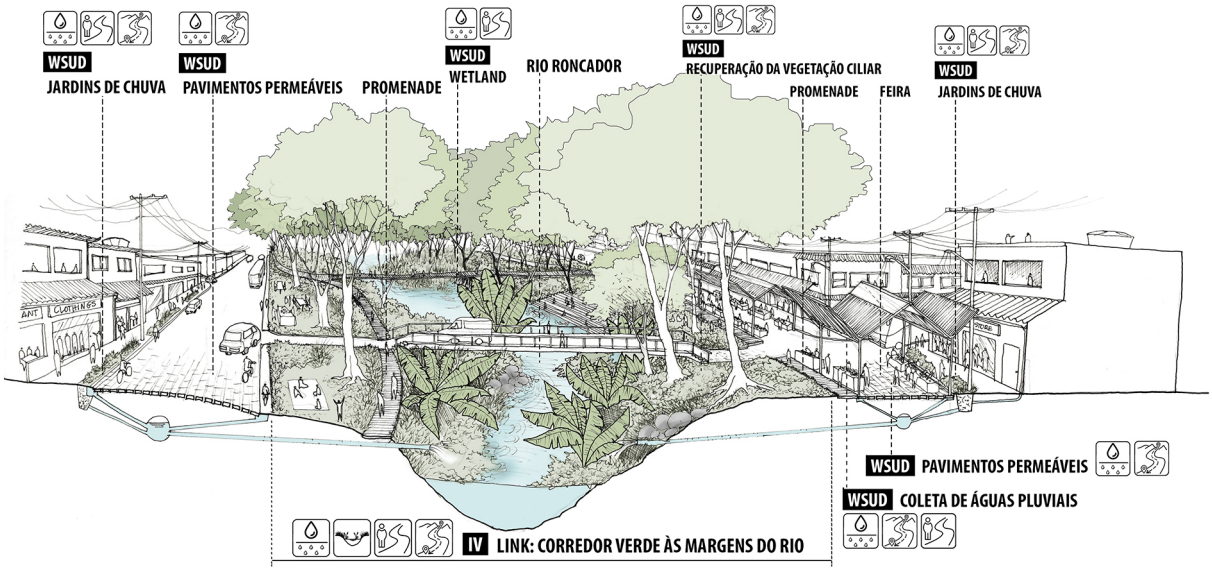

Figure 7: Cross-section of segment 02 showing the requalification of Roncador River on a micro-scale. Source: Ottoni, 2021.

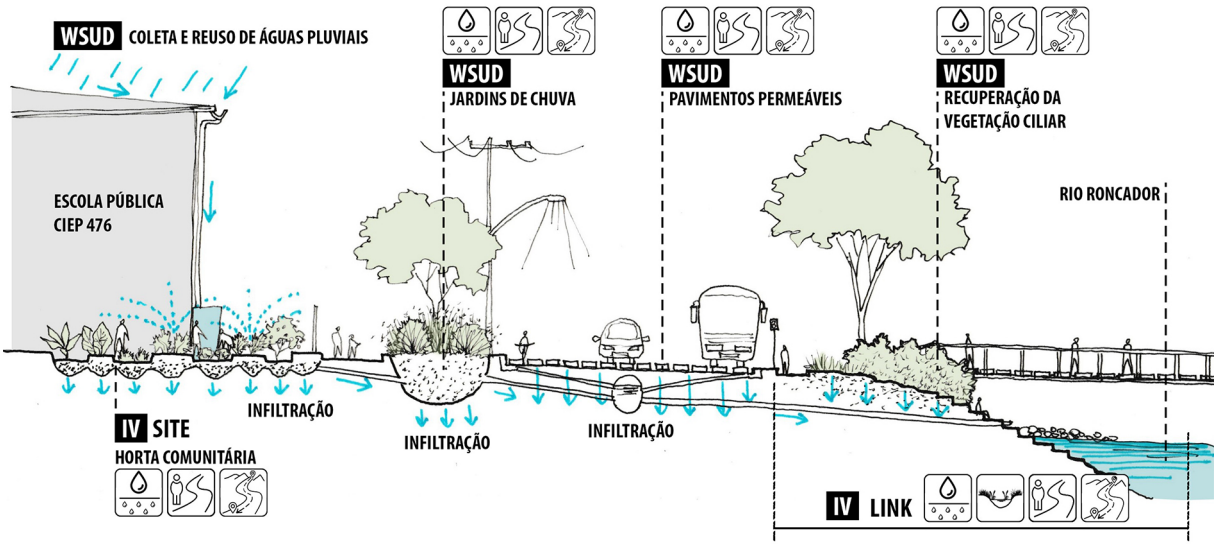

Figure 8: Schematic cross-section of segment 01in the surroundings of CIEP 476 School. Source: Ottoni, 2021.

The project was submitted to the members of the Municipal Environmental Council before the Environmental Conference held in April 2022. However, the current Municipal Government showed no interest in the proposal, opting for a partial river-channeling project. This alternative plan involves the implementation of 2,100 meters of concrete cellular gallery and 1,243 meters of trapezoidal gallery in the section that runs through the Nova Campina neighborhood. Construction began in January 2022 (Figure 9).

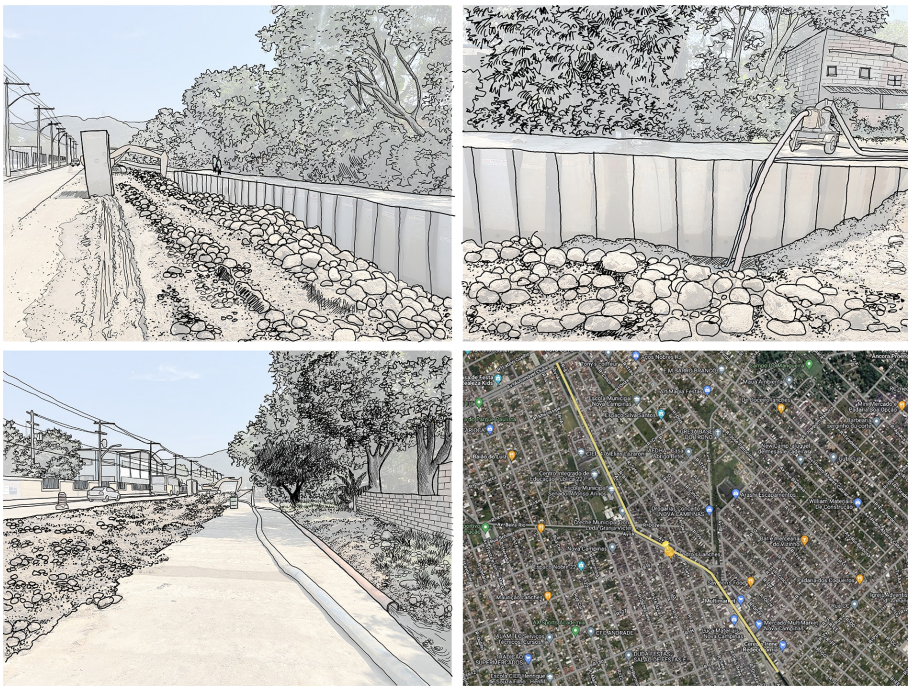

Figure 9: Roncador River Channeling: works in progress. Images based on photos of works in progress for channeling the Roncador River (2023). Source: Government of the State of Rio de Janeiro (2023).

On the local municipality's social media, it is stated that the project's purpose is to end the floods in the area. Once again, the river is portrayed as the source of problems to be solved through channeling works. The project's interventionist and conservative perspective is evident without an integrated approach to this river structure. This is noteworthy given that the river spans 8 kilometers, while the project only covers a segment of approximately 3 kilometers.

The presented requalification project emerges as a counterpoint or even a utopia in this context.

Final considerations

The analysis conducted on the rivers of Duque de Caxias has shown that despite their importance in shaping the territory, rivers can also be perceived as a challenge

to urban development. Most of the interventions over time have exacerbated flooding, a phenomenon resulting from the low-lying nature of the rivers, which tend to overflow and occupy the adjacent plains during rainy periods. River straightening has lowered the water table level in certain areas due to increased water flow velocity. Lowering the water table in naturally flood-prone environments facilitated human settlement. However, periodic floods persisted. The increased flow velocities, combined with occupation along the riverbanks, led to the removal of riparian vegetation and intensified erosive processes along the banks.

Recently, projects embracing sustainable drainage concepts and aiming at the environmental preservation of the rivers have been developed, such as the Iguaçu Project. Nevertheless, public initiatives have not aligned with this perspective. State government resources have solely supported channelization works proposed by the municipality for the rivers. Within this context, river requalification appears as a utopian idea. However, when addressing the Tietê River in São Paulo, Denise Falcão Pessoa proposed utopia as a design methodology and a path to guide the city's development and transformations (Pessoa, 2006). Hence, the proposal presented in this text could be seen as a manifesto for an alternative way of thinking about the rivers of Duque de Caxias and a warning against disregarding existing studies and projects in the actions of the current municipal and state governments.

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