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# FLOODS AND EXTENSION PLANS: DISCOURSE AND PROJECTS IN SOUTHERN BRAZIL

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This paper focuses on four extension projects on floodable areas in the city of Porto Alegre, in the State of Rio Grande do Sul. The city is in the Jacui River delta, which flows into the Guaiba Lake, one of the main waterways in Southern Brazil. Such urban projects – with similar goals amongst themselves, such as integrating housing and industries, for instance – were never implemented. However, as initiatives associated to state economic and strategic development plans (between 1935 and 1960), the study of such projects significantly contributes to the understanding of Porto Alegre's trajectory of expansion. The Jacui delta and its islands limit Northern Porto Alegre. The projects were to be located on such wetlands, given their strategic site in relation to means of external connection, such as waterways, roads and railways. Because this area had always been subject to floods, a solution for overcoming such issue with infrastructure works was always present in the creation of projects for the delta. Porto Alegre, from its foundation to the first half of the 20<sup>th</sup> century, suffered with floods of the Guaiba Lake that caused major damages to the city. Because of that, from 1942 through the 1970s, a levee and a wall were built; to this day, they influence the connection between city and Lake, maintaining the collective memory of past floods. Therefore, this work focuses on the different approaches and discourses of the authors of the extension projects for the flood issues, and on their intentions towards making such projects resilient to the recurring floods. While researching the plans, we have observed that the cost of construction work and of the expropriation needed for building the levee has contributed to postponing, deterring and modifying the execution of such projects. In spite of the failure on implementing the projects, their focus on the relation between the city and its surrounding waters became an important resource for the study of the city's history, given that the wetlands are a significant part of its collective memory.

## **Keywords**

extension plans, resilient projects, industry, housing, city history

## **How to Cite**

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## INTRODUCTION

On the first half of the 20th Century, Brazil sought to consolidate industrialization and implement its manufacturing industry, by promoting a series of plans and actions. The industry-based development goal allowed for many projects for industrial cities or urban nuclei to happen, congregating both production and housing. Porto Alegre, capital of the state of Rio Grande do Sul, participated on this process by proposing four projects at different times. Two were private – the *Gravatái Wetlands Plan* (1935) and *Benópolis* (1949) – and the other two were public – the *Jacuí Delta Plan* (1958) and the *Porto Alegre Industrial City* (1961). The works intended to structure industry as means for economic development whilst interacting with housing as an increasing demand from society.

The main aspect that connects these works and characterizes them as a set is not only their common goals, but also their location in rural or suburban floodable areas alongside the *Guaíba Lake*: the *Gravatái River Wetland*; part of the city of *Guaíba* and the islands on the delta of four rivers – *Jacuí*, *Cai*, *Sinos* and *Gravatái*. The location was strategic in all projects, for it congregated or encouraged most connections within the city of Porto Alegre: the railway, the port, the roads and the airport. The city, however, often suffered from floods throughout the region and on the already settled industrial neighborhoods where most industries and housing for the working class were. The flooding events were in the local newspapers, which showed and described the factories' great losses and the suffering of the working class.

In spite of that, projects for the floodable areas of the *Gravatái Wetlands* and the river delta continued to be designed, for those were the city's future expansions. These projects were object of other works, in which we sought to analyze their urbanism references and the political and economic relations during the time of their making.

The impact of the floods in Porto Alegre and region has always been a recurring issue. Only in 1970 would it have a solution with the levee construction. We emphasize that the history of flooding has always been treated by its social impact and its economic losses with photographs and reports<sup>1</sup>. The relevance of this work focuses precisely on eliciting the sequence of projects that pursued solving the flood problem considering the purpose of the region's economic and strategic development. In this work, we focus on the always present relationship between the projects and the water, from means of production transportation to agent of the devastating floods: we analyze the approach of each author (or group of authors) for solving the floods problem, the conditions that influenced each of them and the attempts for implementing them.

## THE PRIVATE INITIATIVES' PROJECTS

The first urban project to combine housing and industry was to be located around consolidated industrial neighborhoods North of Porto Alegre, on a broad floodable area on the confluence of the *Gravatái River* and the *Guaíba Lake*, called the *Gravatái Wetlands*. Large part of this area corresponded to the rural area of the city, having been acquired by a group of industrial entrepreneurs on the 1920s. From the acquisition, they founded a real estate society focused solely on those lands.

In 1934, the society hired urban planner and municipal technician Luiz Arthur Ubatuba de Faria to design the project, its regulation and approval process with the local government.

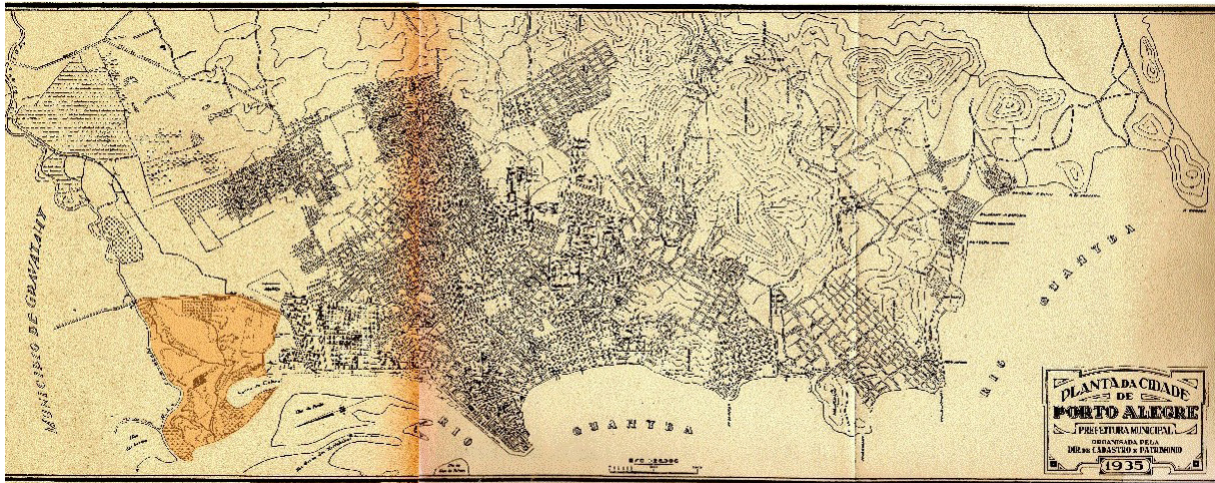


FIGURE 1 Map of the city of Porto Alegre, 1935. Property of Gravataí Wetlands (in orange).

At the time, Porto Alegre's mayor was an industrial entrepreneur himself, Mr. Alberto Bins. He promoted several works in Porto Alegre, continuing not only those initiated by his predecessor Otávio Rocha<sup>2</sup>, but other works with core, structural functions in the city dynamics, such as a street paving plan for suburban areas and drainage systems. The associate proprietors of the Wetlands area were also industrial entrepreneurs; for them, hiring Ubatuba de Faria would be fundamental for intermediating such ambitious extension project with the municipality.

The project was finished by September, 1935, entitled "Project for an Urbanization Plan of an Industrial and Residential District at the Gravataí Wetlands". The author was responsible for "propaganda", promoting the project for the press to later add it to another city plan, called the Gladosh Plan, to be hired by the municipality in 1938. The intention of the partners was to plan the future of the Wetlands in consonance with the guidelines of the Gladosh Plan – a matter often mentioned<sup>3</sup> on the company records, along with the intentions to obtain support for the Wetlands Plan.

The press publicity for this project didn't focus on the land business, but on gaining the public administration for carrying the project on. Therefore, it was clear that even though the plan came from the private initiative, the support from the public sphere had to be obtained, for the area was too great (700 hectares), and the industry and housing functions required major – and expensive - sanitation infrastructure.

On the introduction of the plan, the author stated that the greatness of the Wetlands Plan didn't allow for it to restrain itself to the local design only, and should also deal with its connections to the city and to the future avenues<sup>4</sup>. The author defends that elaborating conjoint plans is necessary, and that the conditions of the city at the time had to be assessed before adding another cell<sup>5</sup> (Figure 2).

In 1936 and 1937<sup>6</sup>, the Wetlands Plan was part of two expos – a local and a national one – as an extension project for Porto Alegre. Ubatuba de Faria and his colleague, engineer Edvaldo Pereira Paiva, soon became responsible for a study for the city, edited by the municipality<sup>7</sup>, in which the Wetlands Plan was included. Therefore, the exchanges between public and private actors of urbanism at the time are very noticeable. If a private project counted on being added to the municipality's studies for its viability in one hand, on the other, the public promotion of municipal urbanism was made through this private project.





FIGURE 2 Gravataí Wetlands Plan, 1935. L. A. Ubatuba de Faria.



FIGURE 3 (Left) Channels of Gravataí Wetlands Plan.

On his introduction, Ubatuba also mentions that the area to be urbanized was subject to frequent floods, and that great work was to be done to fix the problem. When creating the plan, he proposed a wide industrial front along the river and lake, peripheral to the residential area. The industrial area was designed with retreating docks for ship berthing and access to railway connections alongside the Guaíba Lake and the Gravataí River. From this configuration, the engineer suggested that the land removed from executing such docks and the shallower portions of the river should be used as landfills, elevating the average level of the whole area. Drainage would be solved by inserting two water channels with aesthetic intentions along two designed main avenues, and then debouching to the Guaíba Lake (Figure 3).

Although not studied enough, we can verify the references of this design in those from engineer Saturnino de Brito<sup>8</sup>, still in the beginning of the 20<sup>th</sup> Century. The latter's urbanism principles were also determined by sanitation demands, a priority compared to others like circulation, security and aesthetics. This last aspect was not of all disregarded: in examples like the Santos Plan, in the Sao Paulo coastal area, the drainage channels were associated to an efficient road system, and sided by lateral walkways, the park avenues<sup>9</sup> (Figure 4).

The land company made the decision to finance Ubatuba's Wetlands Plan by itself in 1937. However, as we mentioned before, the company was careful about implementing the plan at the time Gladosh was hired, for the design still depended on his approval to be included to his city plan. Gladosh worried about excessive expanding of the city limits, especially due to the costs of a spread occupation, substantially demanding of infrastructure. He argued both the excessive centralization and spreading were harmful to the city; density limits should be adopted on the central areas and the expansions should be controlled.<sup>10</sup>

This was one of the main difficulties the Wetlands Plan would have when seeking support from the municipality, especially regarding the sanitation plan for the northern area of the city, which often suffered with floods and lack of drainage systems.

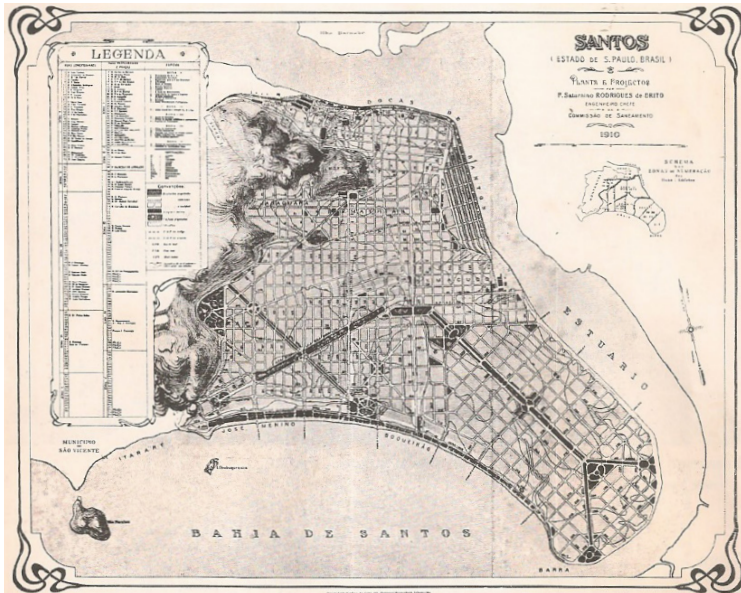


FIGURE 4 (Right) Channels in the Santos Plan, 1910.



FIGURE 5 Benópolis Plan, 1949. Channel and levee along the river. Cross hatched area: train station.

Even though the Gravataí Wetlands and the whole central area of Porto Alegre suffered with the Guaíba floods for years, the most significant flood happened in 1941, when the water reached a new high of 4,73 meters above sea level and affected forty thousand people. Transportation and other public services temporarily ceased, followed by long periods with no water or electric power<sup>11</sup>.

The Wetlands Plan was already being implemented in 1941. The flood caused the work to be interrupted and damaged the work already done, as well as the machinery on site. According to the company, the damages were too big for the urbanization works to continue. In addition, from that year on, the property went from rural area to being considered suburban. This caused its total area to be substantially reduced, because of a federal project to build an external levee, and because of the new installations for the Rio Grande do Sul Railways Company. By the end of the 1940s, with guarantees from the Federal Government that no expropriation of the levee-protected lands would occur, the company decided to propose a new project for the Wetlands, entitled Benópolis from of one of its partner, Benno Mentz.

The engineer and municipality technician Fernando Mendes Ribeiro was author of this 1949 project. When suggested Benópolis, he proposed a zoning tracing similar to the precedent Wetlands Plan: large blocks for industry and deposit functions were designed along the inner side of the levee, segregated by a central railway, while the residential area was limited by a wide and green contouring avenue. The overall tracing of the blocks and roads assumed the geometry of the levee designed by the Sanitation Division of the Federal Government<sup>12</sup> (Figure 5). Over the levee, they designed a road that would connect the city to the North of the state, with occasional elevated pedestrian ways for crossing. An enlargement to a channel nearby the Guaíba margins was proposed, connecting the so-called Saco do Cabral to the Gravataí River, improving its waterways.

The company negotiated with other Brazilian land companies and investors to implement this project; but the execution of the levee would be postponed for many years, therefore postponing urbanization as well.

On these private initiative projects, some points are relevant:

- 1 The intention for the continuity of a plan that aimed on solving local housing and industrial demands strategically;
- 2 The great amount of resources needed for the sanitation of the Gravataí Wetlands, which demanded support and investment from the public sphere;
- 3 The fact that, even with the authors' aid on inserting the projects in the municipality's urban planning agenda, the projects couldn't be carried out due to other factors – the flood of 1941 and the delay on the construction of the levee by the Federal Government.

On the second half of the 1930s, the city was focusing on the construction of underground channels for sewage and drainage on the *Navegantes* and *São Joao* industrial neighborhoods, adjacent to the *Gravataí* wetlands. Those were the first industrial neighborhoods in Porto Alegre, and their demands for sanitation infrastructure were frequently shown in the local press. The sanitation issue pressured the authorities to solve the floods issue on the northern area of Porto Alegre – which would only happen with the levee works and the pumping stations in the 1970s. The floods issue caused new estates to progressively develop in the suburbs and rural areas of the city, which promised to finally solve the sanitation problem for the factory workers along the river margins<sup>13</sup>. This situation generated an occupation process of the areas further away from the center and the *Guaíba* Lake, with poor or non-existent access to infrastructure networks.

## THE JACUI DELTA AND THE INDUSTRIAL CITY

In 1953, five years after the *Benopolis* Projects, the State Government and the Federal Government approved the roadway connection between the state's South and West, to enable development, economic integration and a connection to Montevideo (Uruguay) and Buenos Aires (Argentina). This roadway connection involved a system of bridges and landfills over the *Jacuí* River delta; hence, the State Government started focusing on planning for that area, to avoid uncontrolled settlements along the road (Figure 6).

The planning was object to a contest in 1957, under two different themes – the delta islands and the *Guaíba* city area. Urban planners Edvaldo Pereira Paiva, Roberto Felix Veronese and Carlos Maximiliano Fayet, all professors at the School of Architecture of the Federal University of Rio Grande do Sul, and architect Moacyr Moojen Marques, composed the winning team.

Just like in the *Wetlands* Plan, the whole area comprised by the contest project was floodable. Its geologic conditions were known through a study performed by the French company *Neyrpic*, which defined the occupation limits on both the continental part of the *Guaíba* city and the insular land of the seven delta islands.

The team relied on *Neyrpic*'s assessment, and made a bold proposal to connect Porto Alegre to the ocean, with port areas on the delta that would provide substantial support to the industries located there (Figure 7).

The landfill's ideal level should be six meters above sea level – the same level intended for the road. However, the team realized it would be expensive to fill up to this height, even if partially. Having then defined that the continental portion of the project and certain portions of the islands would be the most favorable for occupation according to *Neyrpic*'s assessment, they proposed landfills up to three meters on lower levels, and peripheral levees at six meters high. They had decided, however, that the landfills would be done in steps, and that the levees would be built as the landfills were being occupied.





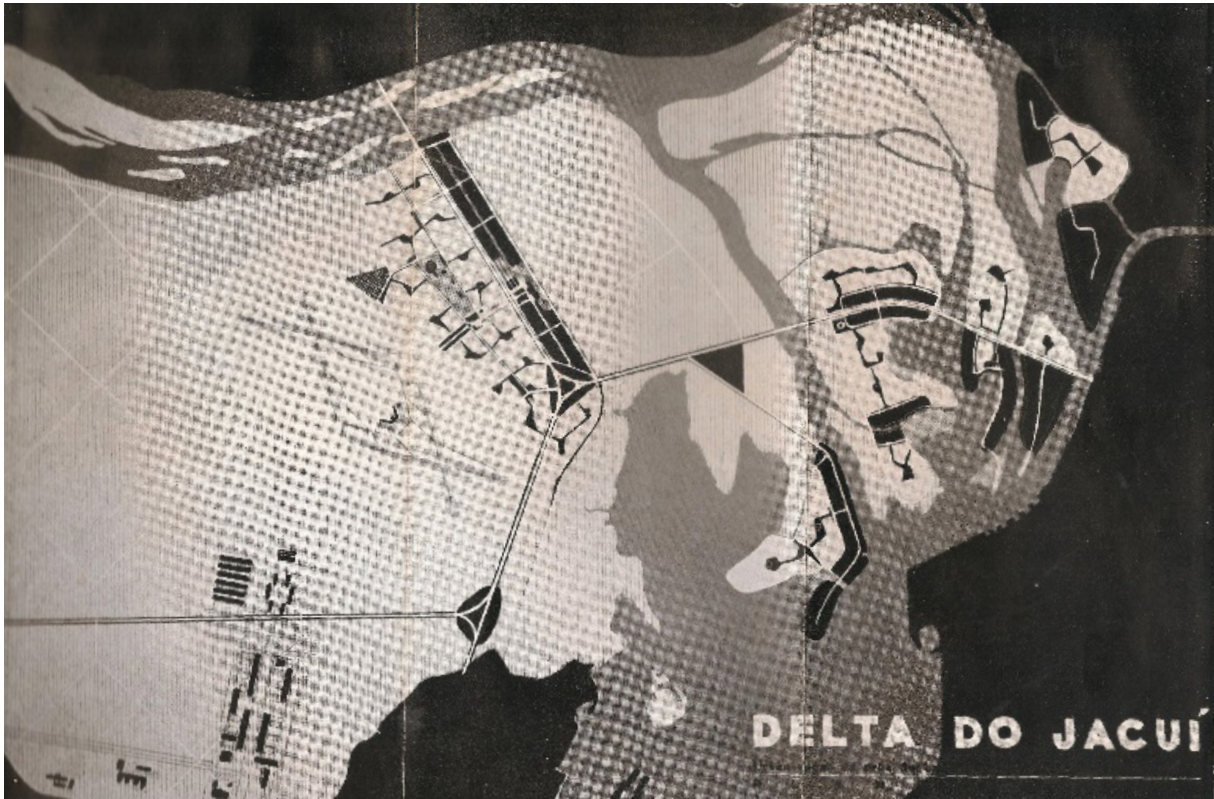


FIGURE 8 Delta do Jacuí Plan, 1957

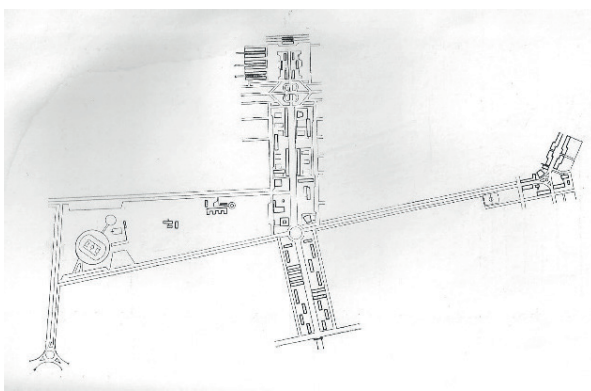


FIGURE 9 Central area of the Jacuí Delta Plan.

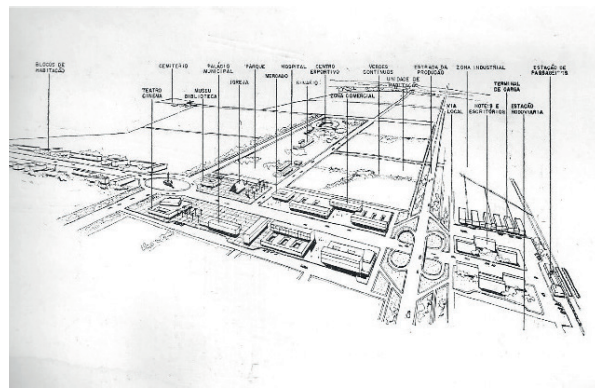


FIGURE 10 Perspective from the central area of the Delta.

The Jacuí Delta Plan comprises a law proposal, making it a code-like plan for the occupation of that extension of Porto Alegre. Nowadays, in the area intended for the “satellite city” there is the city of Eldorado do Sul, integrated to Porto Alegre’s greater urban area. The islands are occupied, but mostly towards their margins on alongside the access roads, therefore differently from the Delta Plan.

The delay on constructing the road because of lack of federal resources in the following years made the State Government organize a team, associated to Governor Leonel Brizola’s Office, to design a new project for industry and housing. Once again the administration turned to the Gravataí Wetlands in 1961, still unoccupied but with strategic multiple accesses, the airport and an already planned peripheral protective levee. The pilot plan was named *Porto Alegre Industrial City*,<sup>16</sup> and its team was composed by professors Paiva and Veronese once again and architect Marcos Hekman.



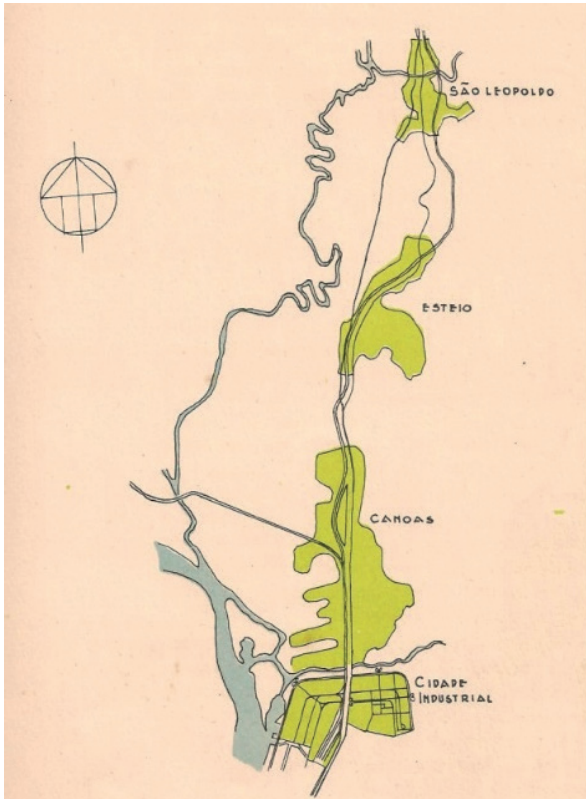


FIGURE 11 Industrial City location: north area of Metropolitan Region.



FIGURE 12 (Right) Industrial City Plan, 1961.

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The main references for this plan were the Brazilian industrial cities of Contagem (1941), Volta Redonda (1941) and the *Cidade dos Motores* (1945). The latter was meant to be the model of urbanism to be followed by the present project.

The project for the *Industrial City* enlarged the area of the precedent *Gravataí Wetlands Plan*, by occupying both sides of the road that sided the railway. This division created two large areas or polders, resulting from the protection of the levee, with individual centers.

The industrial string would locate at the inner contour of the levee, with a peripheral avenue and railways, similar to the precedent plans. The separation between this and the residential area was to be made through a wide green string, to also border the industrial string (Figure 12).

In this design, the levee borders the perimeter of the design area, protecting it from occasional floods. It also determines the structuring roads of the design, which organize the project's zoning. Just like the projects from the private initiative, the interaction to the lake and river delta is not privileged, because the flood protection was still an issue.

As for execution, negotiations were made with Petrobras (statal oil company) to build a refinery on site, and then proceeding with urbanization. The State Government failed on such negotiations, and matters of politic parties transition conflicted with the plan's continuity. Another delay on building the levee due to a new flood in 1967 added to the problem: the now desperately needed flood protection system was the focus of all cooperation between federal, state and local administration.

Therefore, the projects from the public initiative:

- Planned for city extensions similarly to the private initiative, aiming on organizing housing and industry;
- Counted on proposed laws to control occupation;
- Were discontinued for multiple reasons, including the urgency of federal works and other works made by Federal, State and Local administration alliances. The channel for the ocean was not executed because of its great cost, and for representing the potential decadence of the other state ports, Pelotas and Rio Grande, in the southern state.

The levee for protecting the wetlands from floods was part of a designed system of levees and pumping stations. The National Department of Public Works and Sanitation (DNOS) was responsible for this project, which also predicted a curtain wall with floodgates. The wall's height was established according to the flood of 1941, and obstructed the city's integration with its coast when built in the 1970s; it is a matter of discussions regarding the cityscape and its pertinence to the day.

## CONCLUSIONS

Flood management in Porto Alegre during the first half of the 20th Century was recurring news on the local newspapers. It affected part of the city center and mostly the neighborhoods close to the Guaiba River, which accommodated most of the flourishing industrial activities and the working class population, demanding of infrastructure and housing. The first project for the area sought solutions for the floods and sanitation issues through landfills and channels towards the lake. The following project, *Benopolis*, was hired with major modifications in relation to its predecessor, because of expropriations for the levee and the railway station. These elements restricted the project area, and the designed blocks and roads were to accompany their geometry.

The *Jacui Delta* Plan involved the delta islands and the city of Guaiba, and planned for industry and housing to occupy the limits established by a precedent geologic study. The area was to be occupied nearby a planned leveed road, starting from the continent because of expensive landfill work on the islands. The delay on constructing the road compromised the plan's execution, and the State Government turned to the *Gravatá Wetlands* area to create the *Industrial City Plan*. This last plan failed to be executed as well, for it depended on the flood prevention system to be built and the public administration to have continued.

This investigation shows that sanitation and flood protection, as seen, were important premises for the projects, influencing on the urban fabric and general conceptions, thus confirming that there have been real initiatives towards solving the problem. This research verified that the delay on building the federal highway and the outer levees completely shifted the focus from the proposals or stopped them from being executed, while only the Flood of 1941 would be significant enough to trigger governmental action towards protecting the city. Despite the sequence of obstacles, the resilience of the industry and workers ideal was historically part of an important economic moment, and later caused for allotments to take place in areas further away from the city center, and for the Porto Alegre Metropolitan Region to develop.

## Endnotes

- 1 Local newspapers reported the scourge of the population in the floods of 1928, 1936, 1941 and 1967. We highlight the flood of 41 in the publications: “Fábricas Renner: Enchente 1941” (São Leopoldo: Rotermund & Co.1941) e Rafael Guimaraens, “A enchente de 41” (Porto Alegre: Libretos,2013).
- 2 At the time of the Otavio Rocha Government, several infrastructure works are made, such as sewage and drainage systems, enabled by external loans. Günter Weimer, “A Capital do Positivismo”, in *Estudo Urbanos: Porto Alegre e seu planejamento*, ed. Wrana Panizzi et.al. (Porto Alegre: Editora da Universidade, 1993), 119.
- 3 Records from the Mentz S.A Company between 1936 and 1938.
- 4 Luiz Arthur Ubatuba de Faria, *Projecto de um plano de urbanização para um bairro industrial e operário na Várzea do Gravataí* (manuscript, Porto Alegre, 1935)
- 5 Luiz Arthur Ubatuba de Faria, “Urbanização da Várzea do Gravataí” *Boletim da Sociedade de Engenharia do Rio Grande do Sul*, 15, (1936): 51.
- 6 In 1936, Ubatuba de Faria and his colleague and engineer Edvaldo Pereira Paiva would promote their studies for the city at the Urbanism Expo – surely supported by the Local Administration – and also in 1937, at the Statistics and Education Expo from the Ministry of Education in Rio de Janeiro. See: “A visitadíssima Exposição de Urbanismo”, *Diário de Notícias*, December 1st,1936,3, and “O êxito da exposição de urbanismo de Porto Alegre no Rio de Janeiro”, *Correio do Povo*, February 2nd, 1937,3.
- 7 Luiz Arthur Ubatuba de Faria and Edvaldo Pereira Paiva, *Contribuição ao Estudo da urbanização de Porto Alegre* (manuscript, Porto Alegre,1938).
- 8 The sanitary engineer Francisco Saturnino de Brito made several sanitation and extension projects to Brazilian cities such as Campos, RJ (1901); Santos, SP (1905-1909); Rio Grande, RS (1909); Recife, PE (1909-1918) and Curitiba, PR (1920), influencing many of the planners engineers such as Ubatuba Faria. With profound influences of positivist thought in his time, he had dealt with urban issue in its many aspects. About Saturnino de Brito Engineer see: Carlos Roberto Monteiro de Andrade, “A peste e o plano: o urbanismo sanitaria do Engenheiro Francisco Saturnino de Brito” (PhD diss., São Paulo, 1992).
- 9 Carlos Roberto Monteiro de Andrade, “O plano de Saturnino de Brito para Santos e a construção da cidade moderna no Brasil,” *Espaço e Debates* 34 (1991):55.
- 10 Arnaldo Gladosch, “O plano diretor da cidade,” *Boletim Municipal*, 1 (1939):172.
- 11 Sérgio da Costa Franco, *Porto Alegre: Guia Histórico* (Porto Alegre: Editora da UFRGS, 2006),142
- 12 The National Department of Public Works and Sanitation (DNOS) was the federal institution responsible for the project and for flood protection works.
- 13 The examples of flood-related problems are presented on the following papers: “Os trabalhos de saneamento do 4ºDistrito” *Jornal da Manhã*, March 17th,1934,3. ; “Em torno do projeto de melhoramentos de São João e dos Navegantes”, *Correio do Povo*, August 30th,1933,8; “A extinguir o flagelo das enchentes nos bairros de São João e Navegantes”, *Diário de Notícias*, August 27th,1933,4. About the occupation of further areas, see also: Adriana Eckert Miranda, “Morar em locais futurosos: os loteamentos para indústria e habitação em Porto Alegre 1930-1955” *Urbana: Revista do Centro Interdisciplinar de Estudos sobre a cidade*, 8,(2014): 555-576.
- 14 Edvaldo Pereira Paiva et.al., *Delta do Jacuí: plano piloto* (Porto Alegre: Editora Globo, 1958). 29-36
- 15 Edvaldo Pereira Paiva et.al., *Delta do Jacuí: plano piloto* (Porto Alegre: Editora Globo, 1958). 37
- 16 Edvaldo Pereira Paiva, Roberto Veronese and Marcos Hekman, *Cidade Industrial de Porto Alegre: plano de urbanização* (Porto Alegre: Imprensa Oficial, 1961).

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- Atas da Empresa Mentz S.A: N°256 a 400; DELFOS Archives /Pontificia Universidade Católica do Rio Grande do Sul-PUC



## Image Sources

Figure 01: Faria, Urbanização da Várzea, 61-62.

Figure 02: Faria and Paiva, Contribuição ao estudo da urbanização de Porto Alegre, 1938,119.

Figure 03: Faria and Paiva, Contribuição ao estudo,119 (enlargement);

Figure 04: Andrade, Carlos R. Monteiro de, O plano de Saturnino de Brito, 60.

Figure 05: DELFOS/PUC Archives, B.Mentz Collection.

Figure 06: Paiva, Delta do Jacuí, 9.

Figure 07: Paiva, Delta do Jacuí, 31.

Figure 08: Paiva, Delta do Jacuí, 22.

Figure 09: Paiva, Delta do Jacuí, 49.

Figure 10: Paiva, Delta do Jacuí, 50.

Figure 11: Paiva, Cidade Industrial,19 .

Figure 12: Paiva, Cidade Industrial, 68.