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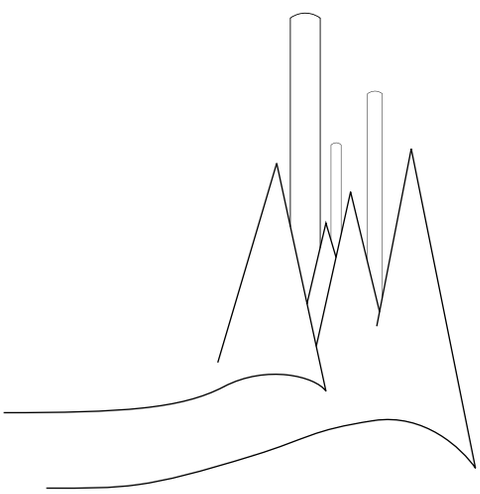
An Atlantic Park

Proposal for a new landscape in the postindustrial area of cabo do mundo, Matosinhos

**Dissertation for Master's Degree In Architecture
guided by Professor Nuno Alberto Leite Rodrigues Grande
and submitted to the Department of architecture
of the Faculty of Science and Technology of University of Coimbra.**

July 2022



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First of all, I would like to thank D’arq’s Community, as well as the University and city of Coimbra for the amazing years and unique experiences I was able to take part on, along with all the amazing and interesting people I got to meet.

A huge thanks to my parents and sister, which without their support this opportunity wouldn’t have been possible, and their uncondiotional support in the choices of my educational path.

I would also like to thank to all my friends, particularly Luís and Renato, for all the good times we had together, and all the support we have shared with each other on our struggles. A special thanks to Sofia, who throughout all my path in architecture helped and suppported when I struggled with different subjects, never giving up on me.

Lastly, I would like to thank my Professor, Nuno Grande, who greeted me with kindness everytime, even when I didn’t achieve the goals I should, and his incredible patience helping me with my dissertation.

Resumo

Esta dissertação é produto do trabalho iniciado na disciplina de Atelier de Projeto II do curso de Mestrado Integrado em Arquitetura da Universidade de Coimbra, orientada pelo Professor Nuno Grande no ano letivo de 2020/21. O tema proposto pelo professor intitulava-se “Cabo do Mundo 21: Projeto para uma cidade Urgente”. Seguido da introdução e desenvolvimento do problema no primeiro semestre, o seu incremento realiza-se na disciplina do segundo semestre Laboratório de Investigação. Esta proposta parte do pressuposto de que a Refinaria da Galp em Matosinhos cessa a sua atividade e os seus terrenos tornam-se disponíveis para a realização de projetos públicos, com uma reduzida desmontagem dos objetos industriais que lá se encontram. Este ponto é importante pois possibilita a proposta de uma cidade pós-industrial, ao invés de optar pela “tabula-rasa”.

O processo inicia-se com a divisão da refinaria em 3 partes, a partir de eixos paralelos (orientação este-oeste), distribuídas por três grupos de alunos. O objetivo desta separação foi a possibilidade de um maior foco nos problemas de cada zona. Apesar desta separação, o projeto urbano foi sempre realizado em turma, de forma a que o plano fosse coerente. Mais tarde, com as diretivas gerais definidas, cada aluno ficou responsável por uma área menor do grupo, sendo nela que desenvolveu a sua dissertação.

Esta dissertação consiste na criação de um novo parque Atlântico, na zona de frente de praia e produção de energia da refinaria (centro Oeste). A reconversão desta área passa pela arborização e renaturalização da frente da praia e da incorporação dos objetos industriais numa narrativa de lazer e educação ambiental.

Palavras-chave: Refinaria de Matosinhos, Cabo do Mundo, Arquitetura Pós-Industrial, Parque Atlântico

Abstract

The following dissertation is a product of the work started on the subject Atelier de Projeto II (Design Studio) from the master's degree in Architecture from the University of Coimbra, directed by Professor Nuno Grande in the year of 2020/21. The theme provided by the professor was titled "Cabo do Mundo 21: Project for an Urgent City". Following the introduction and development of the challenge at hand in the first semester, its evolution continued in the subject Laboratório de Investigação, of the second semester. The presented challenge comes from the assumption that the Galp refinery, in Matosinhos, ceases its activity and the land is made available to the development of public spaces, without removing any of the previous industrial infrastructure. This is an important point as it allows for the proposal of a postindustrial city, in the place of what could have been a "tabula-rasa".

The process begins with the division of the land in three parts in a parallel axis (east-west orientation) and then distributed by different groups of students. The point of this division is the possibility of a greater focus on the existing issues of the specific area. Despite this separation, the urban proposal was always developed in class, in a way that the plan would be coherent. Later in the year, with general guidelines set, each student was made responsible for a smaller area of his/her group, in which his/her dissertation would be based on.

This dissertation is based on the creation of a new Atlantic Park, on the beachfront, including the former refinery's energy production section (West center). The reconversion of the assigned area will go through the arborization and renaturalization of the beach front and the incorporation of the industrial infrastructure in a narrative of leisure and environmental education.

Keywords: Matosinho's Refinery, Cabo do Mundo, Post Industrial Architecture, Atlantic Park

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Introduction

The race towards carbon neutrality is on, a major reduction or total extinction of fossil fuels is certain, and with it, most industries will need to accompany the trend. It is easy to forget that the oil industry is the base of a very large economy that depends on its activity. Oil is currently the world's top energy source, and if we start to pinpoint industries that are dependent on that energy source or designed around it, we will quickly understand that the future holds a substantial and difficult endeavor. If we stop thinking about industries as an entity and start looking at them as infrastructural compounds that are owned or managed by someone or some group, I believe the issue becomes very apparent. Companies that shall fail to adapt to new energy sources will eventually face bankruptcy, their factories will be abandoned, and even if they managed to survive or embrace the new age of industry, there are still parts that cannot be converted. It is not possible to convert a turbine into a solar panel, or a gas engine into an electric one, so the disposal or abandonment of these types of infrastructure is imminent, disposal and conversion cost money, so we can deduct that some, if not most, of large industrial complexes designed around fossil fuels will probably face abandonment.

We were challenged to imagine a new city in the land now occupied by the Galp refinery in Leça da Palmeira, Matosinhos, preserving and recycling as much as possible of the industrial infrastructure found in this area, provoking the relation between man and the machine. The idea of postindustrialism evokes the future and makes us question whether contemporary cities are really responding the needs of their communities, and how can we qualify the idea of urban life.

To understand the objectives of this work, one must understand the special context of 2020, the year its development began. In 2020 we lived through the first big pandemic in the contemporary world, and probably the first one that put major restrictions in the way people lived worldwide. This caused a big social and economic crisis that showed the flaws in the economic scheme, mainly in the way that people became so dependent on products coming from different places. Therefore, when movement is restricted, both the distribution and the acquisition of goods becomes exceptionally challenging. The fear of scarcity for basic needs causes people to hoard which in turn leads to more scarcity. This is an issue that could potentially be avoided by thinking and developing cities as self-sufficient smaller communities. It is obvious that we cannot, in the contemporary era, expect a city to be able to be completely reliant on its own production solely, as we are more and more dependent on goods and services that did not use to be considered basic needs but have undeniably become an essential part of our lives. Despite that, we can progress in ways that reduces our dependency on others. Another issue with the pandemic was isolation, and the lack of conditions some people have while limited to their personal space. This issue could be solved fairly well if cities tended to create points of density instead of being dense all around, for example by creating smaller self-sufficient communities that share certain spaces, themes already experienced in "co-living" communities.

With these two previous points in mind, for us, the Postindustrial Modern city is the recycling and preservation of the industrial memory together with a naturalization and humanization of the land it occupies, while providing communities the option of being self-reliant. As such, our Master Studio class

started developing urban strategies that respected the existing refinery, while trying to insert certain new elements in its urban reconversion, inspired by other similar zones and projects to the one where the refinery is located.

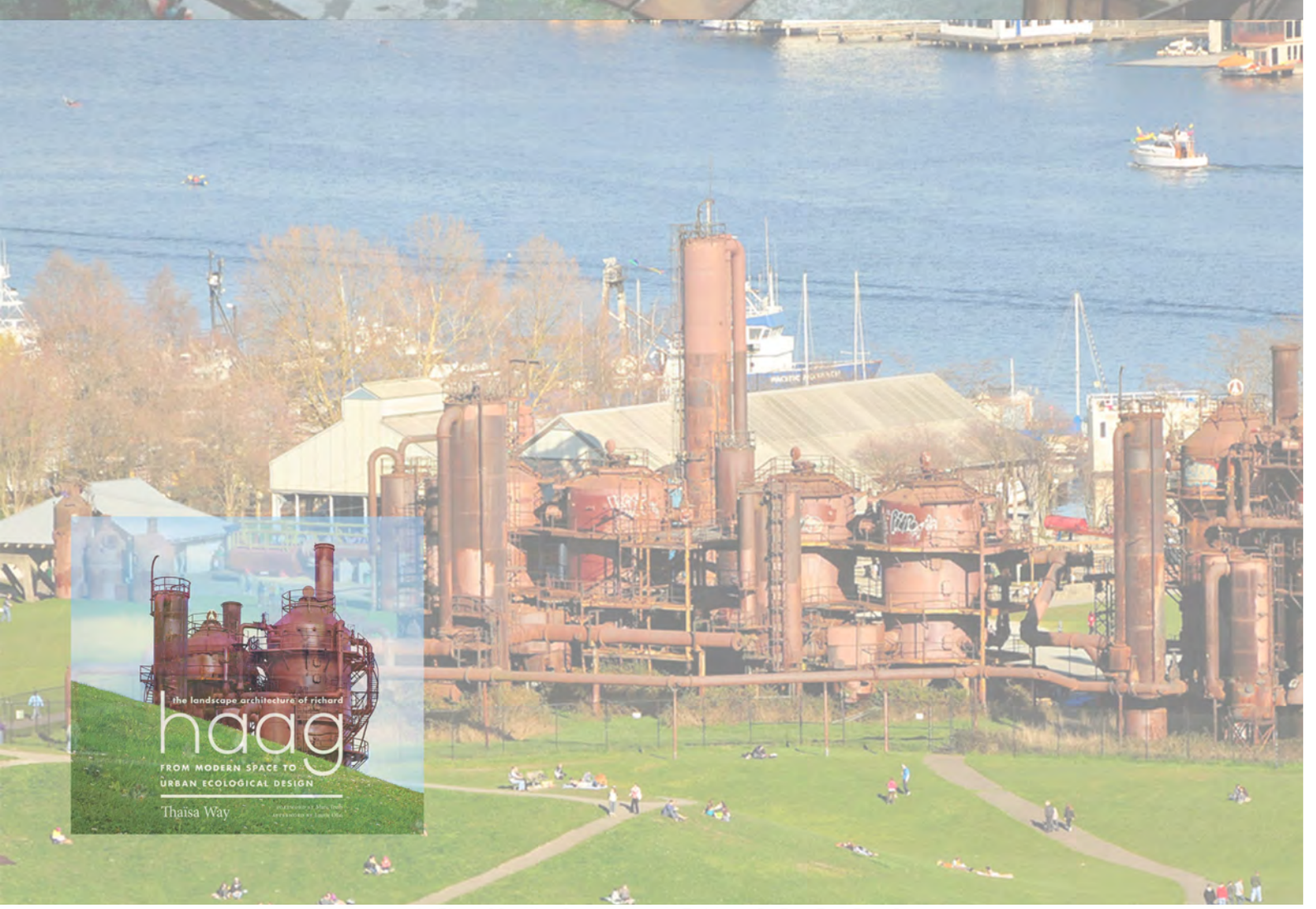
In this dissertation I will work on the issues of postindustrial waste and how to incorporate it in future urban life. In the age of carbon neutrality in is unthinkable to take a large amount of infrastructure and simply erase it from the landscape without thinking first about how it can be incorporated in the new plan, or at least, in efficient ways of recycling it. The main goal is to use as much as possible of what is already on site and create a narrative for an industrial park, where people may be close to those former machines and infrastructures, now reconverted into new urban facilities.

The focus of the project is the Cabo do Mundo beachfront and the energy production section of the former refinery. In this area, the master studio class planned a new Atlantic Forest (very common in other Portuguese foreshores) and a Leisure zone, structured by a proposed Boulevard Avenue. This boulevard, which splits the area in two sections (east and west) is the line that limits the community areas from the public leisure zone. Since I was assigned to design the planned public area, my dissertation will focus much more on the side of the relation between the park and the former industrial compound.

oping urban strategies that respected the existing refinery while trying to insert certain element found in zones similar to the one where the refinery is located.

In this dissertation I will work on the issues of postindustrial waste and how to incorporate it in the cities of the future. In the age of carbon neutrality in is unthinkable to take a large amount of infrastructure and simply erase it from the landscape without thinking first about how it can be incorporated in the new plan, or at least, in efficient ways of recycling it. The objective is to use as much as possible of what is already on sight and create a narrative for an industrial park where people can experience being close to these objects, even if it means the spaces are being reinterpreted in ways that make them more humane.

The focus of the project is the beachfront and the energy production section of the refinery, that was decided by the class plan to be a new Atlantic Forest (with characteristics from the Portuguese foreshore) and a zone of leisure, to support the West side of the new boulevard street proposed. This boulevard, which splits the area in two sections (east and west) is the line that limits the community areas from the public leisure. Since I was assigned land from the planned public area, my dissertation will focus much more on the side of the relation between park and industry than on the study of post-covid communities and the architecture to support them, as public and open spaces are not particularly relevant.



1 - Piazza Metallica, Landscape park, Duisburg; 2 - Rust Red, Peter Latz
3 - Seattle Gas Works Park; 4 - The landscape architecture of Richard Haag, Thaisa Way

Chapter 1 References

1.1 State of the art

The rehabilitation of massive industrial spaces is a relatively recent theme. The first industrial revolution blossomed two centuries ago, and with it the first large industrial complexes emerged. Since then, the industrial sector has expanded, and it's hard to say whether it reached its peak in terms of volume. Decarbonization is not dooming industries at all, it is just challenging their dynamic and methods. As such, some industries will leave behind infrastructure that needs to be taken care of and some of them, like the refinery in study, have a large and significant area that cannot get reused without processes of recycling or reconversion.

There are only a few complexes of this scale that were left abandoned and untouched, and an even smaller number of them are located in places that would incite interest from investing entities to transform them into public spaces. There is a vast number of examples of industrial objects being transformed into houses, offices, museums, and other smaller programs, but there's hardly any examples of industrial complexes transformed into a new urban space.

The first work I chose to study, and the one that influenced the majority of my dissertation, was "Rust Red" by Peter Latz. This book talks about the process of planning and designing of the Landschaftspark in Duisburg-Nord, Germany. This is probably the best example of a reconversion of a large-scale industrial complex into a park, maintaining the memory and infrastructure of the original factory and allowing people to live and experience it in a new paradigm. It also has the benefit of its author being the architect that led the project, making the information on it very insightful and clear for someone who is dealing with a similar challenge. It is incredibly useful as it deconstructs some of the standardized ideas on how to design a project and explains the importance of understanding the place, not just in a visual sense, but in its inner design solutions.

The second piece was "The Landscape architecture of Richard Haag" by Thaisa Way. This book is a general study of many projects led by the architect Richard Haag, a very important designer related to industrial reconversion. He designed one of the first parks (Seattle Gas Park) that preserved an industrial area, making it become the focus the new landscape experience. Even if situated in a large industrial zone, this factory area is of a smaller scale than the Matosinhos refinery; however, the project is very relevant in relation to soil (de)contamination, a similar problem to the one we had in hands. The book dedicates a small chapter to the process of planning and building of the Gas Park, explaining the process and the bureaucracy in more detail than the actual mindset of the architect, which was still very informative and insightful, nonetheless.

5 - Total Grandpuits Refinery, France; 6 - Matosinhos Refinery, Databook of safety, health and environment

After reading some books more related to architecture in the postindustrial sense, it was clear that knowing the complex I was working, on a more technical level, was essential to make a coherent proposal. In this sense, I began researching for more specificities on the refinery. The first and most important of these technical documents I consulted, was the "Refinaria de Matosinhos, Databook de Segurança, Saúde e Ambiente the 2011" (Matosinhos Refinery, Databook of safety, health and environment). This document is essentially a collection of data about the refinery, going through a lot of different subjects, like production, future projects, etc. It also explains how the complex is divided into its different functional areas and how each of them operates. The most important bit was a small drawing of refinery's plan, which indicated the buildings/infrastructures role within the compound. This was very useful for the entire class, as both the pandemic and the fact that this is a private giant company in Portugal made it very hard for us to visit the place and have someone explaining how the refinery operated.

The importance of decarbonization and sustainable energies is undeniable, but are we really in a decreasing market for oil and other fossil fuels? The research led me to a paper by Ivica Billege titled "700 Refineries Supply Oil Products to the World" that compiles a small amount of data about refineries worldwide and draws a few conclusions from the gathered data. The accessibility of the paper with very simple tables allows for an easy understanding of what is happening around the world when it comes to the refinery industry. The data is split in intervals of 5 years since 1996 (except for the period between 1996-99) to 2008. "The recent turn of the millennium is characterized by inflection of growth of the world refineries into a slight decrease"[1]. Inflection means the inversion of a trend: in the growth of the number of worldwide refineries. If we look closer to the tables, we understand that the western world has been in recession ever since the start of the analysis on this paper, but the fact that places like Asia and the Middle East are following the technological curve a few years behind the west, the worldwide number kept a slowly increase. Of course, with this data it is unclear whether the west is lowering its dependency on oil or it if is pushing carbon industries needs into countries that cannot afford to decide which industries to keep, but if the first is true, we are expected to see the same inflexion on Asian and Middle Eastern countries. In any case, the fact is that fossil energy industries are losing ground in western countries and refineries are ceasing their activity. There is no such thing as a small refinery, and they are always located in very privileged lands, as they require good accesses via land, so distribution can be easy, and most of the times are located close to a large body of water where big vessels (like oil tankers) can reach with raw materials. These lands are very valuable, and they must be taken care. Land, like oil, is also a finite resource, and it must be valued and preserved.

[1] Billege, Ivica. "700 Refineries Supply Oil Products to the World" 2009, page 1

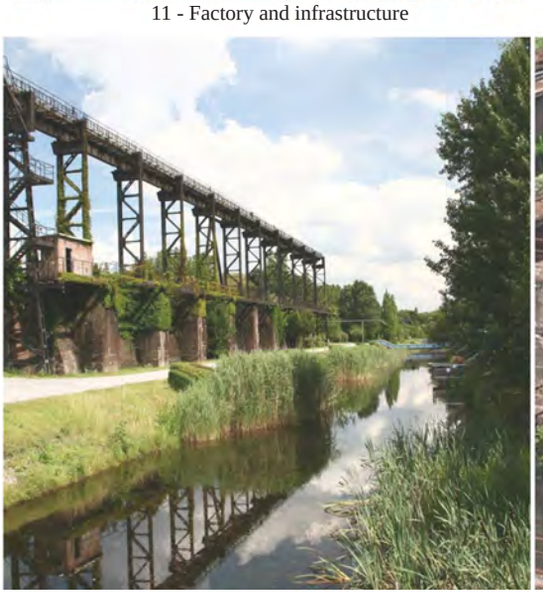
7 - Cogeneration central in Matosinhos Refinery ; 8 - Cogeneration central of Porto's refinery – study on environmental impact
9 - Simulation of the cogeneration central from Matosinho's refinery by Ana Monteiro

The last two essays that were more thoroughly consulted were “Central de cogeração da refinaria do Porto – Estudo de Impacte Ambiental” (Cogeneration central of Porto’s refinery – study on environmental impact), a document by Galp, and “Simulação da Central de Cogeração da refinaria de Matosinhos (Petrogal)” (Simulation of the cogeneration central from Matosinho’s refinery) by Ana Monteiro. Both these papers treat the subject of the new cogeneration central on the refinery in study. It was important to understand how it works on a technical level and how it made sense for the refinery to build one. This will later be discussed in the dissertation.

10 - Factory and infrastructure from above

11 - Factory and infrastructure

12 - Blast Furnace



13 - Emscher River

14 - Walkways on the old rails

1.2 Case-studies

To develop ideas for my urban program - both an Atlantic and Postindustrial Park -, I studied two very influential projects on the subject. The first one was the Landshaft Park, Duisburg Germany, by Peter Latz and the Gas works Park, Seattle USA, by Richard Haag. The Landshaft park covers the design of a big park linking different parts of an old Coal and steel factory, incorporating them into the park and giving new programs to some its buildings. The second focus more on industry as a modern sculpture and the restoration of contaminated land.

1.2.1 Landshaft Park, Peter Latz, Duisburg, 1989

In 1989, a competition promoted by IBA (internatinale Bauausstellung- International Building Exhibition) proposed the reconversion of the old coal and steel factory in Duisburg, and to design a park that linked nature and industry. During the end of the century, IBA promoted projects that would touch the social-economic structure in the area, and these would often be in places that were made inhospitable by human activity. The Landscape Park was one of the major projects in the center of this debate.
The old factory, abandoned since 1985, was still preserved as if it was in its active state, something that allowed Peter Latz, the winner of the competition, to create something pioneering in the rehabilitation of industrial spaces. What makes Latz proposal an architype is the fact that he transformed the environment and atmosphere of that place while maintaining almost the totality of the factory's infrastructure.

The method used by the architect consisted of two main ideas: Observe and Adapt. Since the beginning of his project, Peter Latz understood that plans and sections would not be a practical way to start designing this new postindustrial park. The first part of the process involved the identification of different buildings and structures and the understanding of how they contributed to the factory's activity. The reality is that a factory is a big machine, and its activity becomes its own narrative. By understanding how it works, the architect, with some design elements, can guide the public through an existing narrative, as opposed to other usual methods, where it is the architect's responsibility to create one. Latz considered the production of pictures and drawings of the existing elements much more useful than the creation of a general plan in the beginning. Understanding how they could relate each other could eventually design the plan by itself.

After a thorough analysis of the land occupied by the industry a set of primary ideas was set, the first one being the division of the park by themes. When you have such a wide area to work on, certain elements can easily get diluted if you do not allow them to maintain their own identity. These divisions created three main subjects, the Factory, the Railway, and Water.

The factory occupies just a small part of land in the park, but it is obviously its most remarkable piece. It is a very beautiful and untouched structure of the mid-twentieth century. It is highly organized and due to its age, much simpler to visually understand than modern complexes. Still, it is a large infrastructure which had moments in history of different intensities and importance; therefore, the architect began by separating elements into different categories. The first ones were the "Mega signs"[2], as referred in his book. These were tall or long elements which were visible throughout the park, guiding the visi-

[2] Latz, Peter. Rust Red. Munique: Hirmer Publisher, 2016, page 249

15 - Blast furnace at night

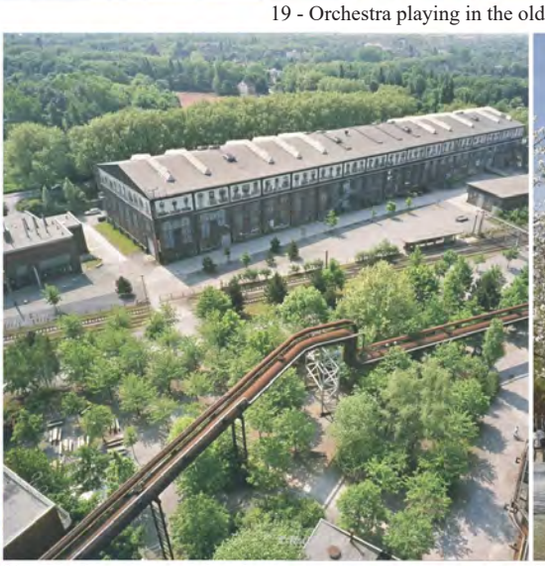
16 - Old pipe

17 - Night event at the Landscape Park

18 - Old Pump House

19 - Orchestra playing in the old Blow house

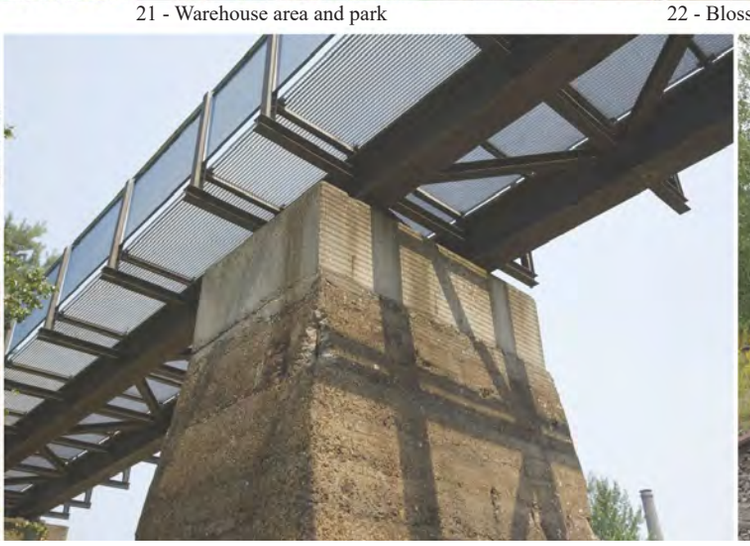
20 - Sinter plant Garden



21 - Warehouse area and park

22 - Blossom Park

23 - Rail Track and Old train



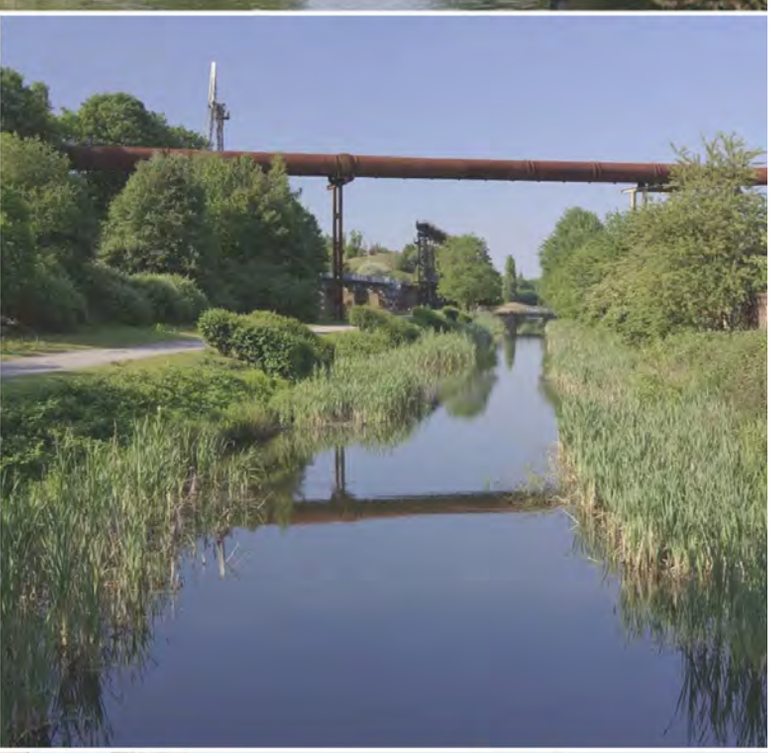
24- Reconstructed fallen railway bridge

25 - Path and park on the old rails

tors. This list consists of chimneys, gas pipelines, blast furnaces, and other tall structures, which became the brand image of the park. The second ones consisted of buildings that were possible to rehabilitate, like metal workshops, power plant, pump house, and other smaller buildings. These were all given new functions, since there was no economical reason not to recycle them. They were all brick buildings of the nineteenth and twentieth century industrial architecture, very well built. Two of the most important elements were the power plant – which was converted into a big hall that could accommodate up to 4000 spectators –, and the pump house, where people can see machinery displays as if they were pieces of art. The third type of elements are empty outdoor spaces in between the buildings/structures. These spaces were converted into all sorts of different spaces: plazas, gardens, children parks, galleries, etc. Those were more freely designed, because they did not have to contain any new function. The naturalization of the space was essential to make the environment less rough and hostile. This relation between nature and machine created an unseen landscape, as if these rusted objects were suddenly not seen as human creations, but rather part of the wild. The most important works of this group were the Piazza Metallica, a big square with metallic slabs taken from the ferromanganese Foundry and displayed in a grid layout on the floor like a painting. There is also a gallery path, created on the furnace bunker base, previously inaccessible, which allows visitors to be inside of the machine, now reinterpreted as postindustrial garden, as if the wild has invaded the machine itself.

The Railway and the Water canals connect different parts as guiding lanes around the park. The railways lead to different parts of the factory. By incorporating them into the walking paths, the landscape design materializes the idea of the industrial park. They largely differ from the water theme because these paths really tend to follow the old railways, bridges and viaducts, providing a more elevated experience, above the trees levels. The water park is another completely different project by itself, since the process of restoring the Old Emscher river was a very complex endeavor. The river was considered a disposal site, being cut off from the river network. This meant that it was highly polluted and not a very pleasant place to be around. The river suffered a major rehabilitation which involved very difficult processes. Its course was altered and the channel in which it ran was reconstructed. The river became a landmark to the park, and it is one of the major moments for visitors, as water elements kept being added on various parts of the factory area. These were built to help collect water for the river stream. The architect refers that he “envisaged feeding water into the Old Emscher without extensive earthworks and interventions affecting the industrial monument, if possible, without pumping it”[3]. So, he and his team began searching for solutions within the factory to serve this purpose. He refers that “iron plants had always utilized water circulation systems”[4], so they were made to collect water from all the buildings and feed it into the river. The search for these different elements allowed the design to incorporate water in more places than just the river, creating waterfalls from pipes (one of the brand images of this park) and filling old water tanks that worked like a modern lake throughout the industrial complex.

[3] Latz, Peter. Rust Red. Munique: Hirmer Publisher, 2016, page 95
4 Ibidem



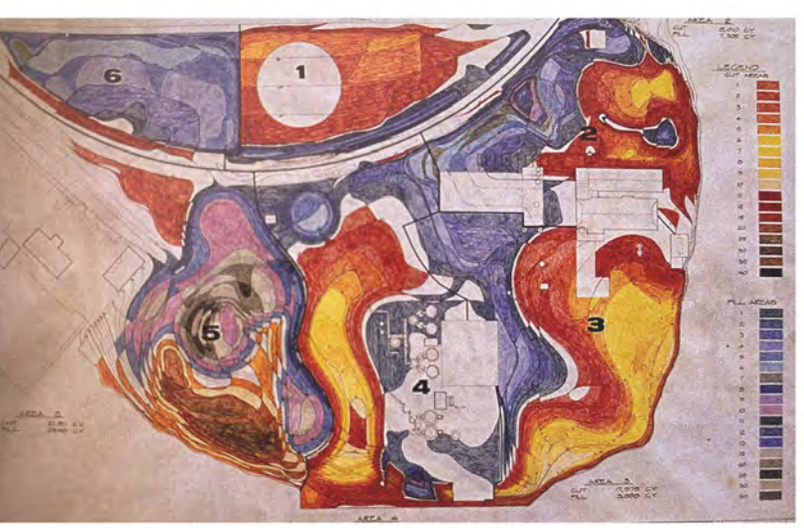
2 6, 27, 28, 29 and 30 - Elements of the water park

Regarding this project, it is fair to say that it is probably the most important case-studies so far in research on postindustrial parks. We cannot forget that there are real people that lived close to this complex, and its activity only ceased in 1985 – there were still some open wounds in the community caused by this factory and others. The memory of this place was not a favorable one, and for Peter Latz to come in, with his team, was genuinely a pioneering effort, and something that cannot be ignored in this dissertation. The recontextualization of Industrial infrastructure is exactly what we are studying, and this project brought a lot of useful and important guidelines on how to act in these circumstances.

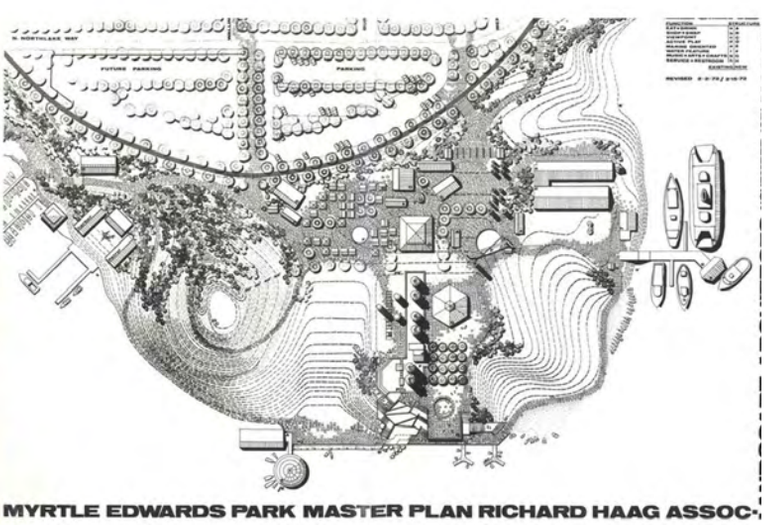
31 - Site in 1971

32, 33 and 34 - Infrastructure left abandoned

35 - New soil (yellow) to replace the polluted surface



36 - Plan of soil removal (red) and addition (blue)



37 - Final plan for the Gas works Park

1.2.2 Gas Works Park, Richard Haag, Seattle 1973

After the second world war, Seattle suffers a big transformation with the continuous industrial development. The urban landscape became completely transfigured, a cluster of industrial infrastructures. The quick expansion of industry in the city never allowed for proper planning or consideration of the consequences for the environment nor the communities. By the fifties, the population became very unhappy with state of the two lakes, Washington and Union, which reached concerning levels toxicity, making them even unsafe to swim in. As a result, a group of residents found Metro (Municipality of Metropolitan Seattle), an entity that wanted to regulate this type of malign activities. The organization proposed "a regional transit system, sewage and pollution control"[5] for the region, but ended up settling for a "scaled down"[6] version. The result of this efforts was the cleaning of Lake Washington, while Lake Union was left polluted.

Later, in 1956, the gas factory that sat by Lake Union closes, and quickly becomes of interest to city officials as it was the perfect spot for a public park. Its location was central to the city and could become a new landscape image of Seattle. An opportunity to design one of the first postindustrial parks is now created.

The context of this factory does not relate at all to the Duisburg one. This factory was in one of the most privileged areas in the city and it directly communicated to the residents in a daily basis. Its activity was a health hazard to all who lived closed to it, and there was no real love or nostalgia about these infrastructures. Despite this, there was no immediate action on the factory, leaving structures untouched and the surrounding environment polluted. It is fair to say that Seattle does take pride in its industry sector, but the community still felt bitter towards a factory that ruined the lake and the land around it. Richard Haag saw an opportunity to design a new type of park, a park that incorporated industry and mixed it with nature, almost fusing them together. He "accepted these gifts, and decided to absolve the community's vindictive feel towards the gas plant"[7].

The complex is small aggregate of gas tanks, pipelines and two bodies with chimneys where the combustion was done. All these structures were left untouched and treated like a piece of art displayed by this beautiful lakeside. Around it we can see paths that go around the park and lead to a hill that keeps the parks secret and is responsible for all its design. One would think that the park was designed around the factory, and it was to a degree, but the reality is that all the soil surrounding the factory was extremely polluted and digging just a few meters down would result in a toxic release of gas. The soil contamination was the biggest barrier to the park's development, and strategies needed to be created to resolve this issue. There are now many ways to decontaminate soil, all of them very expensive, but nonetheless they exist, but one cannot forget that the park's first inception was almost seventy years ago, and some of these were still in development and were not one hundred per cent reliable. After studying many of them, Haag and his team developed a strategy where the toxic soil would all be bundled together in a group, and a new layer of soil would be laid on its place. So, the result was a clean soil around the factory and a giant hill of toxic waste, which had to be dealt with later. This was all planed of course, and the hill was to be incorporated in the park, and a layer of 45 centimeters of clay covered by dirt was put over

[5] Way, Thaïsa. The Landscape Architecture of Richard Haag, From Modern Space to Urban Ecological Design. Seattle: University of Washington Press, 2015, page 147
[6] IBIDEM
[7] IBIDEM, page 150

38 - Drawing of the park's concept, Dale Jorgensen 1971

39 - Live music at the Gas works park

40 - Gas works park, view from the mount pathway

41 - Old concrete structures left untouched

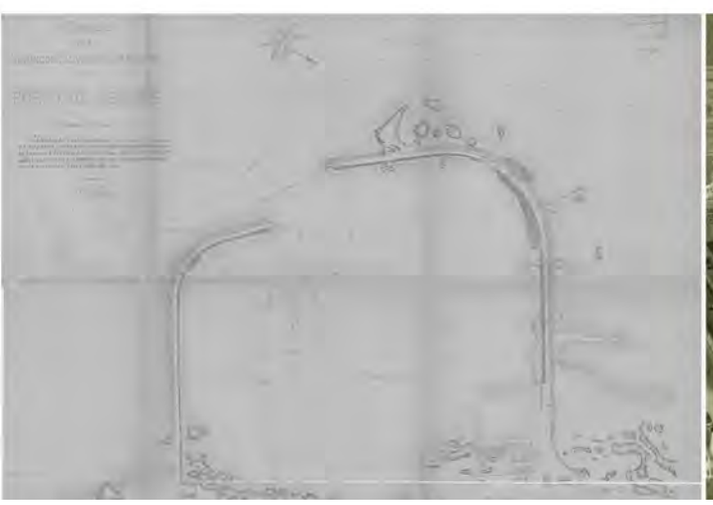
the toxic waste to seal and waterproof it, so water wouldn't get contaminated, and visitors wouldn't be at risk. The layer of clay explains the lack of trees in the park, as it was not built deep enough, and roots would destroy it. This is one of the most influential strategies that the class and I used in the development of our works as we will see later.

The Gas Park, as referred, took over an infrastructure that was nothing more than a big machine, as such, there were no real buildings or objects which could be recycled into program for the park, so the park lives of people's will to be in a less dense space, far from the urban everyday life. Like many parks, it also promotes events, providing a unique and pituresc background. Unfortunately, you can't walk around the structures, as an accident happened involving two children, forcing them to be fenced. Still, the relation between the park and industry is clear, and this was one of the first architectural works that promoted the postindustrial park and is a major influence on my dissertation.

42 - Cabo do Mundo Refinery in relation to Porto, Matosinhos and Leça da Palmeira

43 - Porto's docks in mid nineteenth century

43 - Porto's docks in mid nineteenth century



45 - Final design for Leixões' Port

46 - Leixões' Port after its construction

Chapter 2 History , Context and analysis

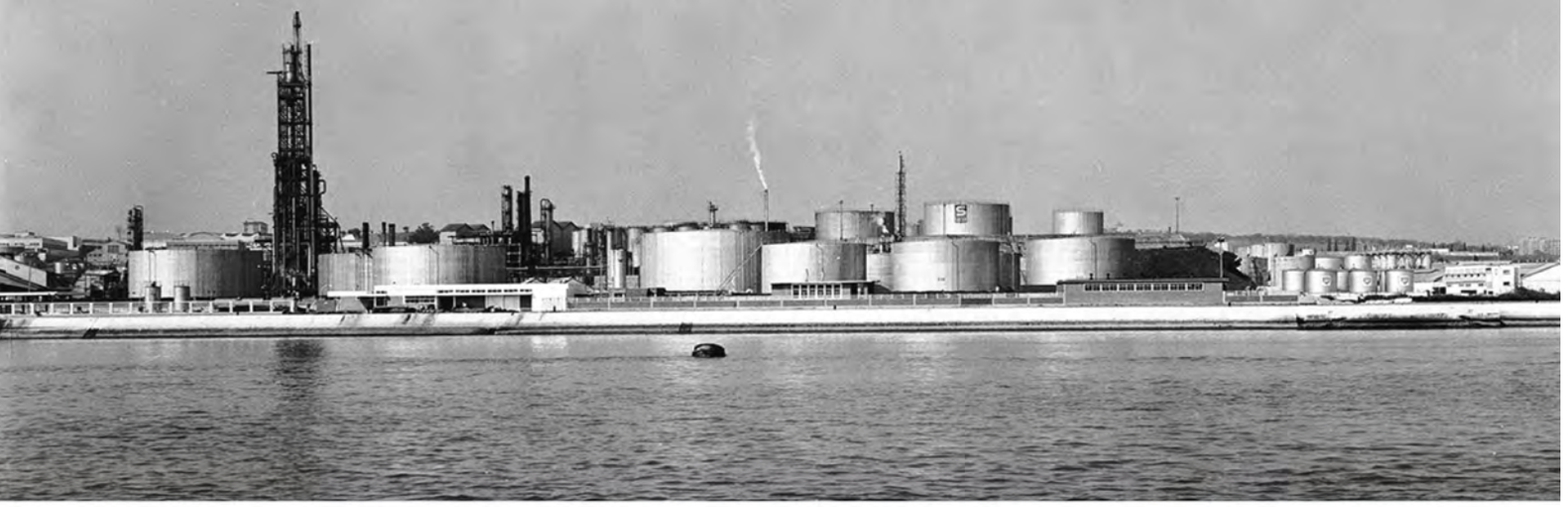
2.1 History

The refinery is located in Matosinhos, at the parish of Leça da Palmeira, in Porto's district. It occupies an area that divides the Aterro's beach (Embankment beach) and the village. This area is especially well situated as it sits quite close to Francisco Sá Carneiro's Airport, Leixões' Port and the A28 highway that connects to A1, the main Highway in Portugal, linking Lisbon and Porto. It is clear that this industry was built in a very strategic place. Unfortunately, if we analyze the area around the refinery, and see what the twentieth century was planning for Leça da Palmeira, it is hard to understand the decision to place such an intrusive and big complex in that particular piece of land. It created a 2.3 Kilometers wide barrier between residents and the beach. It seems completely out of place, but we will go through the reasons that justified this decision and brought us to the situation we are today.

Before Leixões' Port was built, ships would go through Douro River and dock in Porto city. This became an issue as technology developed and ships started to grow, which made it harder to avoid crashing into the rocky depths. Throughout the centuries, the idea of moving the Port away from the center of the city was always received with reluctance, and a lot of projects were done to avoid this transition. The best example was around the end of the eighteenth century, where the city's downtown and river waterfront were redesigned, to improve the access between the river mouth zone and the city. While this was done, the docks were also rebuilt. This didn't solve the docking problem at all, as the bottom of the river was still a hazard for bigger vessels. On March 29th 1852, a disastrous shipwreck took place, and quickly the government created a commission in charge of finding a solution to the issues posed by the Port's hazardous rocky bottom. The hesitation to move the Port out of the city continued, and a lot of proposals showed up. A proposal by George H. Hastings embodied perfectly the climate instituted by the bourgeoisie and other powerful social classes, where a big channel was to be built from Leixões to the docks in Porto. We are talking about a five-kilometer channel, at least, that allowed big vessels to navigate through it, just to avoid moving the port out of the city. This was just one of the first hints that Leixões' Port was unavoidable.

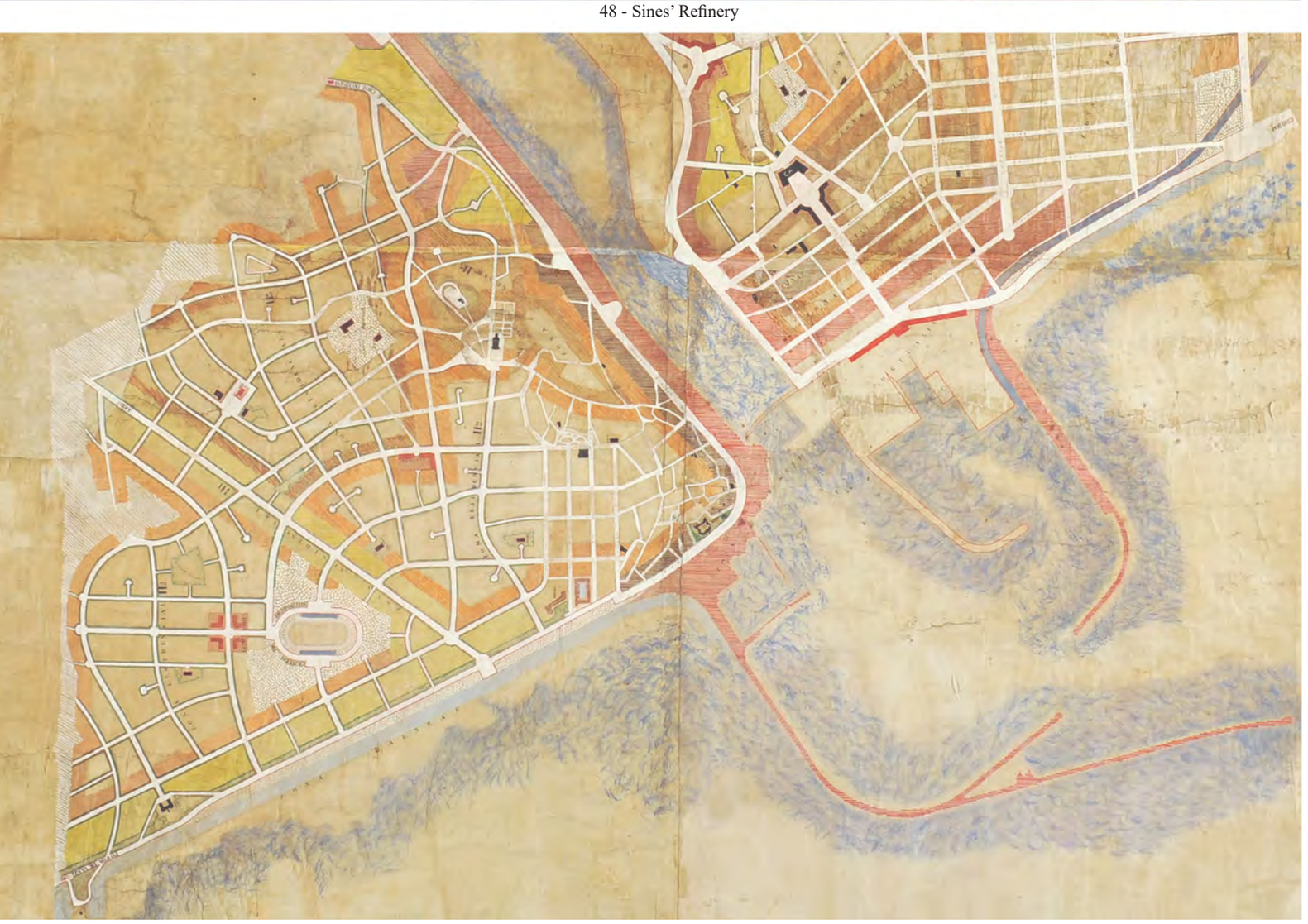
A lot of proposals kept coming and being considered until, finally, the year 1883 marks the beginning of the construction of the new port. The job was directed by Wíriot, a French engineer, and to supervise it, in the name of the Portuguese government, another engineer was pointed: Nogueira Soares. The new Port was set in the mouth of Leça River, characterized by two L shaped jetties and a big enlargement of the river's mouth where the main dock was established. This enlargement implied the removal of land. The solution was to place this dislocated soil in the area where the refinery is now built.

A few decades later, in the thirties and forties, SACOR (a Private Society of fuels and Refined Oils) made an agreement with the government for the construction of the first refineries in Portugal. This happened during the Second World War. Two refineries were planned and built during Oliveira Salazar's dictatorship: the North and South refineries. The first one, of 1940, was Cabo Ruivo's Refinery and then, in 1970, Leça's Refinery. Nowadays, we already witnessed the end of the first one, being completely



47 - Cabo Ruivo's Refinery

48 - Sines' Refinery

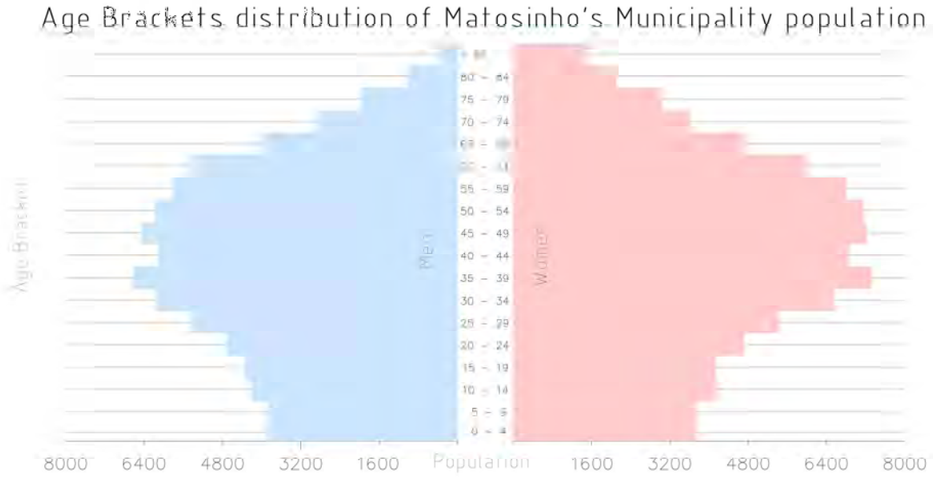


49 - Plan for the expansion of the northern side of Matosinhos

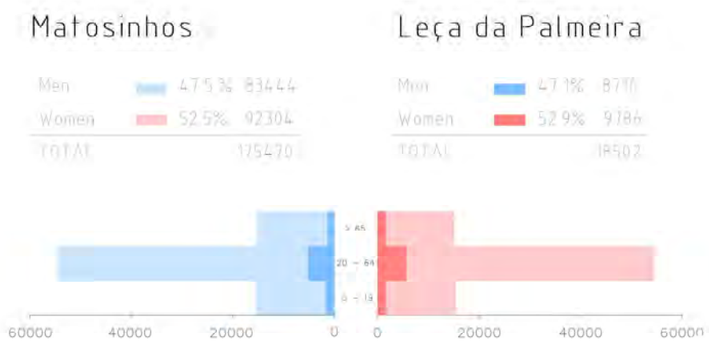
deactivated and disassembled, replaced by a new one in Sines (district of Setúbal, close to Lisbon) and the cease of refining activities in the second, created a new urban opportunity that we intend to analyze.

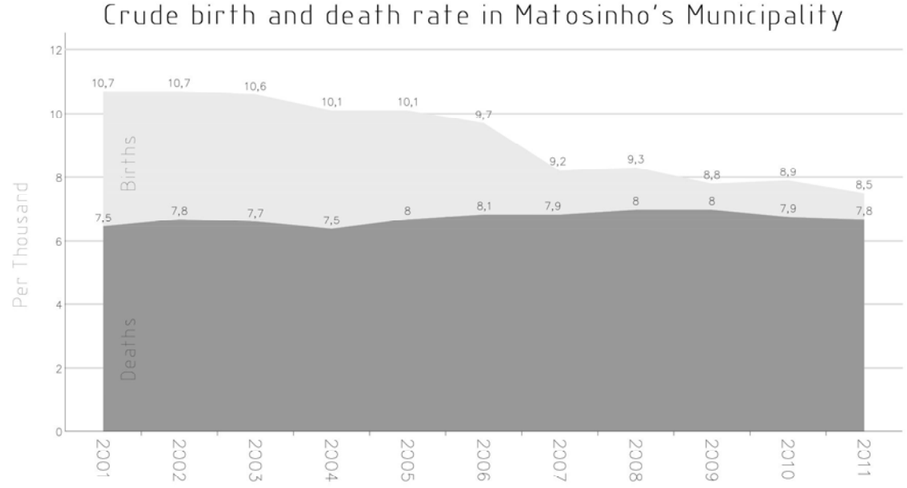
In conclusion, both these refineries were built purely for economic reasons with little care for the consequences that would come along around them. Moreover, the fact that they were developed during a totalitarian regime prevented people that could challenge the proposals. In Leça's refinery case, the fact that the embankment was there, ready, economically justified the establishment of the industry on that area, but it went against a plan made previously. In 1944 an urban plan developed by Moreira da Silva and Maria José Marques da Silva pointed the expansion of Leça da Palmeira towards the north side, proposing residential, commercial and leisure areas. In the late fifties and early sixties, a lot of projects were promoted to consolidate Leça da Palmeira as a place of entertainment and recreation, the most noteworthy being those facilities designed by Álvaro Siza: Boa Nova's Tea House, Tidal and Quinta da Conceição Pools. These two decades were marked by the effort of many people to rebrand Leça da Palmeira but, in 1966, with the beginning of the implementation of the refinery, those efforts became in vain. Our will is to reimagine Leça's urban identity, dealing with the fact that the refinery was there and that we should not erase it from the site's collective memory.

Demographic



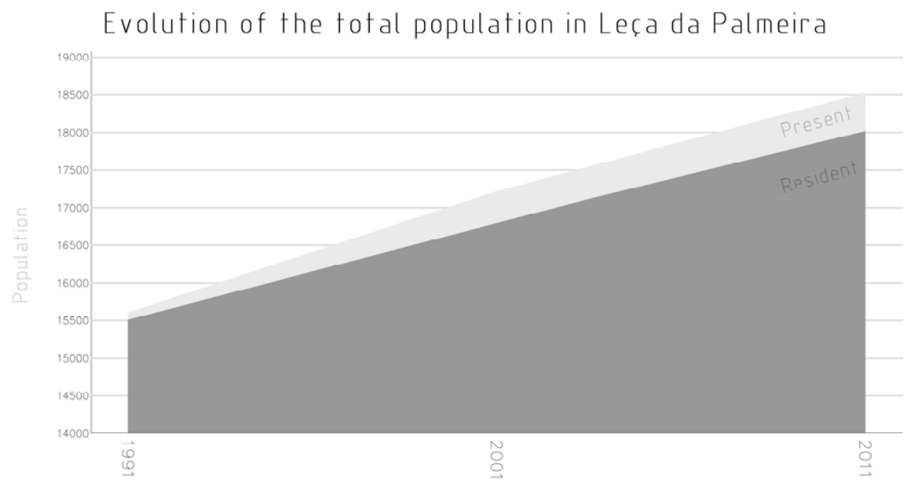
Age Structure of Matosinhos' and Leça da Palmeira Population





Crude Birth and Death Rate Matosinhos 2001-2011

Average births per 1000	9.7
Children per women (2011)	1.1
Average deaths per 1000	7.8
Total deaths (2011)	1.1



Population evolution in Leça da Palmeira 1991-2011

Present 1991	15605
Present 2011	18502
Evolution	+18.56%
Resident 1991	15516
Resident 2011	18006
Evolution	+16%

Description Analysis on population evolution through birth and death rate data

Study area Matosinhos Municipality and Leça da Palmeira

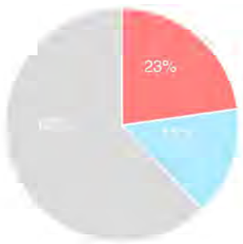
Source INE 2011, 2001, 1991

50 - Demographic data of the population of Matosinhos and Leça da Palmeira

2.1 Analysis

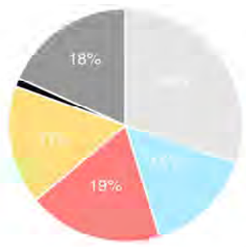
The gathered Data shows that the population in Matosinhos municipality is distributed mostly between 30 and 59 years of age, and the remaining majority is in the younger age groups. This contradicts the trend in Portugal of an aging population. Although this is not proving population to be self-renovating, as the birth rate values do not corroborate this trend, it may be a hint of a migrating population in younger brackets to Matosinhos.

Work and Education



Place of work or study

- Working in the municipality of residence
- Studyinmgib the municipality of residence
- Working or studying outside of the municipality of residence



Schooling Level

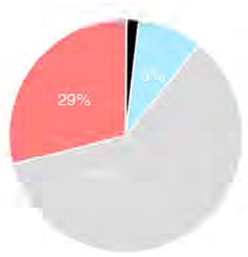
- First cycle of the basic level
- Second cycle of the basic level
- Third cycle of the basic level
- Secondary Level
- Post secondary education level

Schooling in Matosinhos 2011

This data analyses schooling of the population of Matosinhos municipality. There are 15 schools in total, belonging to all the studied freguesias.

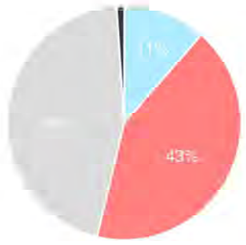
Summation - Population

Educated Population	14197
Students in Matosinhos	26157



Employment

- Employed
- Retired or Pensioner
- Unemployed looking for the first job
- Unemployed looking for a new job



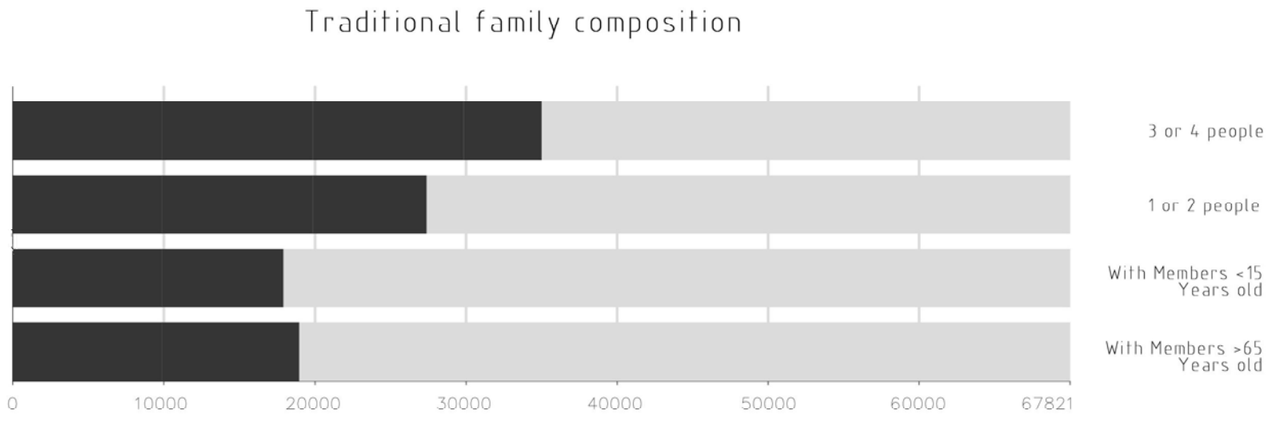
Activity Sector

- No economical activity
- Tertiary sector
- Secondary sector
- Primary sector

Employment in Matosinhos 2011

This data analyses work and occupation of Matosinho's Municipality population. It shows both the proportion of employment as well as the sector which the population works on.

Employed	75059
Unemployed	48853
Total	123912



Traditional families in Matosinhos Municipality 2011

3 or 4 People	35694
1 or 2 People	28481
With people <15 years old	18298
With people >65 years old	19651
Total	102124

Description: Analisys on employment and education of the residing population

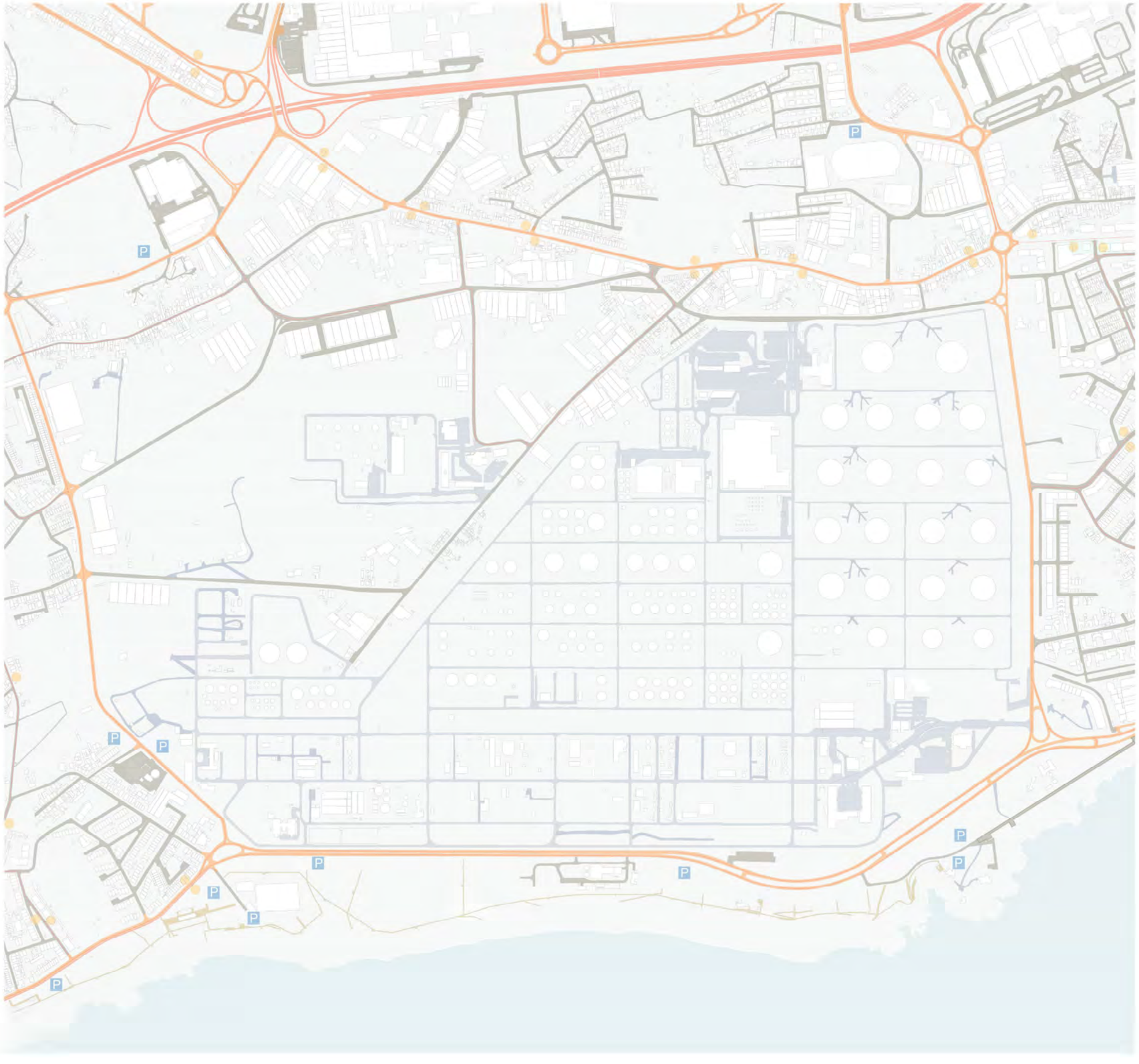
Study area: Matosinhos Municipality

Source: INE 2011

51 - Employment and education data of the population of Matosinhos and Leça da Palmeira

When it comes to work and education, the analysis showed that 62% of the population works or studies outside the municipality of residence. This can only be justified by the fact that Matosinhos is a suburb of Porto, and Matosinhos offering a cheaper cost of living, while not being able to employ or serve the population. Its population is more cultured (17%) than the Portuguese average (13,8%), which is normal for suburbs of big cities

Acess and mobility plan



Cabo do Mundo 21
Leça da Palmeira

Caption
- National Road
- Municipal Road
- Municipal local Road
- Exclusive refinery acess
- Secondary Road
- Bike lane
- Walkway
- Bus route
- Bus stop
- Public parking

Scale 1:10000
Description Acess and mobility plan
Study area Leça da Palmeira

0 250 500 N

52 - Acess and Mobility plan

The plan shows an organized network of roads around the refinery. There is A28 (highway) which connects to the municipality structuring roads, allowing for easy mobility in and out of the industrial area in Leça da Palmeira. The existence of a highly qualified road west of the refinery serves both the purpose of a quick crossing of Leça da Palmeira and access to Aterro's Beach, which can be confirmed by the amount of public parking on the beach side. The road is accompanied by large sidewalks along the avenue, and the beach is equipped with wooden walkways.

In the plan we can also see a very well-structured grid of roads that are restricted to the refinery and its workers. The refinery is fenced all around.

We can see that fast mobility tends to happen closer to the beach, while flow tends to be slower on the east side of the refinery, where we also find the presence of bus stops. Although it is normal that faster movement happens outside of dense areas, it is not usual to see it in the beach front, as it makes it difficult for the community to reach this place by means other than motorized vehicles.

Buildings' State of Conservation

Cabo do Mundo 21
Leça da Palmeira

State of Conservation
Good
Reasonable
Bad
Ruin

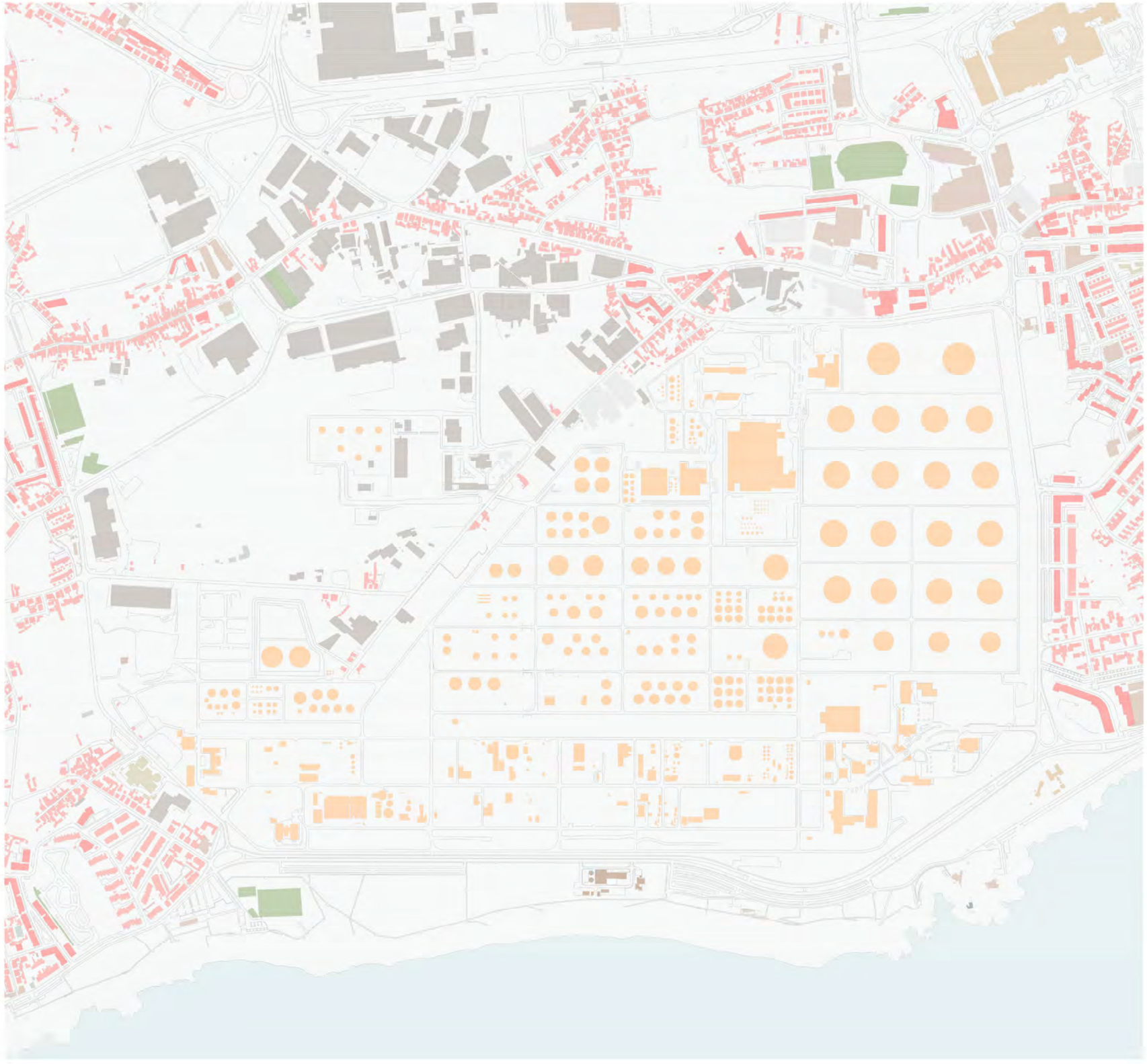
Scale 1:10000
Description State of conservation plan
Study area Leça da Palmeira

0 250 500 N

53 - Buildings' state of convervation plan

In general, the surrounding area is equipped with buildings in a good state of conservation, since they are relatively recent, resulting from the expansion era of Matosinhos and Leça da Palmeira as seen in the plans of 1966. The area between A28 and the refinery is generally in a lower state of conservation, with a few buildings falling into the category of bad state of conservation. This area is occupied by industrial complexes and warehouses; as such, some of them aren't being periodically worked on, and others were just abandoned. The Refinery has most of its infrastructure and buildings in a good or reasonable state of conservation. The exception is the fuel factory sector, which is in a bad state of conservation, probably because it is one of the oldest parts of the refinery.

Buildings' Function



Cabo do Mundo 21
Leça da Palmeira

Function
- Multi Family Residence
- Singular Family Residence
- Commerce
- Services
- Religious
- Health
- Cultural
- Sports
- No function
- Storage
- Water Treatment plant
- Ruin
- Refinery

Scale 1:10000
Description Building's Fuction plan
Study area Leça da Palmeira

0 250 500 N

54 - Buildings' Function plan

As referred before, we can see that the areas north and south of the refinery are largely occupied by residential areas, while the northeast is constituted by warehouses and commercial complexes related to the industries. The southeast makes the transition between these two areas, having buildings of both types.

Although the refinery is one big industrial complex, it can be divided into two different types of buildings and infrastructures. The west and northeast sectors houses machines, from the Fuel factories to energy generation facilities, and the middle sector is constituted by oil tanks.

Hypsometry and waterlines

Cabo do Mundo 21
Leça da Palmeira

Caption
Water
2m
4m
6m
8m
10m
12m
14m
16m
18m
20m
22m
24m
26m
28m
30m
32m
34m

Scale 1:10000
Description Hypsonometry and Waterlines plan
Study area Leça da Palmeira

0 500
250
N

55 - Hipsometry and waterlines plan

The analysis to the hypsometry shows what was expected: the refinery is in a very unnatural land, we can see that the topography lines are very straight, unlike the surrounding area where the lines are much more standard looking. It also shows how the refinery is built in ascending platforms as we go further east and away from the sea. It is also possible to notice how oil tanks are surrounded by land walls that were built to contain oil in case of a leak or an accident. The embankment is very easy to see closer to the beach, where there is a much less gradual increase in elevation, and we see the topography being pushed forward to the sea. There are three waterlines present in area close to the refinery. One of them goes across complex and into the sea, while the other two seem to have been redirected to avoid it.

Chapter 3 Project

3.1Class and group proposal

3.1.1 First Approach

In order to design a new city “Cabo do Mundo 21”, in the place of the old refinery, we needed to work as a class and face the issues that the place presented. The first semester of 2020/21 began with class meetings, where we would all participate and offer solutions to the challenges at hand, which were:

- Reincorporation of city and community in the land of the ex-refinery;
- The need for naturalization, rescaling, and adaptation;
- Connection between the urban mesh of Leça da Palmeira and the refinery;
- Transition between city and coast;
- Soil contamination.

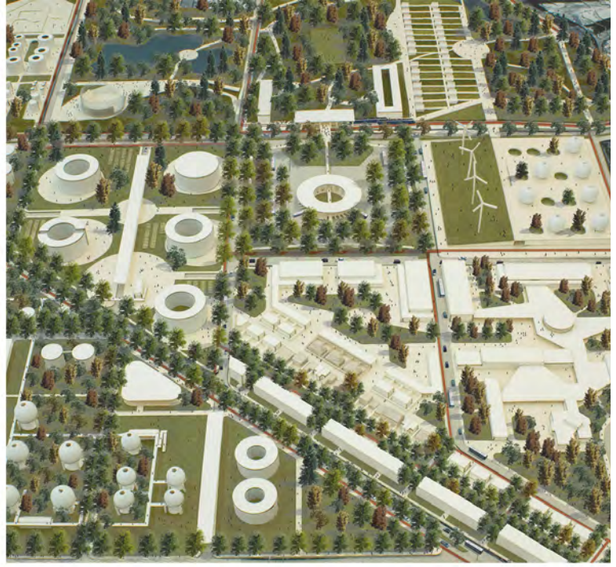
It is important to understand that the refinery is a private complex, with certain benefits given by the government and with a military protection perimeter. In this sense, such industry does not follow municipality rules. It is a challenge to make the articulation between the refinery and the surrounding neighborhoods, as it is to introduce human scale to the complex. There are occasions where you could be standing in the middle of the oil tanks the closest infrastructure is fifty meters away from you. Naturalization of this empty spaces and the addition of new elements was imperative. Although the refinery owns the land all the way west to the waterfront road, the industry never expanded beyond a certain line, and so, there is a very large empty area that needed to be dealt with.

To solve the listed problems, the class devised guidelines for everyone to follow and created a universal urban plan. Our options were:

- displacing of the waterfront marginal into the main North-South axis between the oil tanks and the factories, consequently bringing in into the ex-refinery land;
- This new “boulevard-avenue” should limit the new neighborhood’s mesh. It also allowed heavier traffic to happen on an outer ring, maintaining both the new residential areas uncluttered and making access to different streets of the new urbanization orderly;
- to establish a new transition to the beach to be made by the plantation of a Pine Forest, traditional of Portuguese foreshore areas, and the incorporation of leisure programs on the ex-factory’s area;
- to deal with the soil contamination for the public park zones to include hills, inspired by the Seattle Gas Works Park case-study, creating a dune sequence close to the beach. As it happened in the Gas Park example, we would cover contaminated land with layers of new and clean soil.

After these guidelines were established, the refinery was divided into three design areas, distributed among three groups of students, which were made responsible for developing and detailing different programs.

56 - Atlantic Park, Northwest view (Group A)



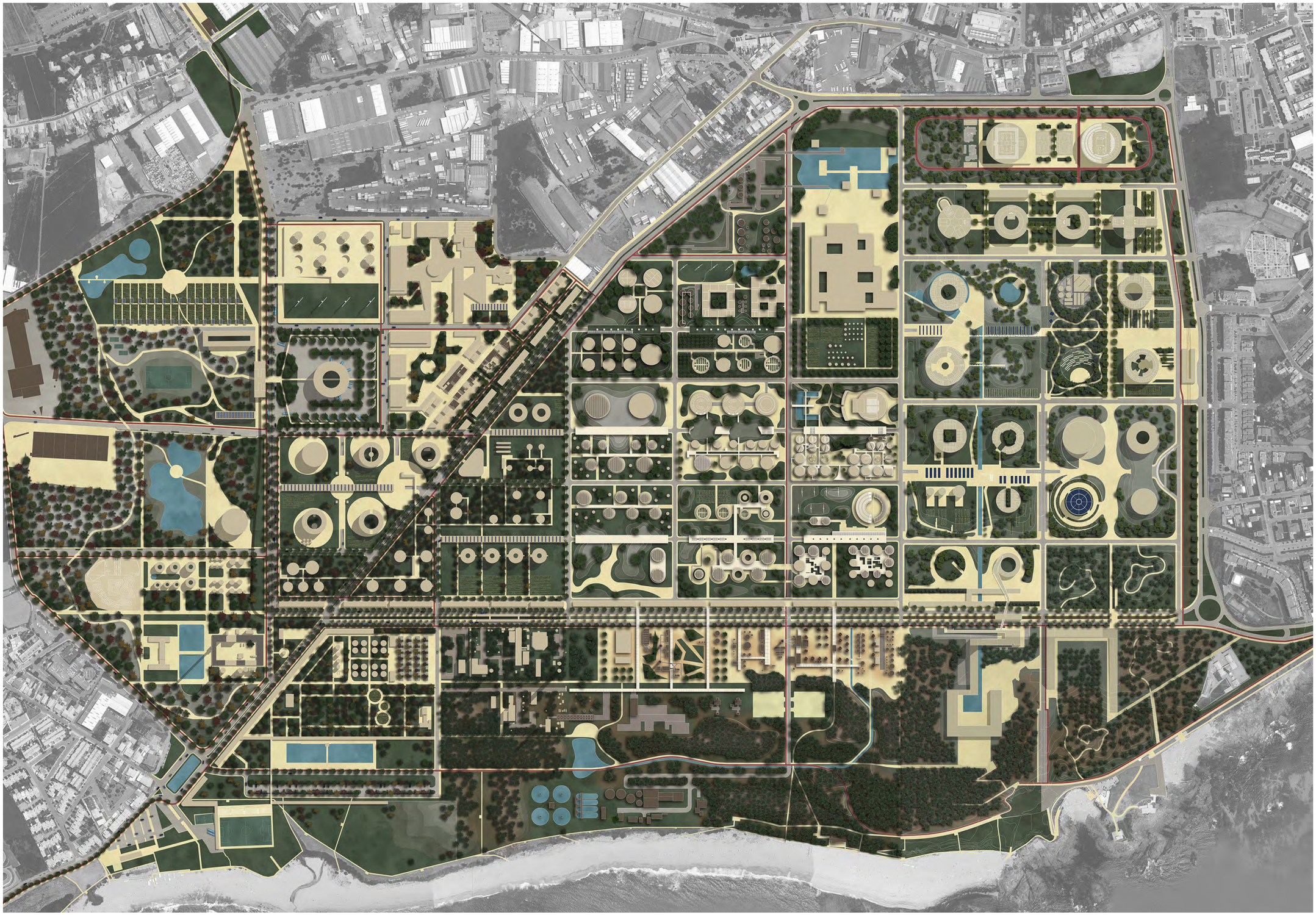
57 - Northern diagonal boulevard avenue (Group A)

58 - Boulevard avenue and reconverted oil tanks (Group B)

59 - Farmers’ Market and publlic spaces (Group B)

60 - Atlantic Forest and south beachfont (Group C)

61 - Reconverted oil tanks (Group C)



62 - Class proposal for the new city on Matosinho's Refinery

3.1.2 Class proposal

The final proposal was a compilation of all the efforts made by the three groups in implementing the guidelines established by the entire class. Communication between us was crucial to the success of the work, since the borders dividing the different areas had to be unnoticeable and fluid. The result is the plan on figure 39. In this drawing we can see the following elements:

-The new "boulevard-avenue", with large central and side walkways, which brings traffic away from the seashore and into the new city, including a metro line in the center that connects to "Metro do Porto" E line (the airport line). The east sidewalk has parking spaces and buildings to be developed as various types of commercial buildings, to promote people from outside of Leça da Palmeira. The west side walk does not have parking; but instead, a bike lane instead, which will later connect to existing and proposed bike lanes, both closer to the beach and around the refinery into the residential areas.

-The Atlantic Park, that occupies all the west and north periphery of the refinery, incorporating new walkways and bike lanes, new water elements, part of the rehabilitation of the waterlines mentioned before, and a Pine Forest. When we displaced the road off the beachfront, we also removed the extensive parking lots. The new access to the beach is now made through three perpendicular roads (each given to a group) by public transport or by other slow mobilities through the park. The forest park will include the existing factories, a cluster of machinery and pipelines. These spaces were converted into public plazas with industrial complexes left unaltered, when possible.

- The east side of the refinery was completely converted into a self-sustaining "park-city", with the rehabilitation of oil tanks into all types of buildings. Among those are public markets, workshop offices, public libraries, showrooms, concert halls, etc. It was also explored the concept of co-housing and temporary living, as well as fusion of public and individual spaces. Much of the land was also converted into public farms and equipped with various types of renewable energy generators, promoting the sustainable and independent aspect of the city we proposed. Like the park, the introduction of nature was vital to fill the void between infrastructures and humanize the space.

The most important part of the class proposal was to promote a new city model, an urban plan for the future, while dealing with the memory of the old refinery. In this sense, we took advantage of most of the infrastructure that exists in the study area. Sustainability deals with recycling; so, it was unthinkable to us to not use what is already there rather than creating and proposing new buildings.

63 - Plan of the group proposal

3.1.3 Group proposal

My group was responsible for sector B, in the middle of ex-refinery land. The biggest challenge we faced during the development of our proposal was the fact that we were between the other two groups. We had to deal with each one's particular issues and, through our area, and solve it in a way that connected the north and south plans. Since our sector did not have major relations between the refinery and the outer residential areas, it was our job to mediate the solutions from both corner groups and make sure that the puzzle would fit. We also had to deal with the presence of a water treatment plant very close to the beach, since we all agreed in class that it wasn't our decision to make it cease its activity.
Like the other groups, we were responsible for one of the perpendicular roads that lead to the beach, and ours was imperative, because the water treatment facility could not be inaccessible by road traffic. This was probably the most important perpendicular access as well, because not only was it on the center of the new city, but it also seemed to lead to the most used part of the beach, where a café/restaurant and the most important walkways were located. The main difficulty of this street was the fact that it would cross right over the slope mentioned before.

We worked on a few strategies to solve these problems, and the result is the plan on figure 63. Those strategies were:

-Designing the commercial buildings on the boulevard with two stories, where the first floor would communicate directly with the boulevard sidewalk, and the top floor would communicate with street on the east side. The space in between buildings would be balconies at top floor level and the communication between the upper and lower levels was to be made through both.

- Creating a perpendicular street, descending just before the last block of oil tanks, between the commercial buildings on the upper level. For that we had to design a small tunnel where both people, bikes and cars could make the transition between the different levels.

-Since parking was taken out off the beachfront, we had to create more solutions to assist the boulevard single lane of parking. As a result, we created some parking, mixed with trees, to support both the park and a shorter walk to the beach. Two big areas close to the industrial park were designated to serve as temporary parking when people influx would demand so, with the possibility to close one or both for public events, having the cogeneration central as a background.

- The water treatment facility could not be integrated in the park, as it is not a public space. So, together with group A (north) we used a hill design strategy to hide it from the park, planting trees around it. In this sense, the facility boundaries became defined by the dunes and the trees.

64 - Overall view of the proposed park (Scan QR for Video)

65 and 66 - Pipelines holding structure

67 - Boulevard crossing walkways built on old pipeline structures

68 - Walkway built on old pipeline structures

69 - Plan and sections of the individual proposal for the mid West section of the refinery

3.2 Individual Proposal

My proposal was focused on the area between the boulevard and the ocean. This was the area that was set by the class to be a public park, and it followed the guidelines accordingly. I was responsible for the design of the new Post-industrial Park, together with an Atlantic forest, which I named Atlantic Park.

3.2.1 Postindustrial Park

This was the place in where most of the machinery was located, unlike the remaining areas, which were designated for storing of both raw and refined materials. If we look at these objects from above, like we did at the start when making the urban plan, we would be easily mistaken into thinking some of these would be easily transformed into buildings. The reality is that this type of industry is nothing like others where you might find a big warehouse, with machines inside it. This big bodies are the machines, if you remove the machine themselves, there would be nothing left.

The first thing I did to be able to make any sort of proposal was analyze all these different structures, and how they fitted into the activity of the refinery: what was their purpose, how did they work, what kind of machinery is inside the cluster and how it can be converted or reused. This allowed me to choose with more confidence what was meant to stay, and what was going to get disassembled.

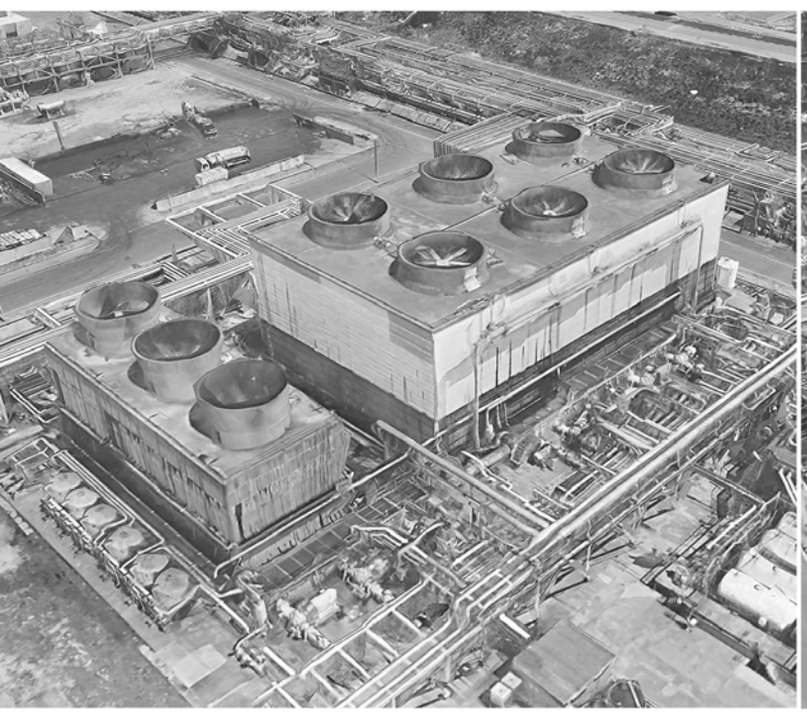
The Pipeline

The pipelines were one of the most thorough studies I did, and they ended up one of the highlights of my work. To me it was important to understand how they interacted with the space beneath, and how I could make them part of this industrial park. I discovered that almost all these pipes were being held at a higher level by metal beams, so they would not interfere with mobility on the ground. I found the pipelines outstanding, and I thought it was a reflex of the refinery's urban mesh. So, I used the beams to support a new metallic path, where people could walk freely and enjoy the view five meters above the ground level. This elevation provided a perfect view since the refinery's structures were so tall. The metallic structures were surveyed one by one, to make the proposal the closest to reality as possible.

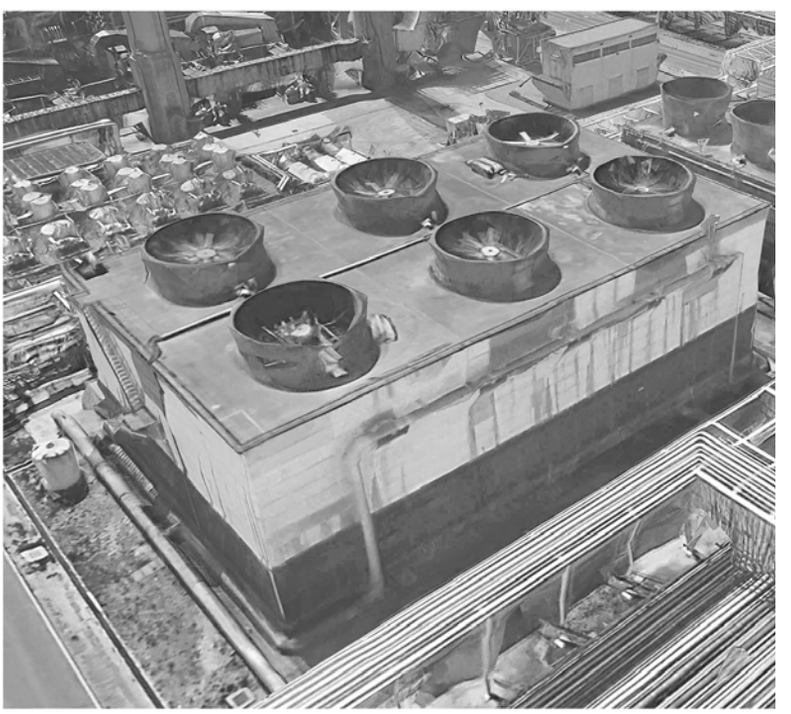
These pipelines used to connect the factories to the oil tanks, and they crossed the avenue we transformed into the boulevard. This street was, as mentioned, already one of the most important to the refinery, so when pipes were constructed to cross it, they were built on a long steel "bridge", with trusses to help with the span. I proposed the reconstruction of these bridges so that people could cross the boulevard on the upper level where the commercial balconies are located. This allowed another way of connecting both levels of our group's area. The pipes that were on the floor or were in the middle of these squares, which I intended to transform in plazas, were all removed, as they posed an obstacle to public space.

70 - Removed Office building

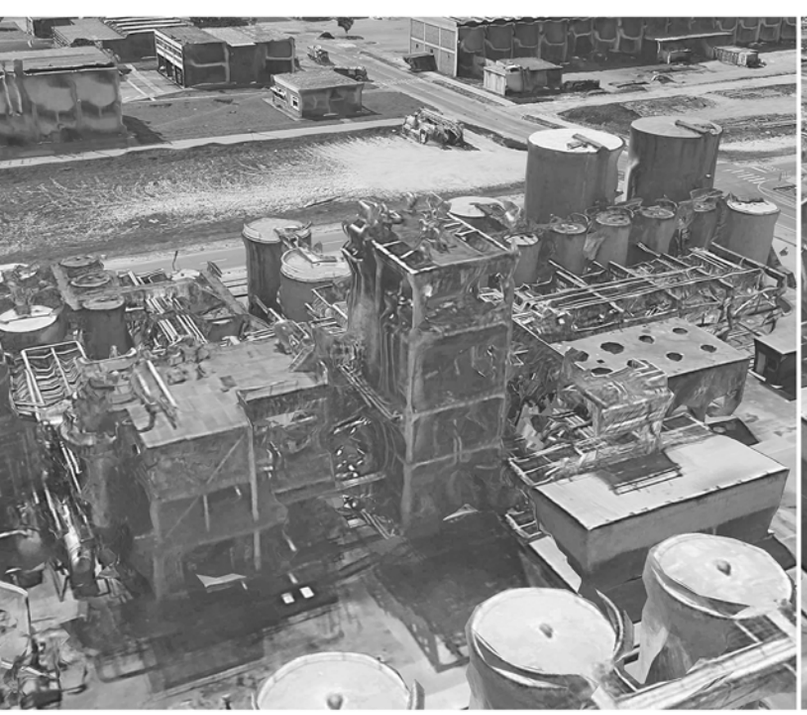
71 - Removed Building and warehouse



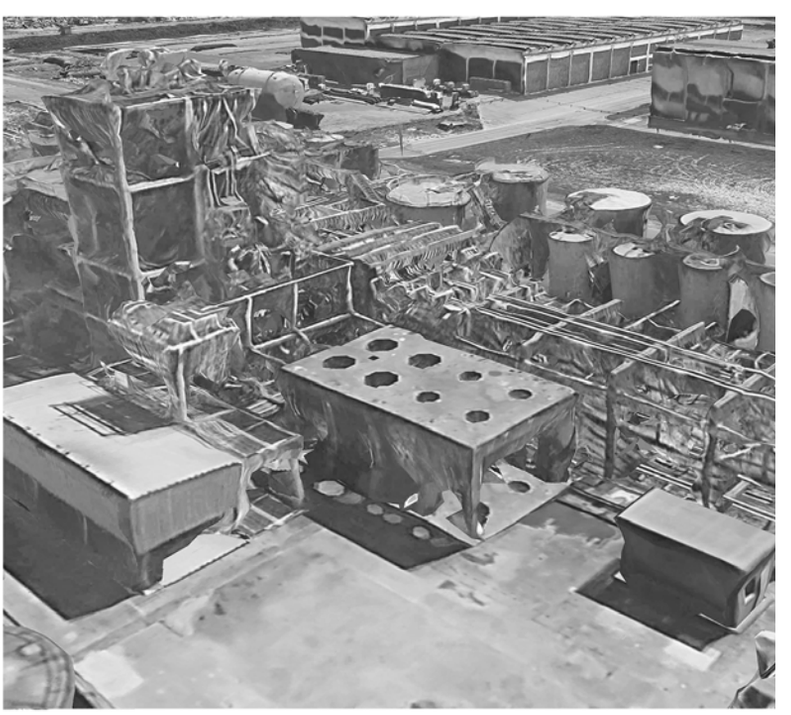
72 - Thermoeletric cooling buildings (southwest view)



73 - East Thermoelectric cooling building (Northeast view)



74 - Metallic infrastructure



75 - Concrete slab and pillars

The offices and warehouses

Often, I would find one or another building in this area, which most of times was just an office that was always in the middle of the squares. They were of little architectonic value, if any, and were inconvenient to what I was going for with this park. Also, it was impossible, with the public information I could access, to find what the buildings' plans were, so redesigning them was never an option, as I was unable to make informed decisions. The same situation could be said about three warehouses that were located by the pipelines. Besides the fact that little could be found about them, I suspected that they were filled with machinery. The possibility of making a complex where people could walk and see the machines for themselves was of interest to me, but again there was no possible way to make informed decisions about these structures. As a result, all these structures were removed.

Infrastructures to rehabilitate

The postindustrial park was an interesting concept, which in my opinion, by itself, is worthy of a visit. But the fact is that I wished more for the park. I wanted to provide its users with a bit more to experience. As referred before, the idea that people could enter a building and see different industrial units was very interesting, but it was something that I would very hardly be able to do. There's was no chance to make an inventory with the different machines found in the refinery, discover their size, and then create an exhibition with these pieces. It may have been possible to suppose what kind of machines a refinery usually has, but the path of assumption wasn't one I was willing to take, so I came up with a different concept. What if people could experience being inside a big machine? As I referred before, all these different structures were nothing more than covers for the machines inside them, so I just had to find a big one. Luckily, the thermoelectric plant cooling unit was right in the north corner of my area, and after some research, I was able to discover what they were. This complex housed six forced draft coolers, which are very characteristic because of their enormous fans on top, making this building look like an iconic Lego piece. I chose this structure to rehabilitate and transform into a concert hall and a pavilion for temporary exhibitions.

After the decision of converting that complex, it occurred to me that it would be ideal to have a building in both corners of my area. The north one was solved, I just had to find some structure in the south corner that could be transformed and house a public program on it. The idea of having two building complexes on each side seemed obvious to me, as they would mark the end/start of the postindustrial park and between them there would be all the outdoor activities. I settled with three structures: two of them were very close and were just metal floors with machines on it, which could very easily be transformed to its raw structure and make anything out of it, and the third was a very small but interesting concrete slab, hold by ten concrete pillars. The fact that the slab had eight circular holes reminded me of the thermoelectric coolers. The first group was to be transformed into public study rooms with a small library, while the smaller complex was going to become a cafe.

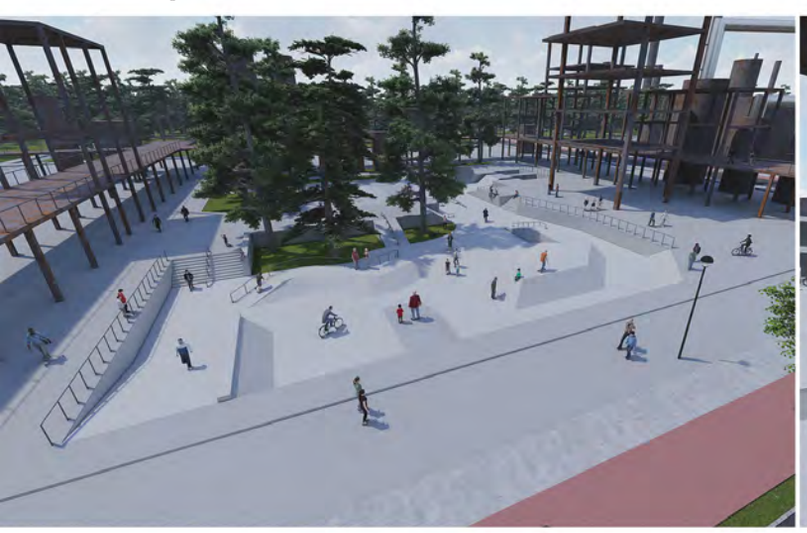
76 - Thermoelectric cooling square

77 - Atlantic park square

78 - Old tanks in the Atlantic park square

79 - Blossom square

80 - Industrial area of the blossom square



81 - Skatepark square (east)

82 - Skatepark Square (Northwest)

The industrial plazas

Like the rest of the refinery, this area was divided in different blocks. These blocks were divided by private roads, which both me and my colleagues transformed into walkways in the industrial park. These walkways were the continuation of the boulevard sidewalks, marking the entrances in the park from different points. By looking at the proposal, it is also clear that the maintained pipeline structures were maintained as marking elements, enclosing different "industrial plazas", as I decided to name them. Treating each plaza as its own theme, according to the previous existing machinery, would make the park more diverse and unique. The proposed plan shows how the reintroduction of nature in different ways and the use of distinct rules helped me create unique squares, each with its own reason to be visited.

First, the furthest north, there's a block occupied by the thermoelectric coolers, the biggest one being the one that was transformed into the exhibition pavilion and concert hall. For this, I made a very simple plaza around it, with small trees to provide shade and benches between them. The smaller square was purely functional, as I wanted people waiting for events on the building to have some comfortable place outside.

The second one is constituted by two blocks that surround two chimneys connected by very large and elevated pipes, which constituted the former thermoelectric plant. Since these plazas were marked by vertical features, it was the perfect place to introduce the entrance to the Atlantic wood in the park. Pine trees are very tall, so its introduction needed to be in a square where they wouldn't hide the main attraction: the machinery.

The third block is constituted by two different parts, the northern corner is an emptier space with 2 tanks east, while the southern one is a very dense and untouched cluster of infrastructure. Since the block was very raw and rusty, I decided to plant mock cherry trees for two reasons: the white and pink tones would match well with the rusted objects. While giving a little less monotone experience and it also created a "blossom event"[8], something I was inspired to do by the Landshaft Park project. As mentioned, the southern part was left as it was, as I considered the experience of walking through these machines and pipelines interesting enough.

The last square had one of the buildings that was impossible to survey. With the removal of the structure, there was not anything of interest for visitors to see. It was also the widest square, where the absence of shade and the concrete floor made it very uninviting. I took advantage of this and proposed a Skatepark. Since this square had almost no machinery to visit, I didn't mind the use of pine trees again. The fact that they were tall meant that I could use less area for trees and more to the Skatepark, while providing good amounts of shade. Therefore, trees are mostly concentrated south and west of the square.

[8] Latz, Peter. Rust Red. Munique: Hirmer Publisher, 2016, page 222

83 - Beachfront view of the Atlantic Park

84 - Transitional band infrastructures left behind

85 - General view of the bridge along with the new waterline

86 - Valley and park viewed from under the bridge

87 -Road and view to the park over the bridge

3.2.2 ATLANTIC PARK

The Atlantic Park is a more standard like public space, than the previous one, but it is still unique. It contains an Atlantic Forest, made of Pine trees, which are expected to establish their own natural ecosystem, like in other traditional Portuguese forests by the seashore.

Transitional industrial band

Just west of the Post-industrial Park, we can see in the proposal the existence of industrial structures which are now fused into the Atlantic Park. One of these complexes, the one with the 4 chimneys, is the Cogeneration power plant. It was built in the last decade, and it was a big investment made into cleaner forms of energy. Although it was still using fossil fuels as a source, it was a much more efficient than traditional generators. Galp claimed it alone would power 70% of Matosinhos municipality and reduce Carbon dioxide emissions by 400.000 tons per year. I tried to incorporate it into the park while maintaining its activity going, but with the cease of the refinery's activity, the direct access to gas would be cut. Other possibility was to use other fuels to power the complex, like biomass, but research showed that this was only possible in smaller machines. Therefore, the only fuel possible for the cogeneration plant to work was gas. The fact that this complex was going to collaterally suffer from the cease of the refinery's activity was accepted, and it was a casualty of the postindustrial city. As such, the area around it was simplified and made part of the park, by planting pine trees around it, making a picturesque image of these four chimneys coming out of the forest, like taller trees. The remaining infrastructures consisted of pipelines and old machinery, left unoperated, as an industrial archeological artifact. Those were left as they were, only removing the floor slabs that were on those blocks, making it all natural and part of the Atlantic Park.

The bridge and topography

Ever since we did the class proposal, it was clear that our group was given the most important and bigger access to the beach. The existing street was 14 meters wide and went across the refinery, from east to west. Such brutal road was cutting the park in two, which made no sense to me. As explained before, the idea was to make one continuous Atlantic Park around the refinery, and I felt this cut was too strong.

I spoke before about the strategy that Richard Haag and his team developed in Seattle, based on the taking of all contaminated soil and constructing hills, sealing it with layers of clay and clean soil. The class used this strategy to create dunes around the park, trying to make the topography closer to what a foreshore one would be like. All my classmates were piling soil, but no one was really digging any. I saw this as an opportunity, because my park was located where no factories were ever built, so it was to be expected that my soil was of much better quality. I was able to provide the rest of the park with something close to 79800 Cubic meters of soil to build the dunes, which is certainly not enough. This decision alone would be saving the equivalent to eleven thousand trips made by trucks, supposing the density of the soil would not prohibit the trucks from carrying their maximum volume. We can safely

assume that this digging would be possible because this is an embankment of land that came from the Leixões Port construction. It isn't likely that we would find and rocky soil in the first meters.

To cross this excavated valley, I designed a new bridge in the park, which avoids the division of the Atlantic Park in two. The bridge design is sober, resulting from a straight structure that gets blended into the park's forest and allows all kind of traffic to go over it. To solve the relation between cars and pedestrians, two bridge extensions were created, providing access to the bridge via walkable ramps. These extensions are wave shaped to go in and out of the forest, making them lighter pieces.

The waterline

In the analysis we observed before, we could see three waterlines that existed in the area of the refinery. Both our group and group C wanted to take advantage of their existence, so we decided to resurface the middle line and use it in different moments, as we can see in the classes' proposal plan. I used my share of the line to design a riverlike section that defined the park's movement. This allowed me, without the need of any type of slab, to design a path just by the absence of trees, since the river would be enough as a guiding line. It ends in a small lake where people can gather around and enjoy the park. The decision to not end it in the sea came from the fear of any contamination. It is likely that the flow from this waterline wouldn't be able to feed all the proposed sites both our groups designed, so a system was to be developed where all the water collected from the industrial park was to be redirected through existing draining systems to the river. In the end of its course water would be going to the water treatment plant and be looped back in the system when required to keep the river healthy.

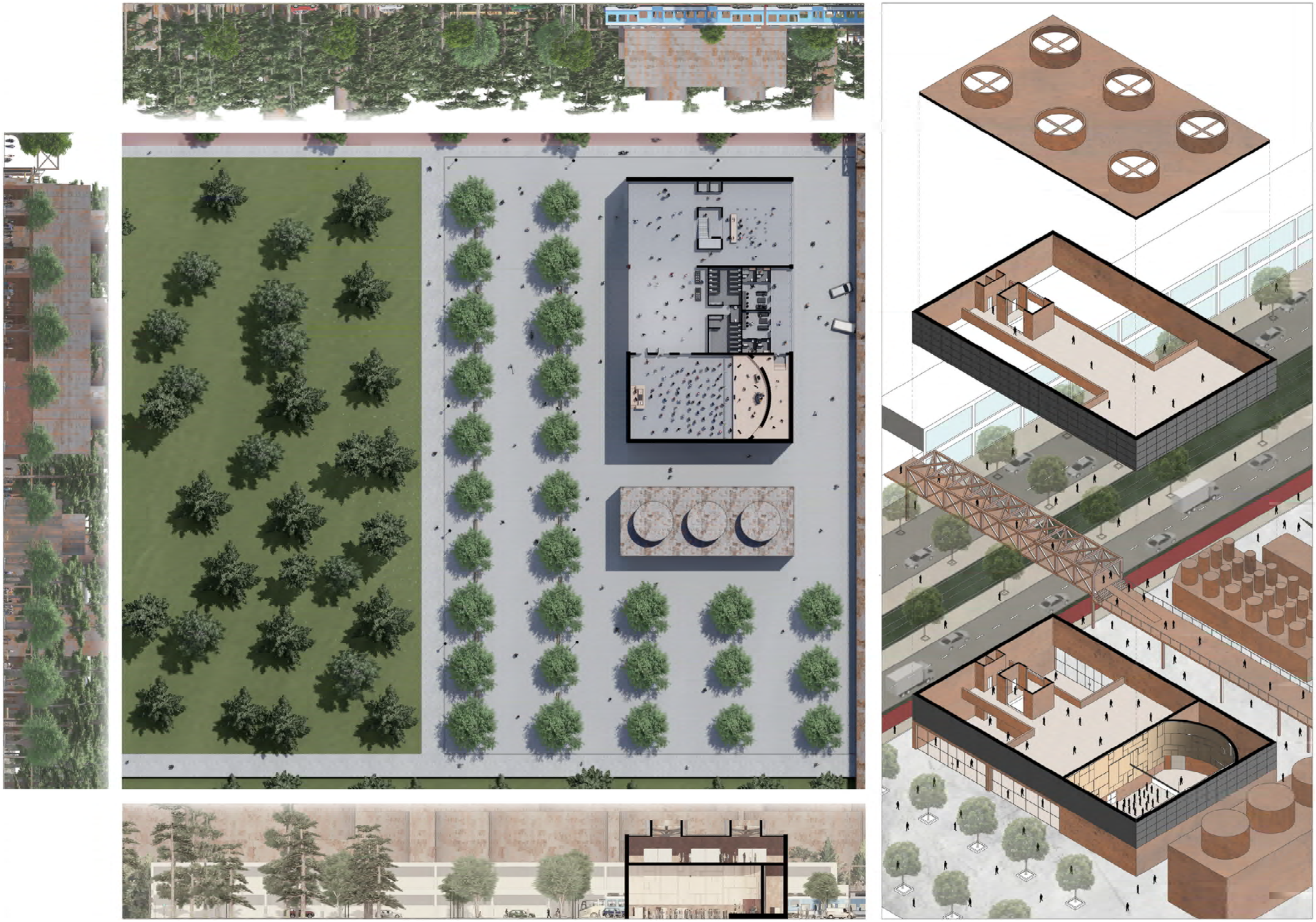
88 - External view of the thermoelectric cooling building (Scan QR for video)

89 - North foyer (concert hall entrance side)

90 - South Foyer (ticket and information stand side)

91 - Concert hall (audience view)

92 - Concert hall (stage view)



93 - Plan, sections and axonometry of the proposal. Reconversion of the Thermoelectric cooling building

3.2.3Proposed rehabilitations

Thermoelectric cooling structure

The infrastructure I decided to redesign is made of two main elements: an outer shell, held by a structure of concrete pillars, and the six forced draft coolers inside it. The coolers occupied almost the entirety of the volume of this infrastructure. The interior is defined by small corridors between them, in the case that any maintenance must be done. The machines are very complex, and there isn't really a way to incorporate them into anything architectonic. The solution was to remove all the machinery and leave the most memorable element of the complex, the six fans that topped it. By doing this I ended up with 42x28x15 (length, width, height) empty warehouse, that is, a 1176 square meters space with a high ceiling.

In my proposal, this building houses a concert hall and a pavilion for temporary exhibitions. It is divided into 3 floors, with 5 meters between slabs. A new internal structure had to be made to allow the building of the different rooms and floors, as the structure that was there would most likely not be capable of supporting any of it, since it was only made to hold the facades as the cooling units were self-sustained by their own structure.

The first floor is constituted by the concert hall, two foyers, public bathrooms, and the dressing rooms. The vertical access is made on the eastern section, and, on the first floor, it makes the division between the foyers, while maintaining visual connection through the corridors and the glass pane. The building is accessible from both foyers, so people don't have to walk around to enter. The bigger foyer (north) is destined to be used by people who are going to the concert hall. The south one is where the information and ticket stand is located. The remaining floor is occupied by the dressing rooms, with its own private entrance as well as a very large corridor that allows the artist's gear to be taken to the stage. This side of the building can be accessed by cars or buses without interfering with the park's activity, and the fact that it is close to a pipeline walkway makes it easy to set a boundary on a security perimeter in case it needs to be created for an event. The first floor will use the same concrete slabs proposed outside, recycled from the western blocks from where they were removed. If we divide the building in three equal parts, we can see that the concert hall occupies the west portion. The concert hall does not have contact with the cooling fans, which to me, was the highlight of this building, so I decided it needed its own identity. Acoustically, rectangular plans with plain walls are a very bad mix, so I incorporated acoustic solutions in my design. First, the stage was designed to be concave, making it the real focus of the room, drawing your attention as soon as you walk in. Then a grid system was made through a computer algorithm, developed by me on Grasshopper, that would divide the walls in wooden squares and rectangle pieces. Raised from the wall at random distances, those pieces make the walls uneven, avoiding reverberation. This strategy also allowed for sound to get behind the wood and be absorbed by a softer material on the back of the planks. To make the manufacturing of the pieces easier, the planks measures could only be multiples of one, instead of randomized.

94 - Exhibition room, third floor

95 - Exhibition room, second floor

The second floor starts on the vertical access, and a bridge connects it to the middle section of the building, where the first exhibition space is located. Instead of concrete slabs like we have on the first floor, wood was the material of choice, since I wanted people to feel like the bridge was a light piece, making it clear that it wasn't always there. The third floor follows the exact same logic, with the exception that the bridge is longer, and the exhibition occupies the western section, over the concert hall.

The reason why we have this stair shaped section, is because I wanted every public space of this building to have a visual of all six fans, with the exception of the concert hall. To me it was important that people felt like they were inside the machine that was there before, and this pavilion-like feeling had to be guaranteed.

The materiality of the building consisted of the original outer shell on the second and third floor, while the outside first floor and all the inside walls were covered in Corten steel. This material was chosen because it respected the tonalities of the ex-refinery. To give contrast, since Corten steel is such a visually heavy material, the ceiling is made of white plaster, apart from the top floor, except on the top floor, where you can feel the presence of the existing cooling fans structure.

96 - Cafe and library view from the street (Scan QR for video)

97 - Book room on the library

98 - Study rooms on the first and second floor

99 - Terrace on the fourth floor of the library

100 - Plan, sections and axonometry of the proposal. Reconverted structures into a library and a café.

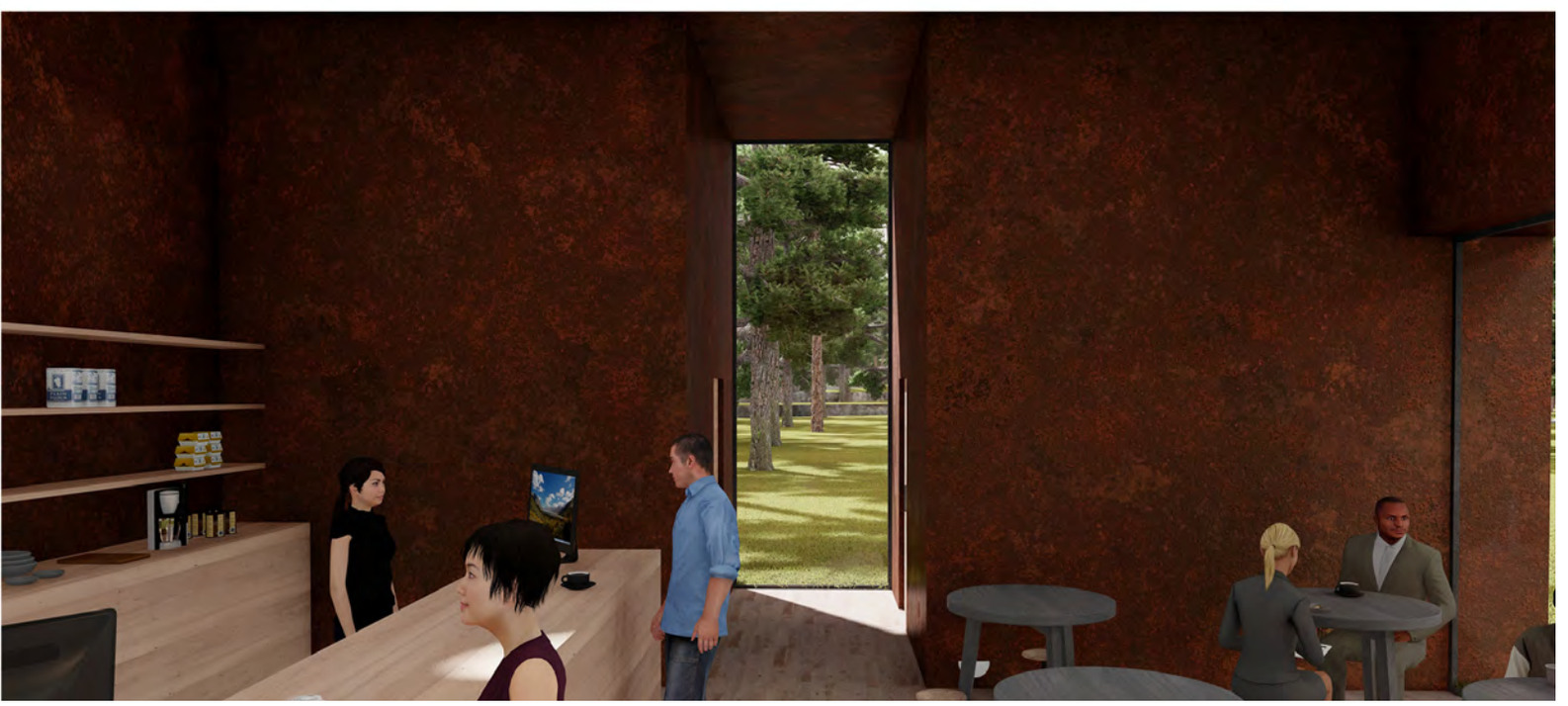
The library and café

The library and study rooms were based on two metallic structures that existed on the south area. These looked like the starting structure of any building, but they were just a compilation of beams and floors housing machines that could not be identified. So, I decided to empty those structures and reuse them. They were very close to each other, but they were not connected; so, the only metallic structure that was added by me was to attach them to each other. The west structure had five floors, while the east had only three. Very quickly this became an issue, as the western structure was very narrow, and could not house standard vertical accesses. The solution was to locate the lifts in the middle section that was added to connect both structures, and since this connection was already very small, the addition of the elevators transformed it into a transition corridor. The stairs were built inside and around the western part, and their path was continuous, something that allowed an interesting result. They were located on a different corner on each floor. Besides the fact that this allowed me to avoid the typical stairwell, the different locations for the stairs made every floor be different, even if their plan was very similar. Since there was no need for more vertical accesses, the bathrooms were designed on the eastern section on the first and third floor.

The entrance in the building is made through the northwest corner, where there's a reception. A big study room is located on the east section, where we can also find the corridor that leads to the bathrooms. To make the corridor a little less claustrophobic, a window was opened on its end from the first to the last floor to light it up. From the second floor upwards, the building follows one simple rule: the eastern section was always constituted by study rooms, while the western and narrower one would have shelves for books, always having a desk by the big window where people can also work. On the fourth floor, I designed a rooftop where people could go and work outside. The western section always shares the same plan to the top floor. And the only difference that occurs from one floor to another is the location of the desk by the window. Since I didn't want those workers to be distracted by the people going up and down the stairs, the desk is always on the window contrary to the staircase exit, as seen in the axonometry.

101 - View to the outside from inside the cafe

102 - Cafe’s interior



103 - Cafe’s Vertical window

The cafe was designed on a small concrete structure that, like the previous, houses some unidentified machinery. The strategy was the exact same, to clear it and reuse the existing structure, transforming it into a building. The structure was very small, so the result is a very simple solution, but I considered it worthy of rehabilitation because of the skylights that were already there, which reminded me of the skylights created by the fans on the forced draft coolers. The communication between these two objects made sense to me. The café is constituted by a small room fronted by the service counter. The southeast corner was occupied by the kitchen, while the west section has the public bathrooms. The cafe most iconic moment, besides the skylights, is the window in the end of the corridor that leads to the bathrooms. This opening can be seen from the cafe's main room, and the fact that it is overlooking directly into the Atlantic Park, almost transforms it into some sort of realistic painting. The outside design was made to resemble the libraries, as the two buildings are very close to each other.

Both the library and the cafe are rehabilitated with the same materials, and the same construction rules as the previous described building, since I wanted all proposals to maintain a certain architectural uniformity.

Final Remarks

This dissertation, along with the work developed by my classmates, was centered on the urban reuse of big industrial complexes, as well as the social-economic aspects of the areas in which they are settled. The economic benefits of Leça da Palmeira's Refinery are undeniable, but the cease of its activity is leaving a big and poorly located industrial complex behind. The growth of Leça da Palmeira was always limited due to presence of the refinery, so with its deactivation an opportunity will arise to incorporate and transform it into a new urbanization.

The objective was to create a new and contemporary city model, that would respond to both the difficulties that were presented by Covid-19 in the last two years and the abandonment of large industrial complexes. At the same time, the new urbanization would have to fuse itself into the surrounding area. On a more particular note, the refinery is a big part of the area's economic development, so it was important to us to maintain work and productivity as part of the new city. Therefore, the class proposed strategies that promoted self-sustaining residential blocks as well as cultural, leisure and work-related ones, a new network of roads and accesses, the introduction of new lines for public transportation, most importantly the continuation of Porto's Metro line, and the development of a new Atlantic and Postindustrial Park.

On this specific paper, it was highlighted the research on reusing structures impossible to reconvert or too expensive to recycle, introduction of public spaces in industrial complexes and the (re) naturalization of the foreshore. The design looked to create a new and innovative landscape, one that could become a model of study for Postindustrial parks in the future.

To conclude this dissertation, I would like to refer that the development of the city "Cabo do Mundo 21" is mostly an academic work, but in which strategies and guidelines were by far the most important segment of our class proposal. Not only did we create a new city model that could be looked at by any urban plan in the future, but we also specifically responded to the problems of Matosinho's expansion after the refinery ends its activity. On December 21st, 2020, galp announced that the refinery would no longer be refining crude. On December 28th, just a week later, the first news of our work appeared on the Portuguese online newspaper Público, and later the national television news segment on RTP (Radio e Televisão de Portugal). More recently, 16th February 2022, the municipality of Matosinhos announced that it was confirmed that the refinery's area would start its conversion into "an innovation district, a solution integrated, sat on a "urban ecosystem, social and environmentally sustainable", which foresees commerce and services, hospitality, restaurants and bars, industry 5.0, habitation, cultural and leisure equipment, and a green park." ("um Innovation District, uma solução integrada, assente num "ecossistema urbano, social e ambientalmente sustentável", que prevê comércio e serviços, hotelaria, restauração, indústria 5.0, habitação, equipamentos culturais e de lazer, e um parque verde."). This is a very interesting development, as any of the class's dissertations could have this exact phrase on it. It seems clear that our research anticipated some of the actual situation; a phenomenon that will surely happen in other geographies and urban cultures. I am glad I could have the chance to contribute for this kind of design-based research.

[9] "Galp, Município de Matosinhos e CCDR-N estudam soluções para os terrenos da Petrogal" https://www.cm-matosinhos.pt/servicos-municipais/comunicacao-e-imagem/noticias/noticia/nova-cidade-vai-nascer-na-antiga-refinaria (acessed June 21st, 2022)

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Image source

All links were acessed lastly on July 10th

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42 - Google earth (edited by author)
43 - https://commons.wikimedia.org/wiki/File:Cidade_do_Porto_com_a_Ponte_P%C3%AAnsil,_meados_do_s%C3%A9culo_XIX.png
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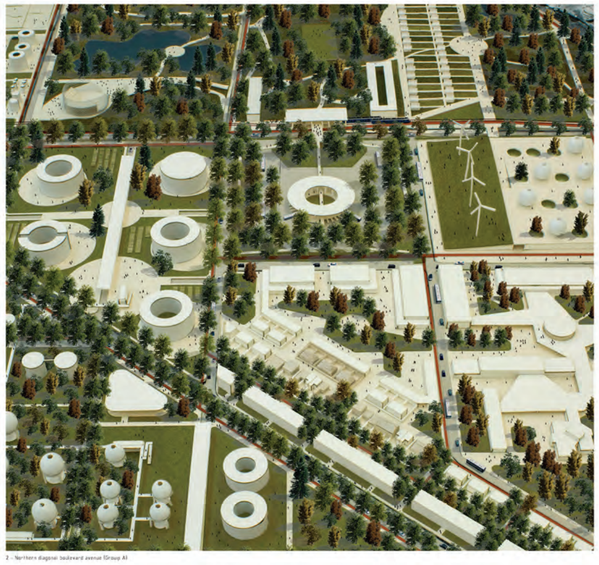
49 - Provided by Câmara Municipal de Matosinhos
50 and 51 - Data compiled and drawn by the class
52, 53, 54 and 55 - Drawn by the class
56, 57, 58, 59, 60 and 61 - Photographs taken and edited by the class
62 - Plan by the class
63 - Plan by the group
64, 65, 66, 67, 68 and 69 - Developed by the author
70, 71, 72, 73, 74 and 75 - Google earth
76 to 103 - Developed by the author

Class proposal for the new city on Matosinhos's Refinery
Graphic Scale 250 Meters



2 – Northern diagonal boulevard avenue (Group A)

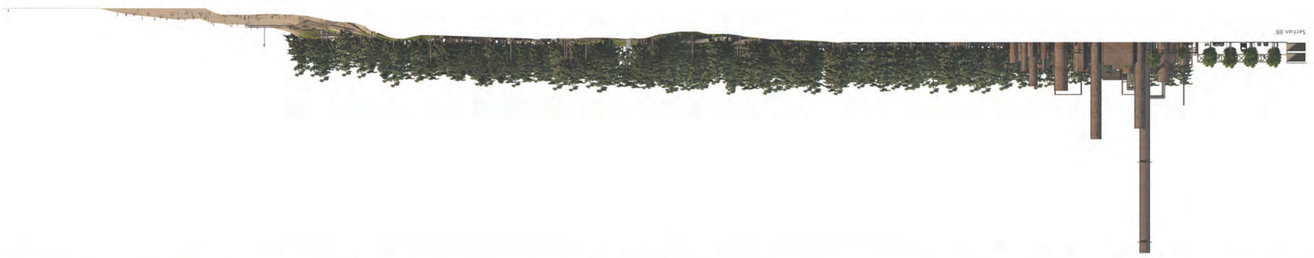
3 – Atlantic Park, Northwest view (Group A)

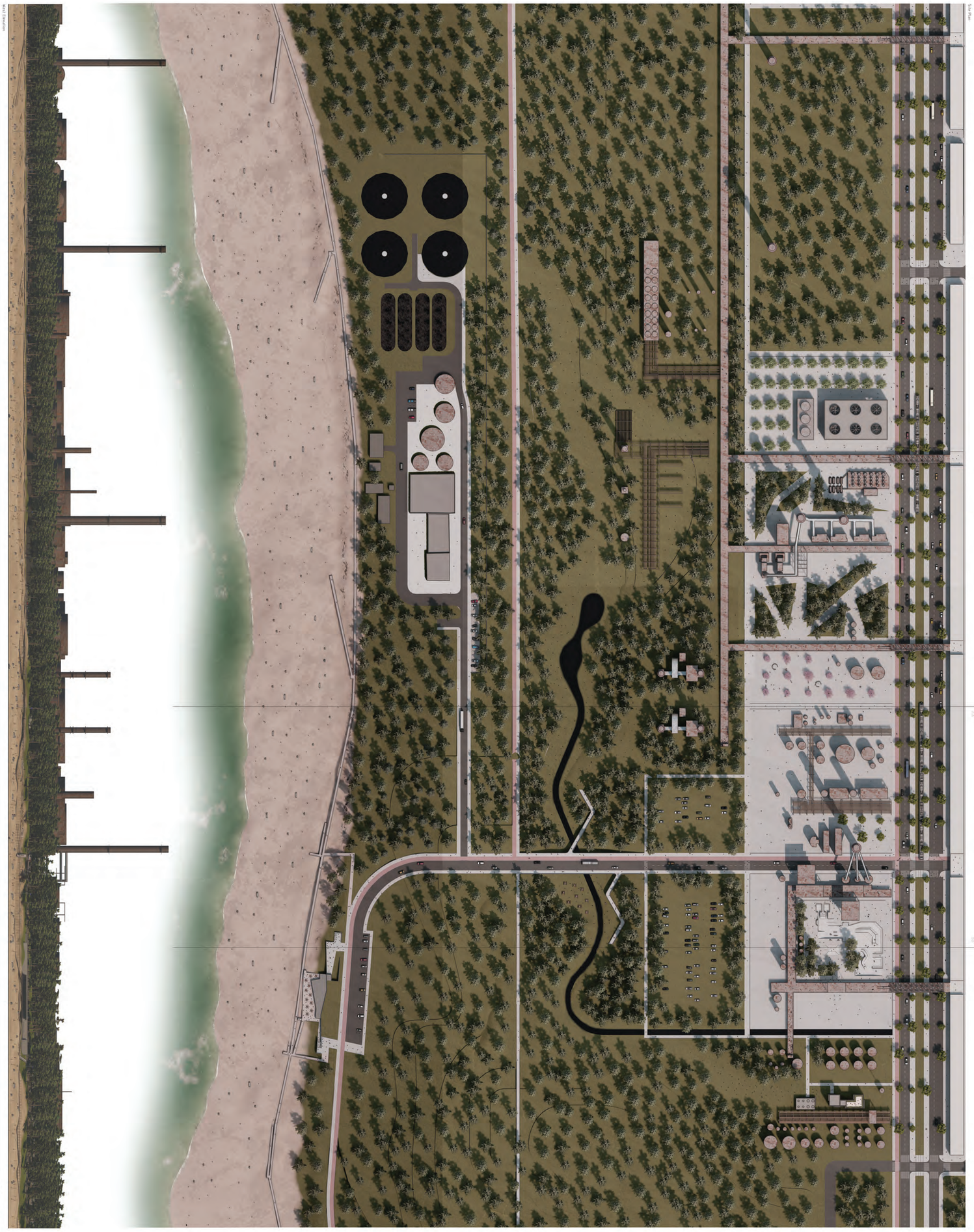
4 – Farmers' market and public spaces (Group B)

5 – Boulevard avenue and reconverted oil tanks (Group B)

6 – Atlantic Forest and south beachfront (Group C)

7 – Reconverted oil tanks (Group C)





Section AA'

East Elevation

Scale 1:500 @ A1 size

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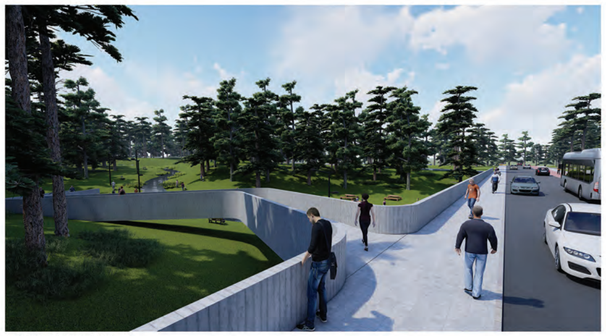
Z

1 - Boulevard crossing walkways built on old pipeline structures

4 - Boulevard Avenue

8 - Skatepark square (east)



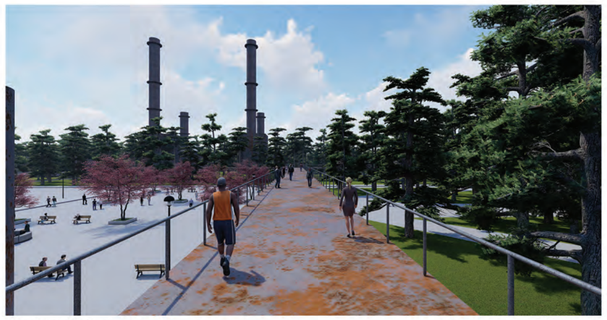
11 - Road and view to the park over the bridge

2 - Industrial area of the blossom square (Pipelines left untouched)

5 - Atlantic park square

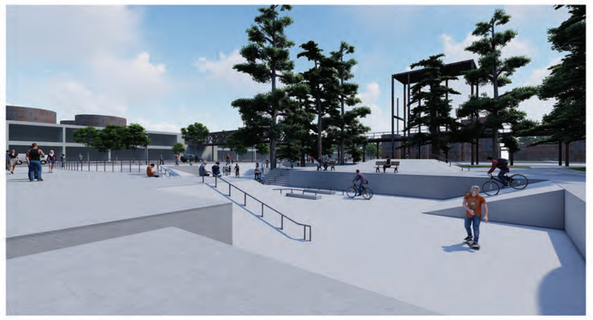
9 - Middle of the Skatepark

12 - General view of the bridge along with the new waterline

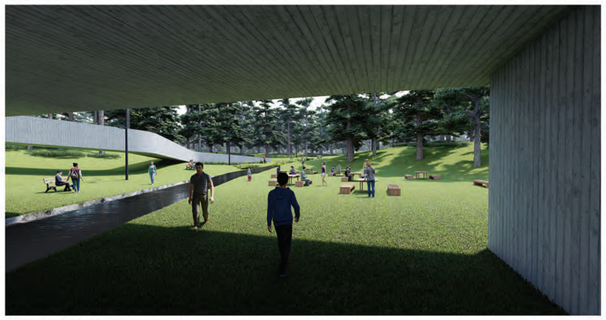


3 - Walkway built on old pipeline structures

7 - Blossom square

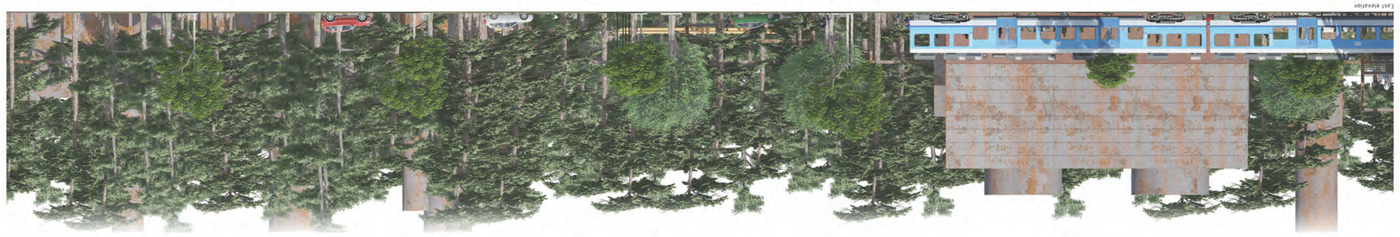


10 - Skatepark square (west)



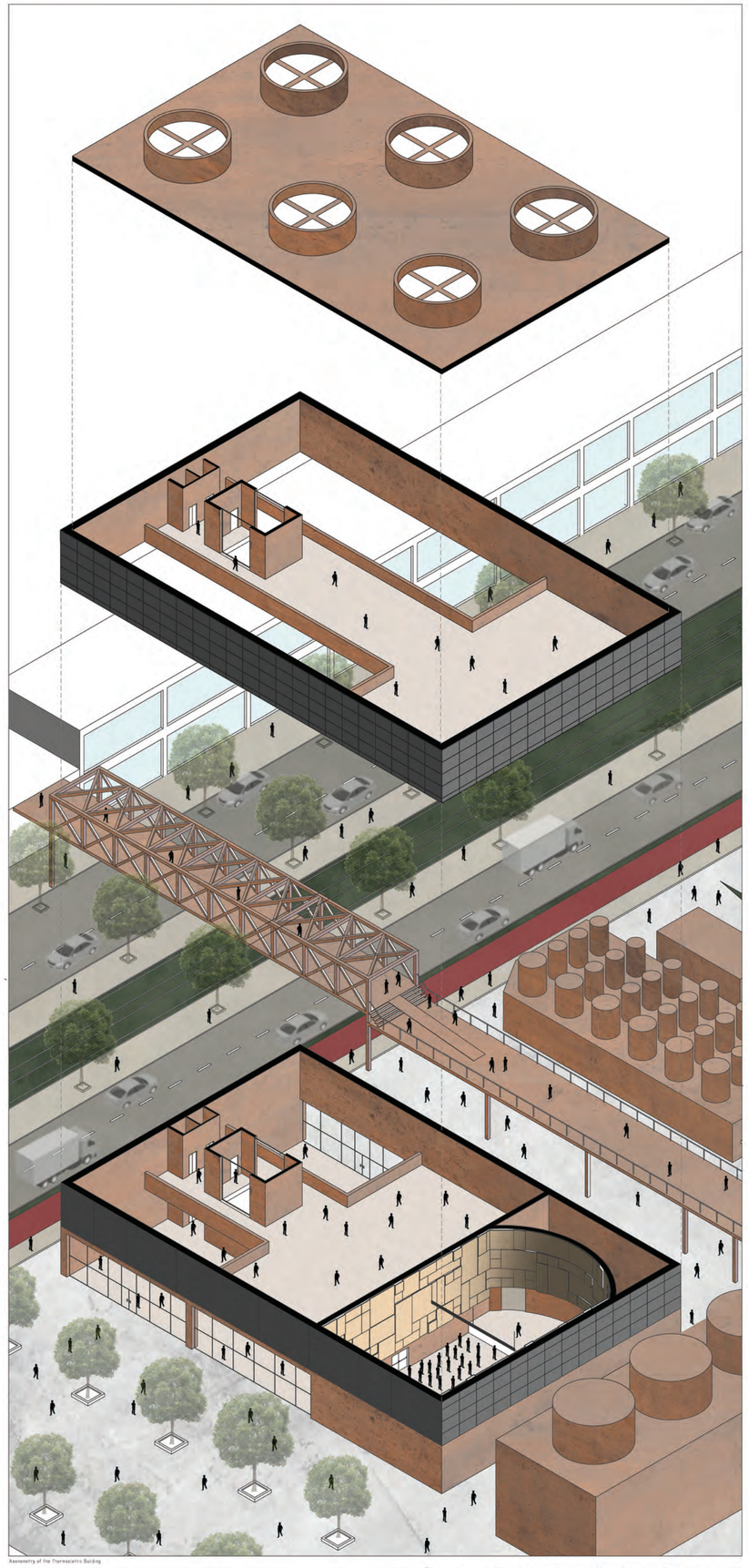
13 - Valley and park viewed from under the bridge

14 - Beachfront view of the Atlantic Park



Plan

Section BB'



Axonometry of the Thermoelectric Building

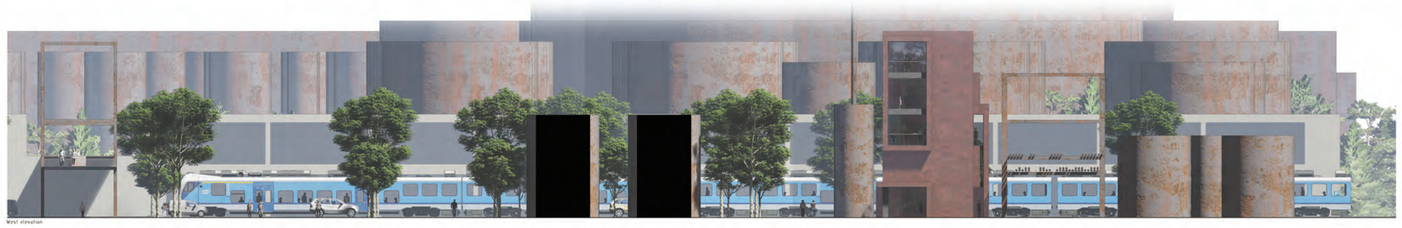
Scale 1:200

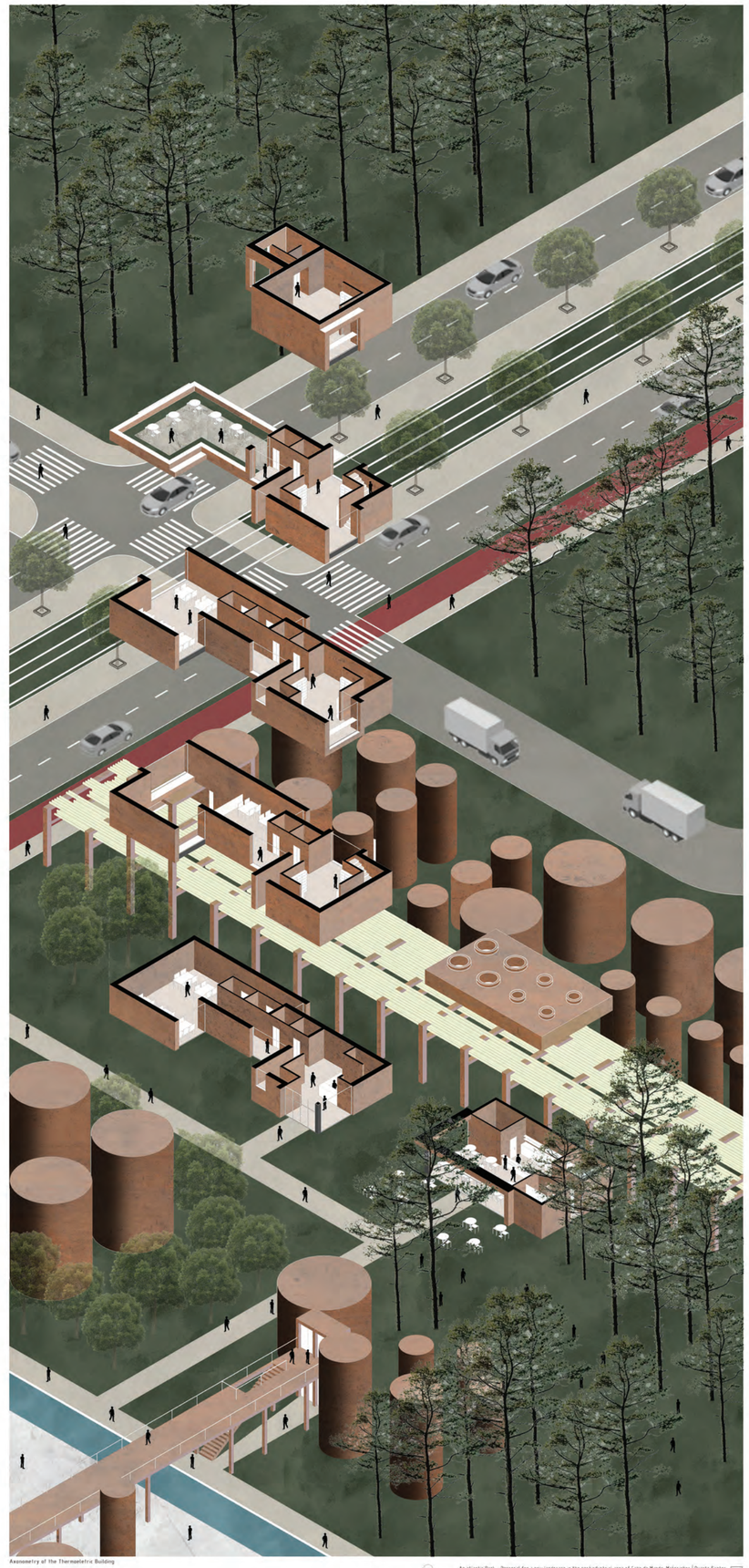
East elevation

North Elevation

Plan

West elevation





Axonometry of the Thermoeletric Building

Scale 1:200

An atlantic Park - Proposal for a new landscape in the post-industrial area of Casa do Mundo, Matosinhos | Duarte Santos
Plans, sections and axonometry of the proposal. Reconverted structures into a library and a café.

1 - South Foyer (ticket and information stand side)

2 - North Foyer (Concert hall entrance side)

8 - Book room on the library

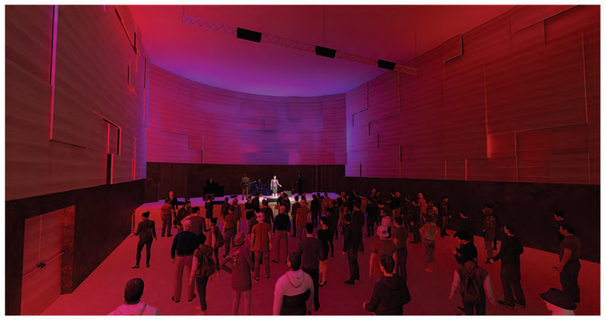
11 - Cafe's vertical window

3 - Exhibition room, second floor

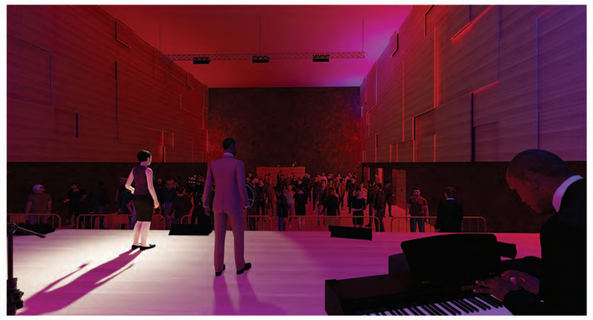
4 - Exhibition room, third floor

9 - Study rooms on the first and second floor

12 - Cafe's interior



5 - Concert hall (audience view)



6 - Concert hall (Stage view)

10 - Terrace on the fourth floor of the library

13 - View to the outside from the cafe

7 - External view of the Thermoelectric cooling building

14 - View of the Cafe and library from the street