Urban Project in Santa Apolónia Riverfront

Spatial continuities as regenerative processes

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Index

List of Figures

Acknowledgment

I would like to take this opportunity to first and foremost
thank God for being my strength and guide;
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All the teacher that contributed to my education at técnico;
To my parents for all the love, support, and patience:
To the Erasmus community for this opportunity;

Thanks a lot for your efforts, they are highly appreciated

Abstract

This thesis investigates and proposes a development plan for the Santa Apolonia area located in Lisbon, the capital of Portugal. The development plan involves the area extending between the Santa Apolonia train station and the Xabregas suburb. With the urban expansion of the city of Lisbon, necessity dictates the development of underdeveloped district as that discussed by this thesis. The conversion of the Xabregas suburb into an industrial area lead to its isolation from the main urban fabric of the city of Lisbon. The task of developing this area into an urban zone that has high connectivity to the capital is challenging but nonetheless essential. Many obstacles present today in this region make this project nontrivial. The lack of urban infrastructure in this study zone in addition to the separation of this region by a highway and railway tracks are elements of the problem addressed by this thesis. These problems will be addressed and proper solution will be suggested within this development project. Infrastructure is a collective term for the systems and space of flows that provide the services of the city, such as transportation, water, energy, information, communication, and public spaces including green parks. Recently, there has been a strong focus on the architectural renewal of stations, bridges and terminals, but less emphasis on how these infrastructure systems interact with their local tissues. Spaces of flow can be studied using space syntax, which provide strategic and evidence-based consulting services in economics, planning, design, transportation and property development.

Keywords: Axial-map, continuity, layering, dynamic, space-flow

FIG 01: Lisbon from Almada engraving by Lieut. Col. Robert Batty, Moon, Boys, and Graves, London, 1832

Chapter 1. Introduction

1.1 Theme Framework and Objectives

This project aims at creating a development plan that employs different strategies that target different aspects of the project. These strategies are based upon solid parameters that are defined by the limitations and possibilities of the region at which the project will be built. Using depth map one can draw the axial map of the city of Lisbon. From which the elements, such as architectural and urban details, of the design proposed can be accessible to the public and the importance of such project is justified. In addition, the depth maps facilitate the design process substantially by illustrating the optimal choices regarding space, orientation, possible routes, and transportation terminals. All of this information is displayed in the analytical axial maps.

The analysis and development of this architectural project focus upon the potential users. Thus, the design is oriented towards creating an attractive place to the public that have the potential to be one of the most popular locations in Lisbon. There are other factors that are considered as an inert advantage to the project. These factors are, but not exclusively limited to, a waterfront on the river Tejo, a premium location in perspective to the center of Lisbon, and a high accessibility by different means of transportation.

Starting with the first analytical map , the integration of axial lines is of particular interest to the searchers as it correlates well with the number of destinations found along the axial line. The homogeneity of the design to the surrounding environment is not only established by integration, through making sure that all possible locations within the built environment would be categorized by their visual relationship to other occupied spaces through a continuous map. Due to its providence, it wasn't hypothesis is that VGA would give a good indication of how people might interact with space of the project. Whether individuals are considered to be moving through it, standing, or generally occupying it. Secondly, connectivity measures the number of immediate neighbors that are directly connected to a space in the system that is a state local measure. This would give us a proof of the level of connectivity that the study area have with its surroundings.

1.2 Justification and Motivation

With the advancement of time the population of city of Lisbon increased leading to urban expansion of the city. The expansion of the city of Lisbon passed through different phases throughout time. Starting with the phase of the development of Alfama area to the more recent development of the area of Duarte Pacheco. The grid system development in the city of Lisbon is analyzed in this research to reach a complete understanding of the grid. Starting with transportation, communication, public spaces, gardens, social programs, and the recreational sector. In-depth analysis of all of the elements afore-mentioned is a requirement to obtain a clear assessment of the current situation in the area of intervention. Based upon this analysis, the proposal will be built to enhance all the factors of project success and to avoid possible factors that can hinder the effectiveness of the intended project.

The nature of the project location is unique due to its proximity to the city of Lisbon. This location, between the areas of Santa Apolonia and Xabregas, constitute the ultimate location for possible urban expansion of the city of Lisbon. The study will conduct first an analysis of the grid as a whole to understand the level of importance of the intervention area with respect to the city of Lisbon. Then the area is analyzed through layers that show the different components of the area such as infrastructure, public areas, parks, Gardens, transportation, mobility, built structure, and recreational sector. After the area evaluation, comes the reconstruction of the layers according to the compiled proposal.

FIG 02: Intervention area location in Lisbon city [17]

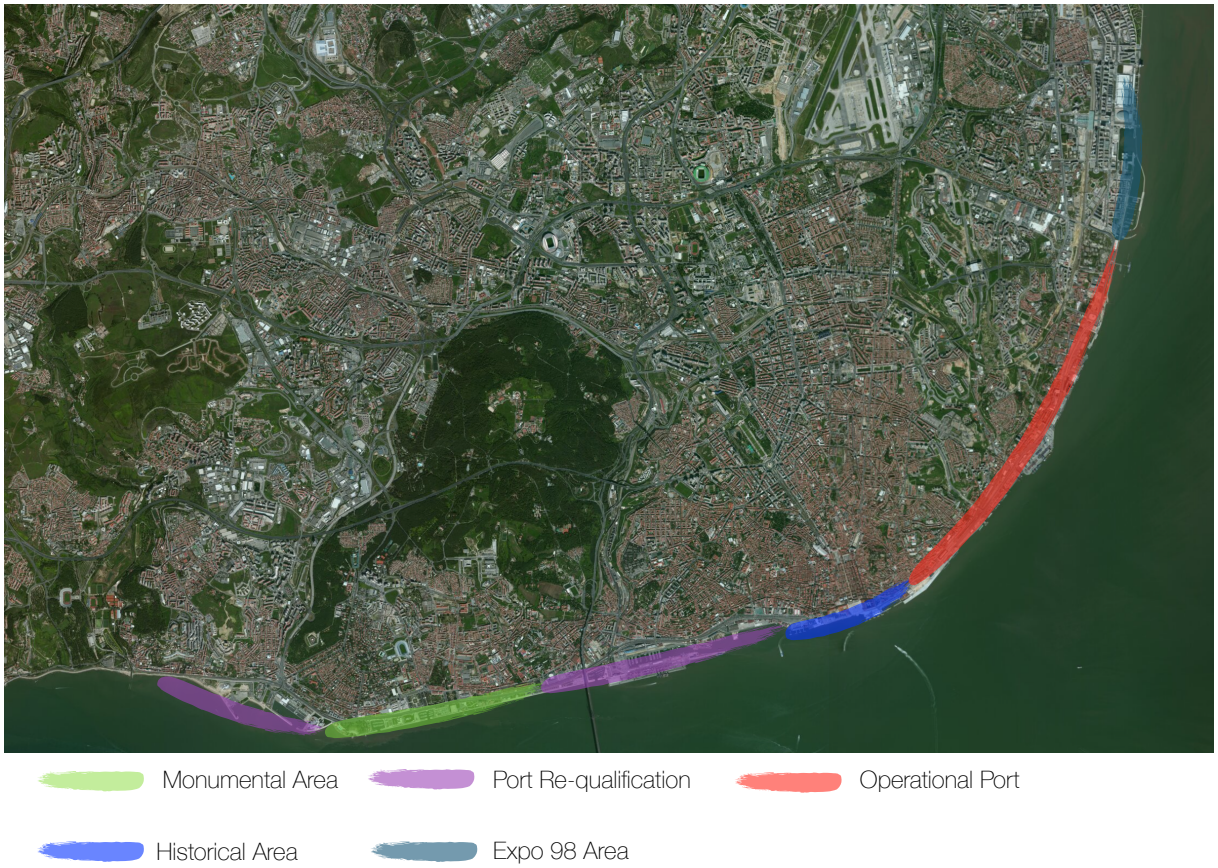

FIG 03: Lisbon waterfront classification [17] Paula Pacheco, City's Port Qualification, 43rd ISOCARP Congress 2007

1.3 Methodology

This report will be organized in three main sections. First section present the historical overview of the city of Lisbon. Followed by the analysis of the infrastructure using depth map. Finally, the design proposal of the area of intervention. The historical overview will consider the main development stages that the city of Lisbon has been through. This make us understand the city in chronological order. Also the influences that drives these major urban development stages, to be taken as an approach. The infrastructure would be divided into two parts. The first part is presented in broader perspective that includes the analysis of the grid infrastructure. The second part studies the area of intervention, to identify the arrangement of the various sectors of infrastructure to create an environment that would be highly favored by the city's inhabitants.

After analyzing the grid as a whole. It would be compared to the other factors that defined the city such as topography, history, connectivity, and integration. This analysis will lead to conclusive understanding of the project-area present situation. Then, design proposal will be formulated based on the analysis results obtained. The proposal starts by an overall reconfiguration of the area and all the way up to reconstructing the main components. The design proposal is optimized to wards the renewal of the area and all of its components to deliver a modern design. This design aims at building and including services for instance transportation, water, energy, information, and communication. Also, the design will have an emphasis of recreational facilities as public spaces, gardens, and other recreational sectors.

Finally, the results of the design proposal project are presented and discussed in detail. The discussion will treat the results according to the rearrangement of the intervention area while focusing on the physical artifacts of the network. The discussion will address architectural renewal of the stations, bridges, and terminals. In addition, the degree of the infrastructure system's homogeneity with the local urban tissue is argued.

Chapter 2. Analysis

2.1 **Location**

The study area is located at the eastern bank of Lisbon city waterfront of the Tejo River. The site's surrounding, environment, and natural boundaries causes it to take a linear pattern. Specially, the terrain plays a big role in determining the linear extension of the river side. Urban conditions and their relation with the coast is demonstrated by the urban shape which shows the way the city relates, gets and incorporates it into its own structure. By the existent uses in the transition between the continuous urban element and the linear aspect of the coast, with some singular elements and also by the image of the water seen from the city and the city seen from the water [2]. The port transformation has a strong incidence in the design of the city, depending on the kind of intervention. An intervention on its infrastructures or a complete change of uses and re-understanding of the relationships between the consolidated city and the waterfront. Known examples are Boston, for the infrastructures, and Lisbon or Rotterdam for the relationships. The perception and understanding of the city from the water leads to the creation of public spaces by exploiting the physical and visual connectivity and by reinforcing the urban axis connecting to the waterfront.

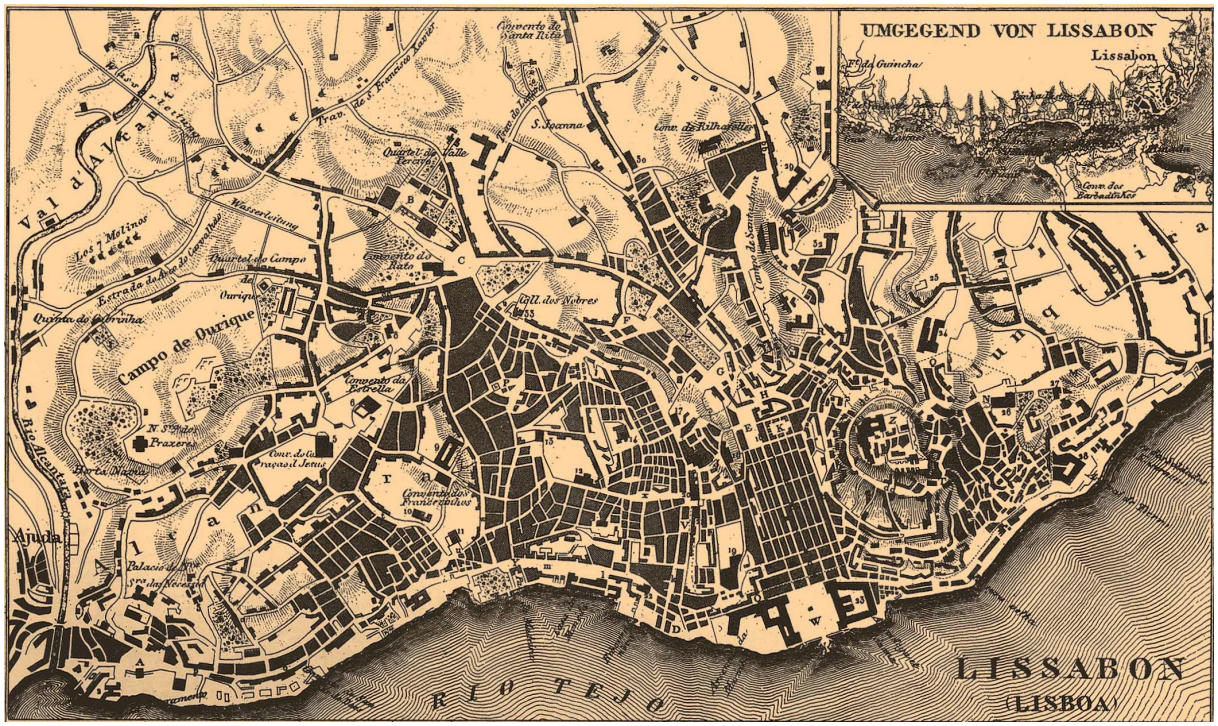

FIG 04: Illustration from Brockhaus and Efron Encyclopedic Dictionary (1890—1907)

2.2 **Historical Overview**

Lisbon city was first found on the hill overlooking the Tajo River, which was more like an amphitheater looking over the main activities of the city connected with the river. This primary settlement was revolutionized throughout the coming centuries starting from Phoenicians. Setting the city on the hill side was a strategic approach for defensive reasons. The expansion of the city made it extend beyond the hills to reach the low banks of the land and the main streams of the topography. This extension lasted till the earthquake, where the city went through major changes in planning and infrastructure innovation. These changes have some influences from other European cities but it was applied with new set of rules. From here we can see a clear pattern difference in the planning grids. Mainly that was due to their application throughout different periods of time. First, the organic grid that was adapted and modified since the beginning of the city, afterward came the strict grid planning of Baixa Chiado that followed the earthquake. Between these two periods and after was a set of grids that combined the orthogonal gird planning and the organic which we can be seen in Bairro Alto. Finally, ending up with the 20th century planning of Duarte Pacheco who was a mayor, minister, engineer and urban planner. All these eras of the urban planning of Lisbon created different infrastructure and space flow networks that was developed in various situations and influences. The aim of this historical overview is to know the reasons behind these planning strategies, which will be analyzed as one entity to reach a conclusion of the evolution of the grid system in Lisbon.

FIG 05: Topographic Map of Lisbon defining Infrastructural outlines [17]

2.3 **Infrastructure and Topography**

City girds are highly affected by the land topography, as seen in Lisbon the topography acted as a limiting element in this city. During the several levels of urban development we can see the different grids starting from Alfama to the latest one done by Duarte Pacheco. The organic patterns were applied for the topographic land nature, while the flat lands and river banks inherited the straight or more orthogonal system to be more functional and accessible. This will give us an idea about the suitable extension that must be applied for the area. The waterfront now is more developed at the western side of Lisbon, while the eastern part is neglected. Here, the topography also plays a big role in this condition. Due to the Alfama hill side, the eastern part of Lisbon is not see as much as the main western part of the river front. Narrow passages from Praca de Comercio make it also less accessible. The only solution is land reclamation at the eastern side of the Praca de Comercio which will give more visual interaction and bigger accessibility to this side. However, this is where the project area start with Santa Aplolonia station. With a narrow flat land to a more abroad flat land at the further extension of this area.

FIG 06: Structural Integration Produced with Depth-map, 2013, evidence by design workshop, Institute Superior Técnico Source: Produces by Author

FIG 07: Structural Connectivity Produced with Depth-map 2013, evidence by design workshop, Institute Superior Técnico Source: Produces by Author

2.4 **Evidence-based Design**

Space Syntax provides strategic, evidence-based consulting services in economics, planning, design, transport and property development. Combining extensive global experience with robust and sophisticated technologies, we forecast the effects of planning and design decisions on the movement and interaction of people in buildings and urban areas. Space Syntax's unique contribution to the field of urban planning and design is in the identification of fundamental links between spatial layout and the social, economic and environmental performance of places [8].

Throughout this analysis. the grid system of Lisbon will be put into the text, to be able to know which main axis are the most active. The studied area is just a part of the city, space syntax can provide enough information and evidence concerning the infrastructure. Network connectivity and the level of integration is a design proof that can be used for the initial evaluation the level of importance of these lines for the city as a whole. This study is conducted using an advanced program along with simple and effective strategies. Due to the complexity of the city networks, this can be easily calculated using Depth map program. Grid system is a group of lines that have connection, which gives a specific meaning. Using different kinds of analysis schemes, ranging from macro to micro, an analysis of the position of the site to the whole surrounding can be reached. Then the in-site for the choice and depth to the cars approach from the main street to the surrounding.

These analysis can provide the proof to which the project infra-structure can be primary evaluated before the intervention. Also, it provides a big margin of possibilities where the connection and integration of the main axis of the project can be re-evaluated after the suggested modifications. That provides a mathematical proof of the importance of the studied sector of the city as will be shown in the analytic maps of the city structure. In this research, the layering of the city systems is part of the methodology, but initially the basic infrastructure will be examined first. Afterwards, the other layers of the city will be added to this primary information to have broader view of the intervention as a whole [7].

As shown in the maps, the level of integration of the city varies due to the level of intersecting roads that end up interacting with the same axial line. For example, as we see the main avenue of Almirante Reis, the studied region has a medium integration level which can be improved by either connecting it to more subdivided network or extending the line which can reach the Expo 98 area. Adding more subdivided network to the main axis can be problematic due to high possibility of traffic. This should be taken into consideration regarding the aspect of improving the existing infrastructure.

2.5 **Case Study (Cities and Grids in Search of New Paradigms)**

Due to global expansion of population, technologies and economies, there is a direct impact on the pattern and planning of urban forms. This impact translates as a high demand on new urban configurations and paradigms where there exist the potential of transforming the current urban models into new and highly innovative metropolitans. It is also essential to point that the demand is accelerated by the rapid increase in energy requirement and emerging urban culture within the borders of modern cities. The aforementioned factors, not exclusively, are driving cities around the globe to seek a new transformation model in which the city urban design is modified to meet the urgent requirements. Recent cities exhibit a number of models and paradigms, outlining as many as ten different approaches with no single dominance or exclusive form. These new grids are the reference models that new research into urban planning takes as its departure point. The aim of this case study discussion, is to explore new conditions of current urban forms with respect to the culture of sustainable city.

In the recent years, cities with geometrically regular urban design has been synonymous with the urban plans, as opposed to the organic plans of more rural arrangements. The geometrical order of regular grid allows for differentiation with equality. The development of the grid-plan city over time is a significant index of human societies and their urban history. In ancient times, city designs were built while holding the needs of aristocrats and tradesmen as the main requirement of the designs built. These designs were densely applied in the ancient Asian urban models in the east and in the Greek urban models also. These early models were upgraded to meet the increase either in population or to attained territory. These upgrades started as the organization of roman military camps and territory to the bastions built to control the country side in medieval Europe. Also, in United States of America, Thomas Jefferson drafted the land ordinance of 1785 that imposed a regular grid of land boundaries that extended westwards across the continent. In the 19th century, the grid plan was re-adopted in Europe for the rationalization of the emerging industrial cities [3].

Grid characteristics vary and the parameters guiding the dimensions and configuration are also vital. Municipal codes, regulations and by-laws differentiate among cities with distinct cultural contexts. Their manifestation as three-dimensional forms may differ significantly. The city's grid is on a continuous evolution which allows transformation over time. Mainly these

grids are made of sequence of blocks and streets, others are product of predominant infrastructure, as highways, railways or sub terrain transit system. This study of the city grids will be concentrated on how a reinterpretation of the grid might serve to integrate new waterfront with its interior.
City grids are categorized into six different types that are defined by the formal properties of each city grid. And the relation of these to their neighboring territories. This will give us further understanding of the grid variations and their effect on the urban environment.

· Accumulation city: different grids are developed and juxtaposed over time, this type of city has frequently occurred through history, commonly having separate and distinct sector (e.g. Turin, Montreal, San Francisco and Saint Petersburg). The succession of grids have been added together to form coherent, well organized wholes.
· Superimposed city: consists of an innovative grid superimposed on a traditional city, planned as a large extension resulting in the reduction of the role of the old center (e.g. Greek city of Miletus, Mexico City, New York, Barcelona and Milan).
· Discontinuous city: Separated sectors or fragments characterized by different grid systems, each designed to meet the needs of specific programmes, this will create individual neighborhoods with different identities, but not to act as a coherent whole (e.g. Trieste, Lisbon, Edinburgh, and Algiers).
· Infinite City: characterized by uninterrupted extension of the foundation grid. These grid systems are often found in Latin America (e.g. Santiago de Chile and Buenos Aires).
· Cellular City: A continuous whole formed by aggregated multiple complex of cells. In other words it can be described as a group of blocks organized into a cluster that is repetitively deployed (e.g. Brasilia, Savannah and Islamabad).
· City of different scale: cities that are highly affected by the infrastructure of traffic, public transport that was so dominant in the 20th century. Clear hierarchal system in their networks of streets and avenues (e.g. Houston, Seoul and Chandigarh).
The grid system in 21st century should be employed in a different direction since it can accommodate so much more. New paradigms might compromise multiple layers that act at territorial and urban scale. New projects that adapt this methodology can be observed. Few examples of project implementing revolutionary paradigms are, such as Zaha Hadid's One North Master-plan, Singapore (due for completion in 2021), Masdar City solid single grid in Abu Dhabi (completed in 2007) that was developed by Foster and Partners. These projects promote further examination of less obvious dimensions of cities that can enhance the use of grid in urban design and respond more efficiently to new urban cultures.

FIG 08: Buenos Aires, defined as 'infinity grid' as the foundation grid extension spread.

FIG 09: San Francisco, California different grids are developed over time, example of 'Accumulative city'

FIG 10: Barcelona, Spain example for 'superimposed city'. Innovative global grid over the traditional city & reduce the role of old center.

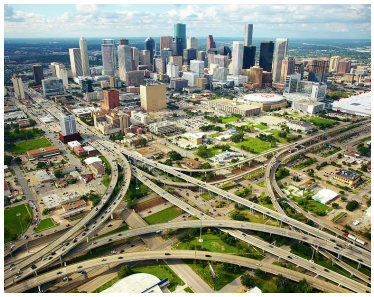

FIG 11: Houston, Texas. Clear hierarchal system in their networks of streets and avenues.

FIG 12: Edinburgh, Scotland example of 'disconnected city', individual neighborhoods with different identities.

FIG 13: Savannah, Georgia blocks organized into a cluster that is repetitively deployed as example of the 'cellular city'

In the quest of the search of new paradigm, the grid system of the future should have a number of specifications that will provide cities with flexible grids that can nourish their growth and demanded expansion. The following characteristics of the future grids should be:

- Being a device of re-naturalization.
- The ability to respect and improve environmental conditions.
- Sensitivity towards the needs and instrumentalizing its adaptation.
- Act as framework of the evolution of architecture over time.
- Create a change in the use of public spaces.
- Aware of the lifestyle changes due to technological advancement.
- Flexibility and choice of future cities, where sustainability, reproduction and recycle is a must.
- Bridge the gap between urban fragments that are created by infrastructure.
- Able to create a sustainable compact city, with the continuity and connectivity of old traditional urban infrastructure, and green spaces, forming new networks and innovative city systems [3].

2.5.1 Redefine the Edge

The case study is an extended study that shows the relation between city grid and its boarders. The discussed aspects of the variation of city grids in the previous section are developed by the same person who projected this proposal of redefining the edge of New York City (NYC) waterfront which will provide an accurate example of how to connect the projected proposal to its contact and have the maximum effectiveness on the city as a whole. Manhattan in NYC is a different type of grid from Lisbon, but the aim is identical.

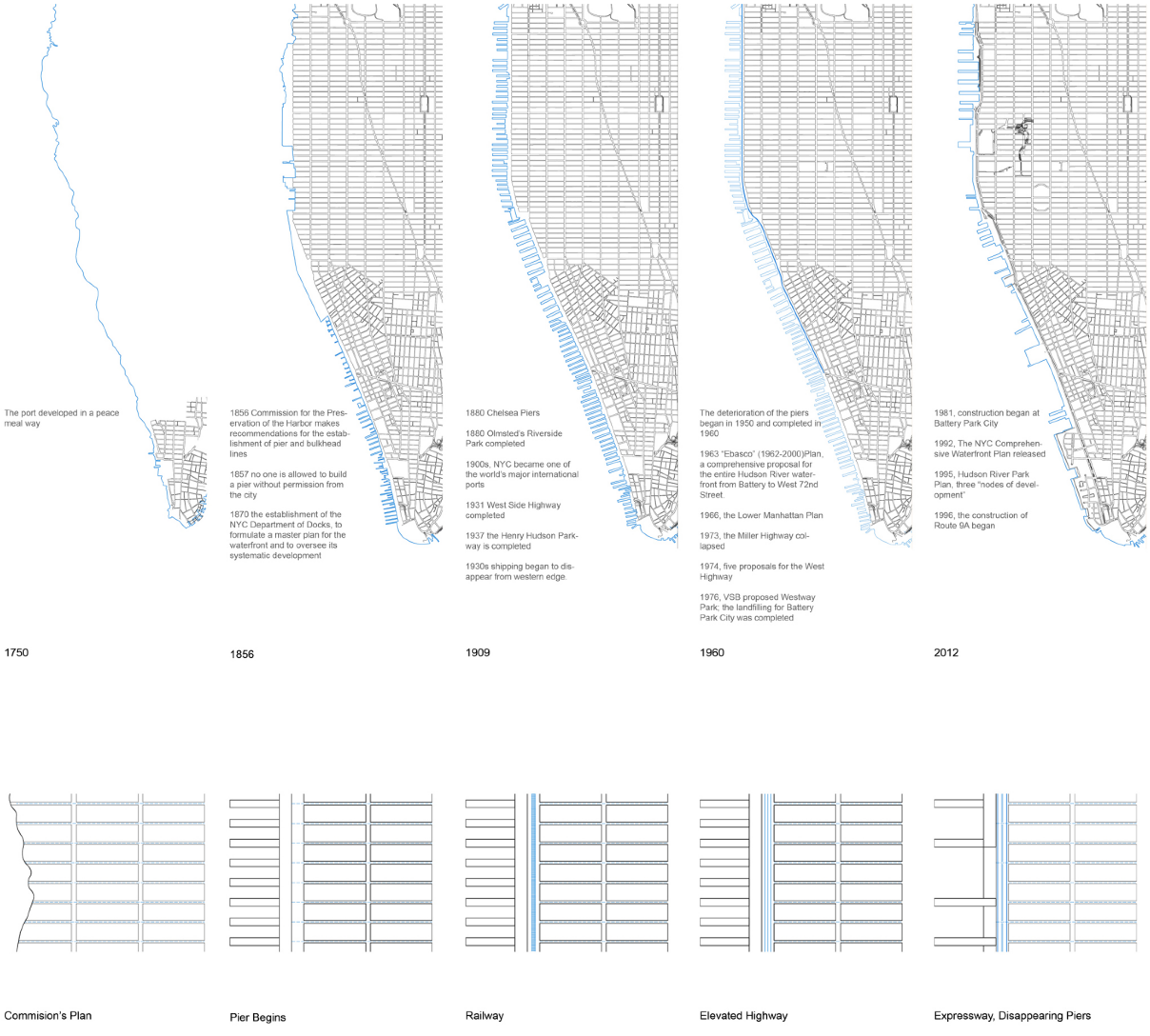

FIG 14: Historical Evolution of the Manhattan West Waterfront [16]

This proposal is developed by Joan Busquets in collaboration with Yi Tu, and the type of this project is an urban design option studio.

The changes that occurred to Manhattan's western edge is similar to what is occurring at the port of Santa Apolonia in Lisbon. Where the area is experiencing an identity crisis, due to the transformation of these districts through time. Several schemes have been proposed to the western waterfront of Manhattan city, although these project were successful in some ways, they have some constraints. The main problem was that their project didn't establish a strong system that can interact with city's interior to produce a connection of programs. As in Santa Apolonia, the Port of Manhattan witnessed the prosperity of the island during industrial age, which made it one of the largest ports in the world. Meanwhile, the diversity between the island and its port, which the island was subjected to a heavy commissioner plan, but the ending of this grid didn't reach the water front due to the chipping industry. Also, the circulation of roads and railway made it impossible for citizens of Manhattan to enjoy the waterfront. With all these similarities that the western port of Manhattan share with the discussed proposal of Santa Apolonia, the proposal comes in handy with the grid analysis that is developed in this report [2].

2.5.2 New Integrated Waterfront

Learning from the previous projects by understanding both their success and constraints, we try to propose a new west-side waterfront that is well organized as a holistic system and adapted to the waterfront environment. For the time being, it is also strongly connected to the city interior physically and programmatically. By analyzing the current programs of both waterfront and city interior, we re-define the west-side waterfront as an integrated system with a series of program segments from north to south including events center, commercial zone, terminal and service center, entertainment complex and institutions, while the rest will be developed as public waterfront parks [16].

FIG 15: Creation of a new identity for the Manhattan post-industrial [16]

2.5.3 Groundlab's approach towards landscape and infrastructure

The proposal of Jiading District of Shanghai is showing a ground ecologies master plan, that seeks the existing 300 x 300 meter super-block to transform it into new 500-hectare mixed used development. This complex will host up to 25,000 workers and 200,000 inhabitants. existing layout is fragmented patches that fails to produce a Homogeneous fabric, and also cant generate enough differentiation and a sense of identity within its community. This case study proposal is seeking to to address this problem, and the understanding of the loss of the human scale within the Chinese cities. Therefore the methodology used in this project is to bridge down the gap, between the large scale of domesticity of the typical Chinese urban villages, and the monumental scale of the super-blocks produced by the large-scale highway system. Soil remediation and water treatment systems are use to create intermediate ground. artificial topography is used to unify the site together, and provide diversity through a global integrated urban system. existing industrial areas are located using a map to define the areas of potential source of pollution. throughout this map the artificial topography will be formed according to this map, to minimize the impact of the polluting sources. A strategy for the digging and capping of an artificial topography in the form of elongated mounds and ponds oriented towards the general summer wind direction, while blocking those from the north in winter. The basics of the special proposal is formed by these new topographies, by breaking down the primary vehicular system that superimposing a large scale. In addition a secondary roads are branched out of the main flow to augment local circulation, and create a system canal to enhance and reduce the effect of storm water.

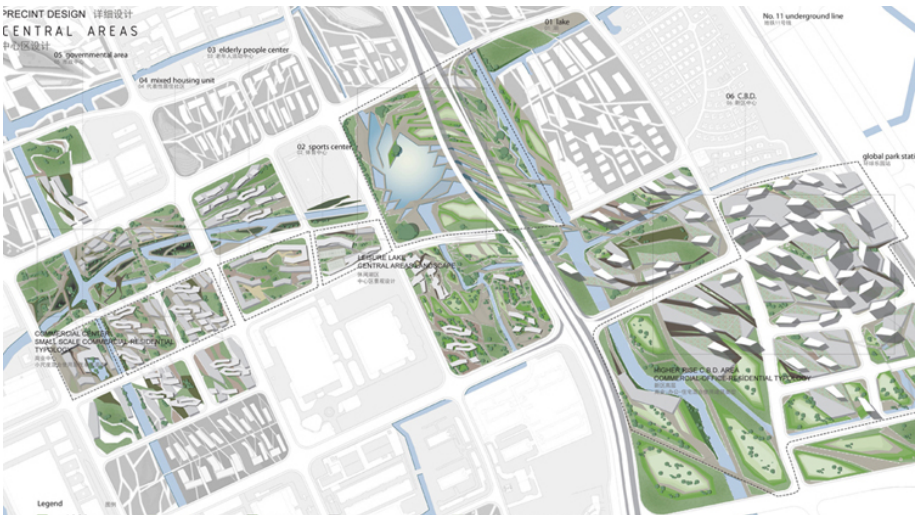

FIG 16: Ground Ecologies, Jaiding District, Shanghai, China, Groundlab 2010

Chapter 3. Diagnosis of the Problem

3.1 **Structure of Existing Port**

As mentioned before, the main issues in this area are various, these are the causes of area degradation. Starting with the segregation, train station current potion and rail path is a major issue. Since this area became a close accessible river side that can be modified for a better urban expansion and public service. Existing highway is also one of these factors, but this one is more manageable by limiting the speed and introduce pedestrian passage ways along the line. To complement this problem solving situation, the parallel street must be more accessible and the network should be dividing the traffic between these two streams. As for the train terminal, the more suitable solution for this problem, is to relocate the train station. This relocation will solve the problem of having a segregated are. At the same time the Santa Apolonia metro line should be extended, to have another station that provide access to the new relocated railway. Finally reaching the other end of this river side extension of Oriente metro station. These changes can reorganize the flow where the main problem is solved without excluding the function of the railway. The station will be unitized for a similar function which is the metro line and finally transforming the area to more pedestrian accessible platform. The grid of Lisbon is as classified before belong to the category of discontinuous city. Separated sectors or fragments characterized by different grid systems, each designed to meet the needs of specific programmes, this will create individual neighborhoods with different identities, but not to act as a coherent whole. As a conclusion of this analysis the area is at the edge of one fragment to create another, this defining factor of the grid might have disadvantage of not having a coherent whole. But otherwise there is a special identity that define each sector of the city, and this give the user the chance to experience more varieties in this city. Topography is acting as a separating elements that is prevent the continuity.

FIG 17: Existing situation of Santa Apolonia Grid Network Source: Produces by Author

FIG 18: Existing situation of Santa Apolonia Urban Morphology Source: Produces by Author

3.2 **Structure of pedestrians & accessibility level**

Other remaining barriers that degraded the evaluation of the whole area. Pedestrian access is the priority in this case study, where the terrain must be modified to facilitate the area to the pedestrian accessibility. As the railway station relocation and the underground is established. The new project program and functions will make this area a public and private service platform. Where the high density of urban morphologic settlements of the hills facing this project and Alfama can benefit from. Nevertheless, this area also can be accessible with the extension of the river side functions and continuity. The detailed project will be dedicated to present a start line of this extension as a public and private functions working together seamlessly. However, as the functions that are presented is equally accessed and servicing the two sectors of the public and private, it will be more homogenous. In this project, these modification's theories and methodologies must be tested to be proven, as it was carried on the gird networks as a whole.

The initial step of the project must be a grid analysis of the project area to understand its connection to the surrounding through the infrastructure. It is also critical to analyze the shape of the infrastructure to infer the city model. As mentioned before, the structure of the grid in city of Lisbon is a discontinuous city model. That indicates that the proposed project should overcome the obstacle of inhomogeneity in the grid structure that is imposed by different grids that serve different surrounding areas. The new grid suggested for this project will homogenize the area by connecting the project area to the surrounding areas, by providing the infrastructure for the pedestrians and by facilitating the completion of the river side of Lisbon as one complete unit. Thus, the aim behind this study is to have a more comprehensive view to the area of study with its surrounding. Connectivity and pedestrian accessibility should be provided equally to all different layers of infrastructure. Thus, having an area that is well connected with the whole city while maintaining its own identity. The introduced structure will be formed by this network to provide more priority to the structure, since it is the dominant element in this area. To provide maximum connectivity of the project area to other major parts of the city of Lisbon, the functionality of currently existing structures must change to a more urban oriented structures. Mainly, by providing more access from the surrounding sectors like Praca Do Comércio and Alfama area.

3.3 **Built structure & Mobility**

Morphologic density is another factor of the urban arrangement because the infrastructure only define the accessibility. The urban rules that has been set by municipality is the defining factor of the urban form. Heights of buildings and total investment ratio is what makes cities look different even with similar grids. As shown in the morphology map the site surrounding is a high density area with buildings heights that vary from 3, 4 to 10 and 12 stories buildings. However, the majority of the buildings are 4 to 5 stories buildings. Therefore, one of the defining factors of the project is to regulate the urban density. Countering the high density with more complex buildings to provide a more urban land for other recreational use. Currently, in the surroundings of the project area, there exists an area of high urban density that is accompanied by an area of low urban density. The area of low urban density mainly constitutes from the vast flat plane that is claimed by the railway and road structure. This gives the proposed project the opportunity to introduce a structural re-balancing of the area of intervention.

Infrastructure can be modified in a simple way, but to improve its quality, the pedestrian access must be maximized. It will be an infrastructure inside another infrastructure, the pedestrian network surrounded by the main streets. As mentioned before, the infrastructure priority will define the shape of the built structure suggested in the proposal. Concerning the mobility, the infrastructure of the roads and highways will be examined to determine the appropriate density with respect to the other structure present in this area. Pedestrian dominancy will be a goal to achieve in this area. The current station contains the metro station of Santa Apolonia which is the last terminal in the subway blue-line[F9] (Azul). Finally, concerning the present infrastructures provide a minimal mobility for pedestrians and provide inadequate access for other types of light transportation like bicycles.

3.4 **Study results**

Resolving the current situation of the urban formation of Santa Apolonia, requires a broad view of the area with all including layers. As the analysis started with a historical overview of the city and the area, followed by comparing the grid network variations with history and topography. And finally try to analyze this grid subjectively using depth-map to have an idea about the area's level of integration and connectivity. With all these information overlaid on top of each other we can form a complete image of the area. Specifying its strength and weaknesses including the threads and opportunities. The area is a possible future nourishing sector of Lisbon, due to its urban form of flat land that is narrow from one side and wider as the extension continues. Narrow access to this area is a weakness that should be treated, by rehabilitate the waterfront extension starting from Praca Do Comércio. With more possible accessibility for pedestrians to be able to visually explore the area before reaching it, and this gives the users the motive to be directed toward the area of intervention. Reaching the grid systems study and the project example of Manhattan that clarifies the role of grids and the interaction created by different types of grids. For Lisbon the grid is discontinuous, leaving each sectors of the city with a specific identity and program. Concluding from all previous information, the area should be reconnected to the surroundings' different sectors and programs. With the connection established, the stage of reforming the area of intervention main structures where the infrastructural dominance of major transport, makes this area less preferable to be inhibited by users. Design proposal will aim to redefine the structural balance of this area to be more user friendly. As well to introduce other structures as parks, green spaces and public facilities. Nevertheless, this area should be different from the other sectors of the city of Lisbon, which gives the city its special defining characteristic. The introduced built structure will be differentiated from Lisbon mainstream of construction tradition. Due to the high density of the neighboring areas, this intervention is trying to take advantage of this plane land, as an escape area for people to use as a public melting point. With the built structure that must be as much compact as possible to give priority for the public facilities. In the following parts of this report these different changes will be demonstrated on big scale, and another more detailed scale to present the different sectors of the area renovation.

Chapter 4. Proposal Discussion

4.1 **Strategy**

The proposed project will act as a catalyst for the urban quality, through the suggested functions that will make the area remarkably usable. Introducing the new reclaimed land of the railway to be unitized for the pedestrian flow and activities. Also, describing the new urban built fabric that will contain various functions. Starting with infrastructure of the metro station and continuation, to the more recreational sector and the green public area. In addition, the introduced program of a hostel that will act as a dividing element between the infrastructure and high accessibility to a more private and calm platform of greenery. In this chapter, the aim is only to re-identify the land uses in the intervention area. The proposal of the area will be divided into two parts, the first part is reformation of the structures that surround the area. The second part, is to define a more specific area that will be the starting point of the extension to push start the area integration and expansion. Urban growth is affected by the time span and needs by the users of the city. Therefore, the area of intervention will be from Santa Apolonia station that will be transformed, and the following reclaimed area by removing the railway that separate the area. This project presents instead the other functions that will serve as a catalyst for expansion.

4.2 **Reconstruction of urban systems**

Reconstructing the area arrangement of structures will define the base of the proposal, where weaknesses and threats will be removed. In addition, the possible opportunities and strength will be more focused on transforming the area to a better evaluation, as a more accessible and user friendly site. The following changes will be only schematic to clarify the two situations, before and after the analysis and case study. That aims for a better understanding of how the different grids work together as a coherent entity.

FIG 19: Pedestrian infrastructure reconstruction Source: Produces by Author

FIG 20: Roads Network & Metro infrastructure reconstruction Source: Produces by Author

FIG 21: Proposed new construction Source: Produces by Author

4.2.1 Pedestrians infrastructure reconstruction

The proposed project will aim to provide the basic infrastructure, and facilities for pedestrian safety. In the following figure the area that was superimposed by the railway is converted to a pedestrian accessible area. In addition to the station interior courtyard, that has been also converted to a public accessible place, where the entrances for the Santa Apolonia metro station underground. Moreover, the area next to the riverside across the road is also a double purpose area, where pedestrian access, cycling access and also a public green space are found. The other elements will be discussed in the other sectors of this thesis.

4.2.2 Mobility network reconstruction

In this section, the mobility that include both the road network, metro and railway structure. With respect to the road network, the reconstruction of this sector will aim to reduce the dominance of this infrastructure. That will deliver more space for the other structures like public spaces and gardens. Narrowing the roads and compacting its area will provide strength and weaknesses that will be reconsidered in the description of this proposal. Moreover, the transition of the railway station offers a larger area and lower segregation.

4.2.3 Proposed built infrastructure

The contrast in the project area is clear, as high density of urban settlements is opposed with the fast reclaimed area that contains less built structures. The aim of this project is to connect the project area with the surrounding while eliminating the segregation regions. In other words, the built structure will act as a barrier between the road network and the public areas. Green spaces and parks are protected by this build structure that is developed in a linear pattern to imitate the extension and the main infrastructures. The functions of these built structure conduct the function of residential, recreational and public building (congress center, car silo, shopping center, and hostel).

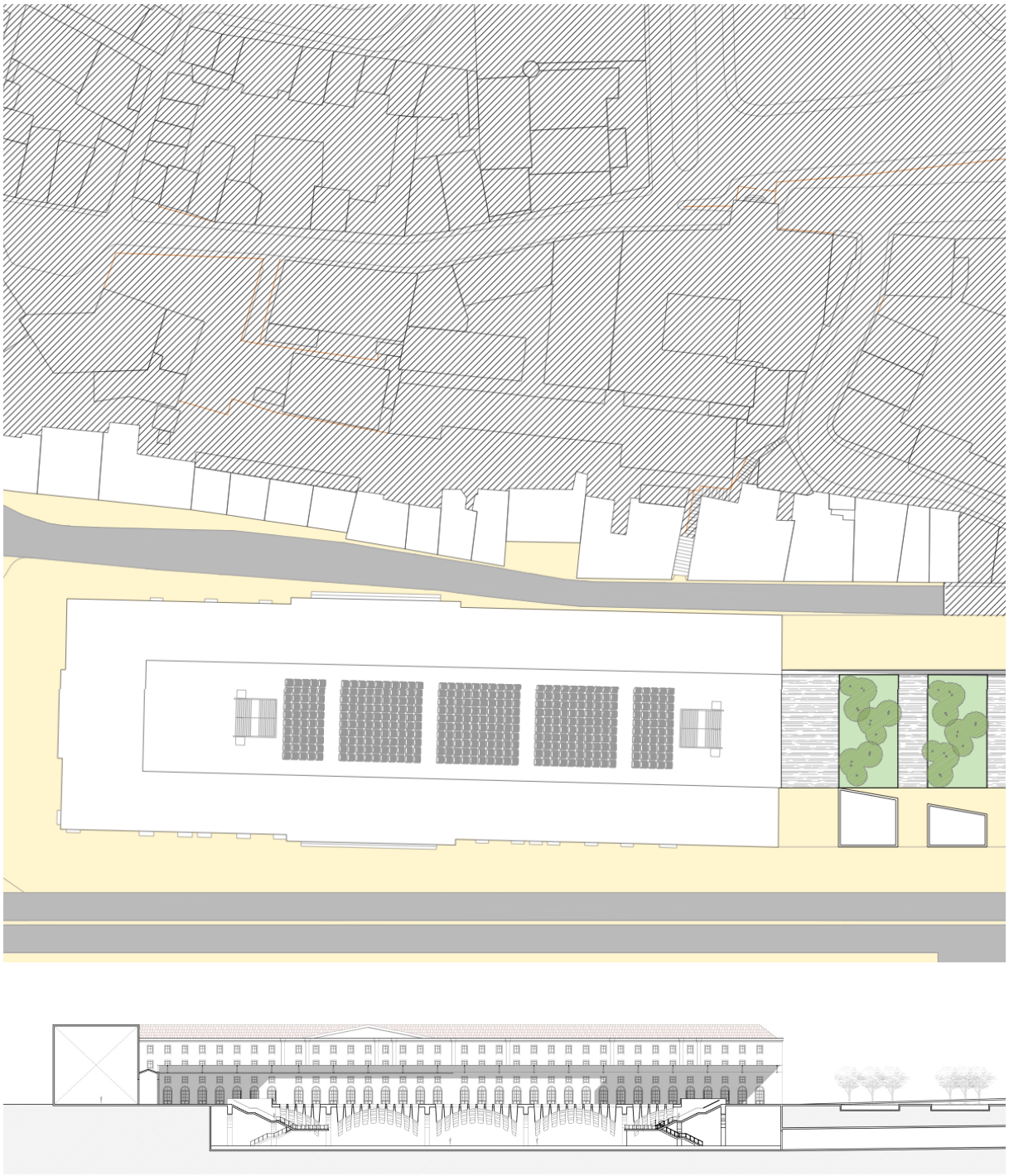

FIG 22: Santa Apolonia metro station renovation plan and section Source: Produces by Author

Chapter 5. Proposal Description

5.1 **Approach Santa Apolonia**

Santa Apolonia station is considered in this proposal as a starting point of solving the problem, and introducing new functions that serve the purpose of urban development of the area of interest. The railway removal is replaced by the metro line extension which will be reconnected with Orient metro station. In addition, another railway station will be proposed by relocating the existing station granting a higher connectivity for pedestrians in the area. The proposed Underground station of Santa Apolonia is also serving the same purpose by using the ground level for pedestrian access connected with stairs and elevators to the underground level. As shown in the section the location will be inside the existing station with a structure allows the propagation of natural light to the station. From this point the extension of the project begins, mobility, built structure and other infrastructures like pedestrian will be developed. The proposal overall is aiming to bridge the gap between the infrastructure isolation of this area. The factors that are implemented in this project are similar to those embedded within the city due to Lisbon's nature as a disconnected city. That indicates that each sector of the city it has its own characteristics and identity. The proposal is acting as a connection on the urban scale of Lisbon, at the same time the small architectural and sector scale. Each sector will have its own combination of functions and layouts. Finally, this proposed project will act as a coherent entity within the proposal and the context.

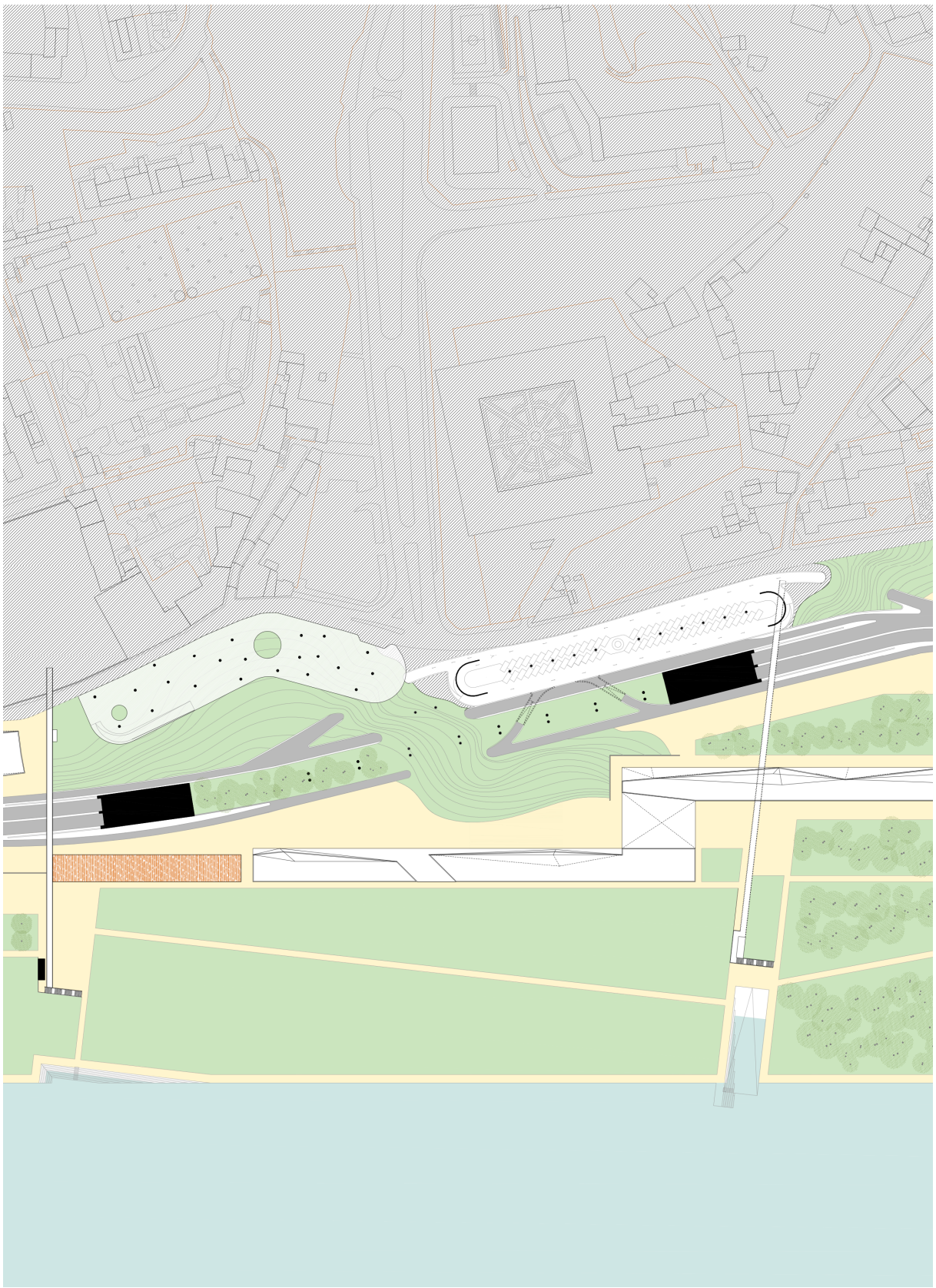

FIG 23: Public park and garden integrated with car silo and commercial platform Source: Produces by Author

5.2 **Public Park and Garden**

In the following section of the project the node of all networks, the segregation complexity of the problem are presented. The previous situation provided an overlapping functions that prevented continuity and connectivity. To serve the proposed structure, three different functions are presented in this section. Starting with the car silo that take advantage of the dead areas of this complexity, to be suited in the node of networks that take advantage of the problem to convert it to a solution. Where the access of cars are highly possible by the bridge relocation and the network extended from it. The road is transformed to be the entrances and exit points of this silo. As told before the aim of continuity is also taken into consideration in this section. The terrain of public accessible park is overlapping to provide safe continuous platform for pedestrians without interrupting the network serving the silo. Moreover, the difference in level of different regions in this area gives a third dimension denote of the project. The three leveled car silo was designed to reach the upper street. The left side of the car silo was exploited to propose another function of elevated market, which can be reached from the green platform beneath or from the street on the upper level. That constructs a shaded part of the park that can also be used as a recreational sector of the market. Direct pedestrian access is also provided by the bridges from two points that present an important sector of the context of the project. These two points are considered as monumental in this context. This will provide direct access to the public park, without interrupting the other networks of the project.

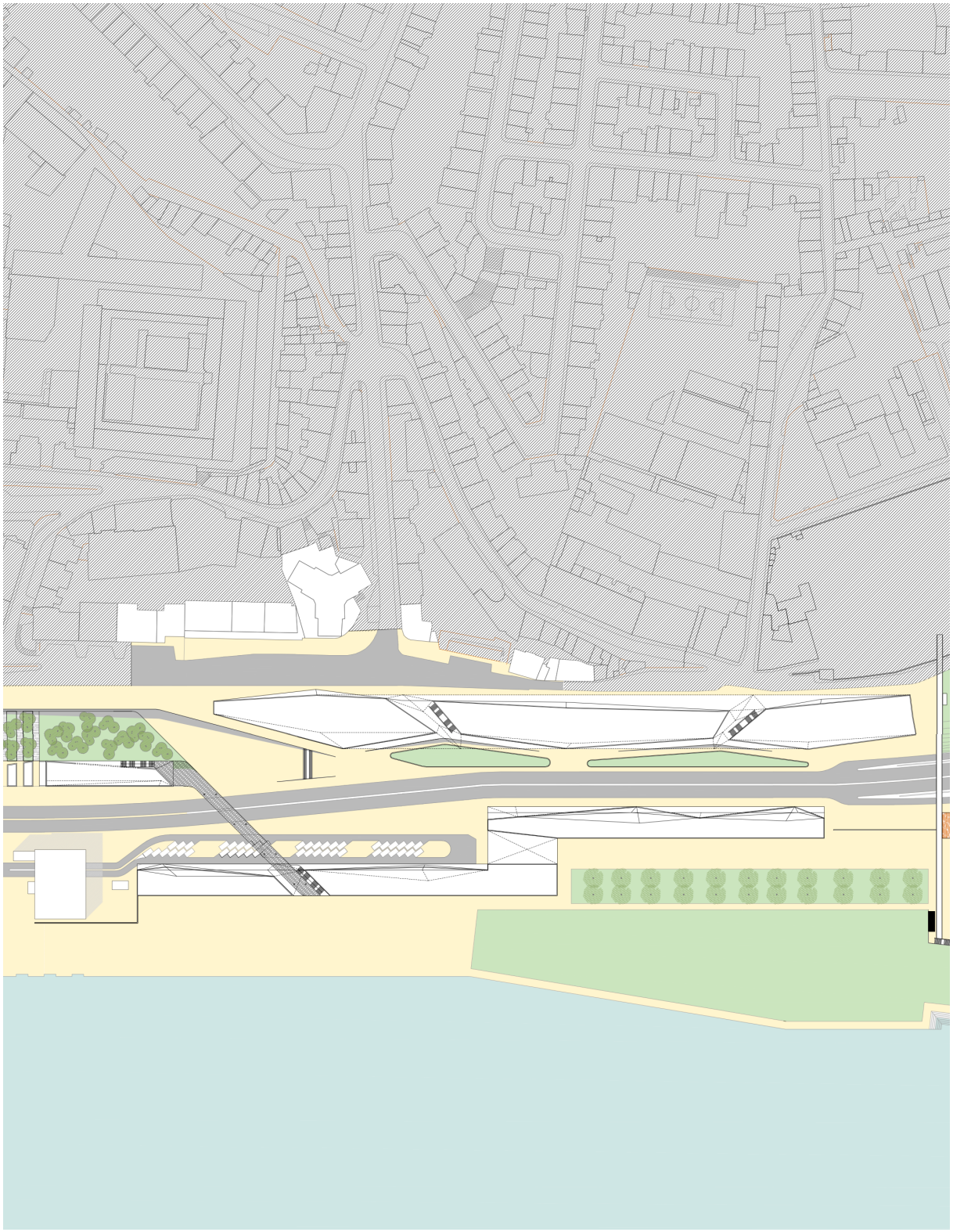

FIG 24: New Construction Proposal (Residential building & Hostel) Source: Produces by Author

5.3 **New construction Proposal**

Various functions are embedded in this area, residential, private and public service. In addition to the starting point of the park and green area, as the extension of the green area expands through the project with an interlocked network of pedestrian walk paths. The networks that provide main accessibility should form the architectural shape of the proposal. The main complex of residential building is formed by various axis of flow. The surrounding context and roads are considered as a flow of access. The three blocks are offering voids in the architectural form to make a joining line that connects the two platform. Visual exploration is a catalyst of movement in this project, as the VGA of the proposed built structure provide dead areas to be explored then transformed to a flow of network. The architectural form contain another purpose of providing an acoustic barrier and acts as a buffer zone for the other sectors. Facades are designed to envelope the contained function and minimize the impact that is produced by the surrounding infrastructure.

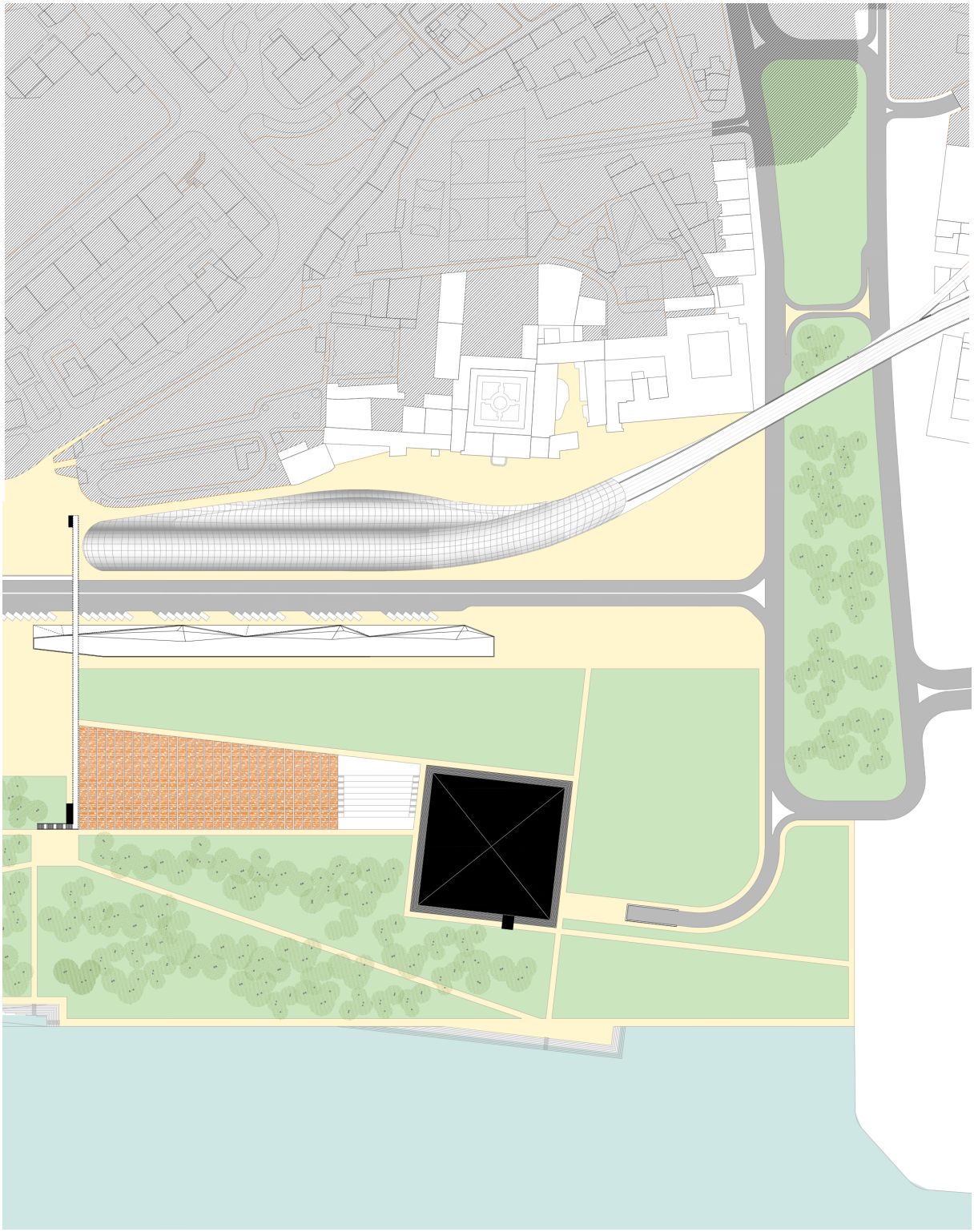

FIG 25: Proposed railway station relocation & Congress center Source: Produces by Author

5.4 **Metro-line Extension**

Railway relocation is a major change in this proposal, the metro extension facilitate this possibility. The proposed extension acts as a connection from Santa Apolonia to the proposed railway station, at the end of the project. This part of the project will have an identity that differentiate this area from its surrounding. The project starts by establishing a modern design of the new station, with a light weight structure. The light weight structure is mainly composed of metal structure and covering panels. The fore-mentioned structure is counterbalanced by the other building within the area that take a regular form. The congress center is imitating the main monumental building in its context. On the other hand, the station will adopt the other organic shape of infrastructure flow. Recreational functions are also present in this sector. The amphitheater that is located next to the congress center offers a better view over the area and to the adjacent park. The infrastructure of roads is modified in this section to deliver better flow of traffic with the node created at the end of the project. Pedestrian access is possible to this section throughout the extension of the project. And through the pedestrian bridge, that connects the railway station in the surrounding area to the park.

FIG 26: Urban Morphology & proposal reconstruction of infrastructures Source: Produces by Author

5.6 **Summary**

In conclusion, this project report delivers a proposed project of the development of the waterfront of the city of Lisbon located near the region of Santa Apolonia. The proposed project is constructed upon theories and facts deducted from the existing grid structures and from other urban development projects conducted in other cities around the globe. The first step in this project founded by conducting an analytic research of the history and all other factors that affect the development in this city. The next step constituted the process of proving the infrastructure effectiveness and integration possibility with the surrounding regions of the city of Lisbon. The final step was achieved by reviewing the grid system development through history and its characteristics. These steps were compiled afterwards to obtain a comprehensive over view of the requirements of the proposed projects and the expected outcomes.

This project aims to serve as a device of naturalization, by improving the city through connecting its waterfront as a coherent entity. The proposal of the project is aware of the changes that might happen in the future in this area. Taking the shape of the infrastructure flow, will allow its architectural evolution. Finally, trying to adapt with the context and bridge down the cap that was created by the existing heavy infrastructure. The proposed public park and recreational facilities will make this area more likely to be used by the city citizens. Thus, creating an improvement in the environmental conditions of the city of Lisbon. Innovative city system enables the production of a sustainable compact city by achieving continuity and connectivity with the old traditional infrastructure and green spaces.

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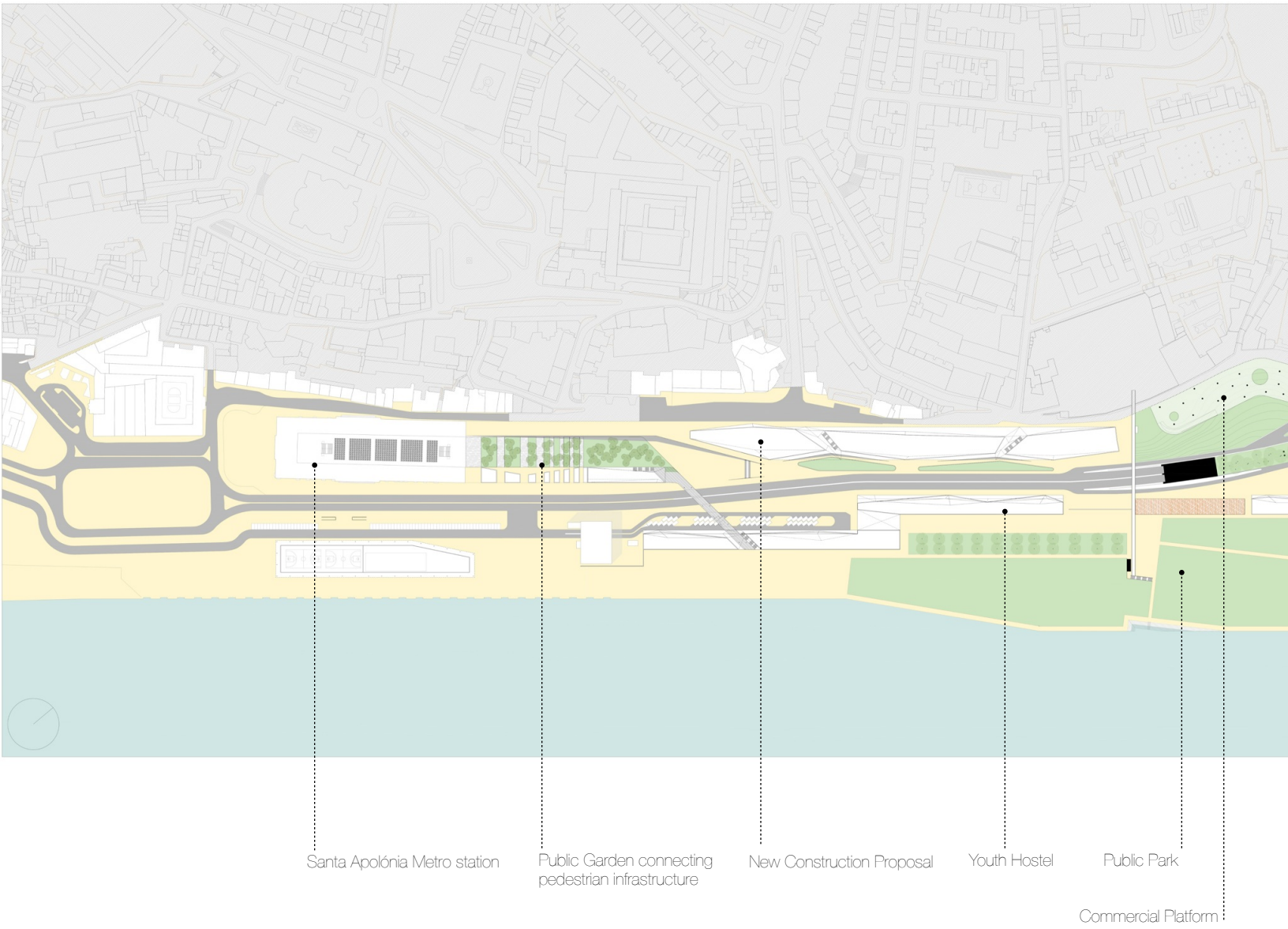
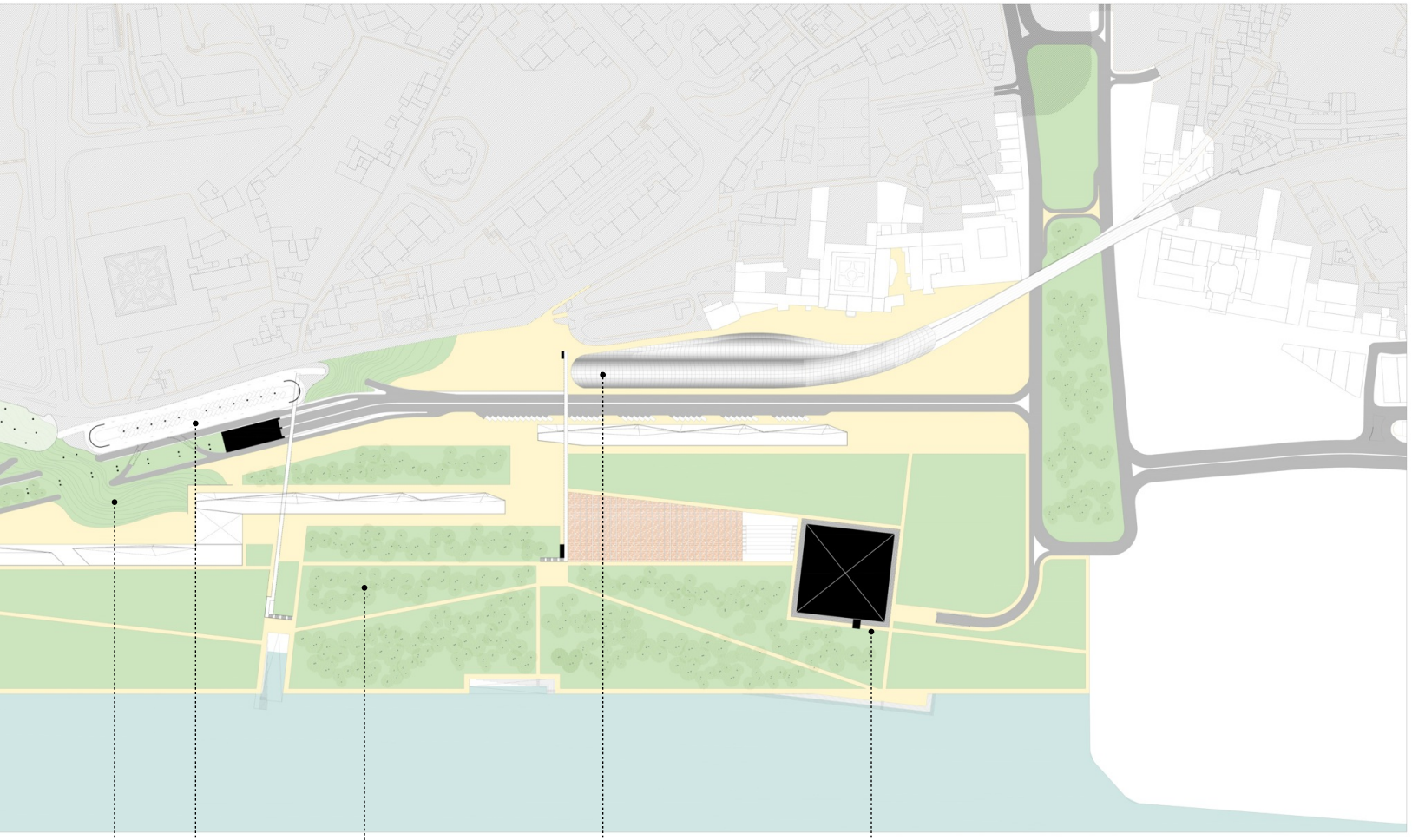
Chapter 7. Annexes

Urban Project
Santa Apolónia - Xabregas

Instituto Superior Técnico Department of Architecture Final Project Omar Abou Nada 77150 October 2014




Artificial Landscape
Car Silo
Public Garden connecting pedestrian infrastructure
New Railway station / Metro line extension
Congress Center