Landscape imagination:
Ecology and Industry

Designing a transition for the Port of Rotterdam into a productive landscape Park

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Regional strategy

Patches
Ecology, Ecosystem services and the natural capital
Landscape ecology
Green landscape infrastructure
Landscape urbanism

Corridors
Increasing economic uncertainties
Environmental degradation
Biodiversity loss

Nodes
Anticipate economic alternatives
Define, preserve industrial and cultural heritage
Remediate existing ecological damages
Promote biodviersity and ecological protection
Hypothesis

Process
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Strategic intervention

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1. Introduction

0.0.Introduction

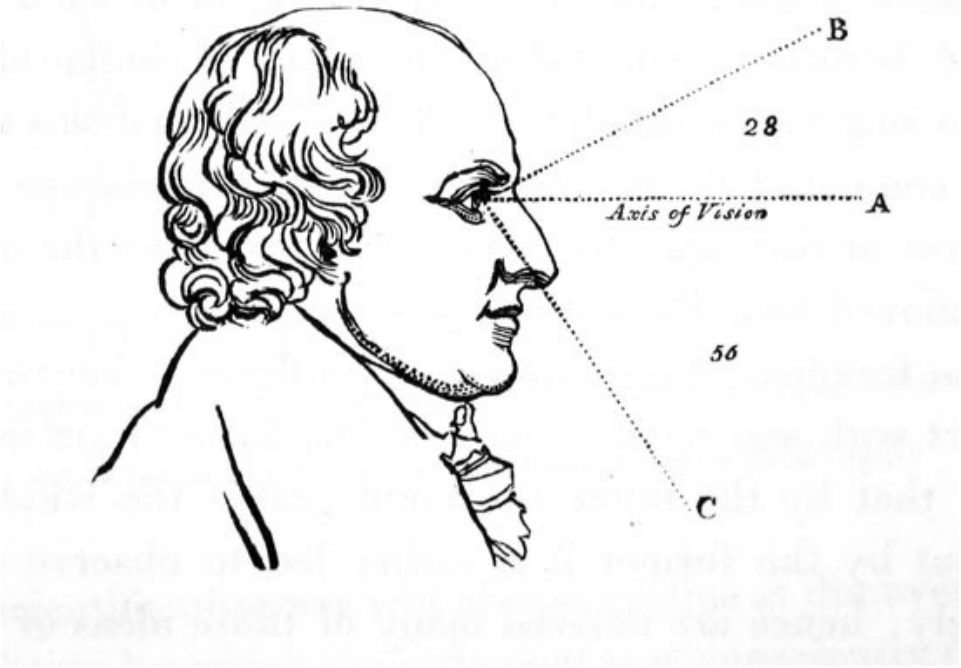
Personal motivation

The research project was initiated by a personal fascination with the domain of ecology and earth sciences. Followed by the start of my academic education in the Netherlands, I've noticed that the Dutch approach towards urbanism, spatial development and environment is slightly different than my previous background. The application of the holistic approach that puts different layers and meanings of territory and urban landscapes had a motivational effect in my studies.

At present, partly driven by the new climatic challenges facing the Low Lands, landscape is once again the focal point of societal debate. The new challenges for landscape are drawing renewed cultural attention. (OASE journal #93) As a reference, I would like to point out the Dutch layer approach, by which De Hoog, Sijmons en Verschuren (1998b: 78) "suggest to distinguish three 'layers' in the spatial organization of the Lowland: the layer of the substratum, the layer of the networks and the layer of the occupation pattern. Indeed, the three layers each with their own temporal dimensions, can be applied on national level as a part of strategical planning, or even on regional and municipality level.

On the other hand, lately the themes of productivity, the third industrial revolution and green and blue economies have never been more present in the academic fields of urbanism and architecture studies. For that reason in the first place I wanted to study the relations between ecology and economy. Since as a location of my project I decided to work in the biggest harbor and industrial landscape of Europe, the Port of Rotterdam, these two notions were fitting perfectly.

Inside the studio of Delta urbanism, an exploratory exercise inspired by the layer approach was conducted and the results showed me some interesting implications. The exercise was to map 3 different layers (the landscape, the infrastructure and the occupation) in three different time periods and three different scales. The most interesting shift, when todays situation is overlayed with the situation of 100 years ago. Complete territorial change is visible and completely unrecognizable. In this way my exploration developed. I wanted to know


B
28
Axis of Vision
A
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C

1.1.Context of the project

Port of Rotterdam

The port of Rotterdam is a 40 km long terminal located at the confluence of two mega-systems, the Holland's North Sea zone and the Rhine Maas Delta. This favorable geographical location allowed the port to be the connection between the faraway locations from the "Russian oilfields to the Suez Canal, to China, to Brazil and the Panama Canal" passing trough the hinterland and the German Ruhr district. (Steenhuis 2015)

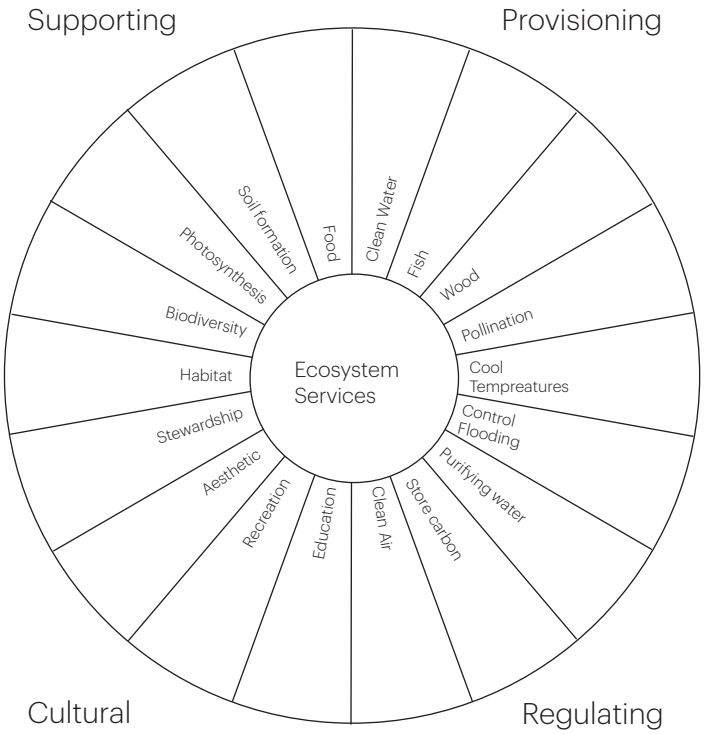
From the fishing markets in the 15th century, to the petro-chemical industries in the 20th century, the world class port, port of Rotterdam "is one of the most important junctions for the trade of goods in the world, and an international logistics hub. (Wurpel, Akker van den et al. 2013) Furthermore this trade based mainly on fossil fuels, "provide a constant basis underlying Rotterdam's growth, and more than half of the throughput today is based on oil and oil products." (Wurpel, Akker van den et al. 2013)

The port of Rotterdam is the biggest port in Europe, and is currently being expanded with the Maasvlakte 2 area. Due to the nature and size of activities that take place in the port of Rotterdam and the hinterland, it unmistakably impacts the environment. (Boer & Verbraak, 2010)

Fig. X.Y.
Rotterdam region landscape formation in 1925

Fig. X.Y.
Rotterdam region landscape formation in 2015 (red fill are the dredged areas and red outline and grey fill are landfill areas)

1.2.Theoretical Framework

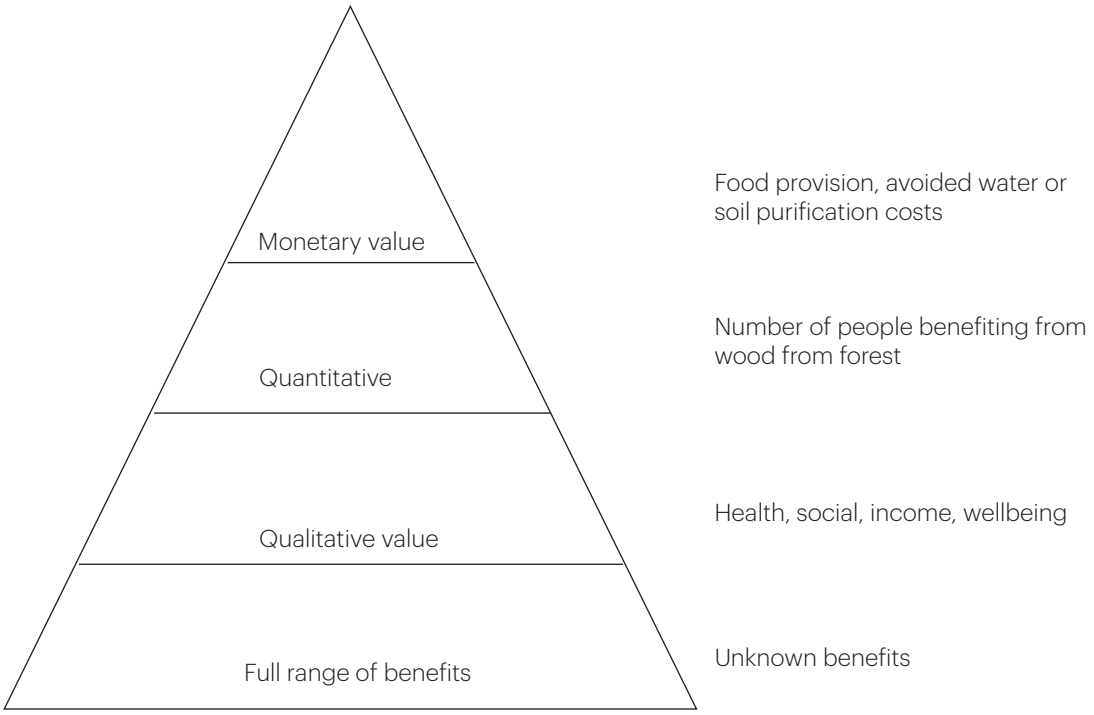


Ecology, Ecosystem Services and the Natural Capital

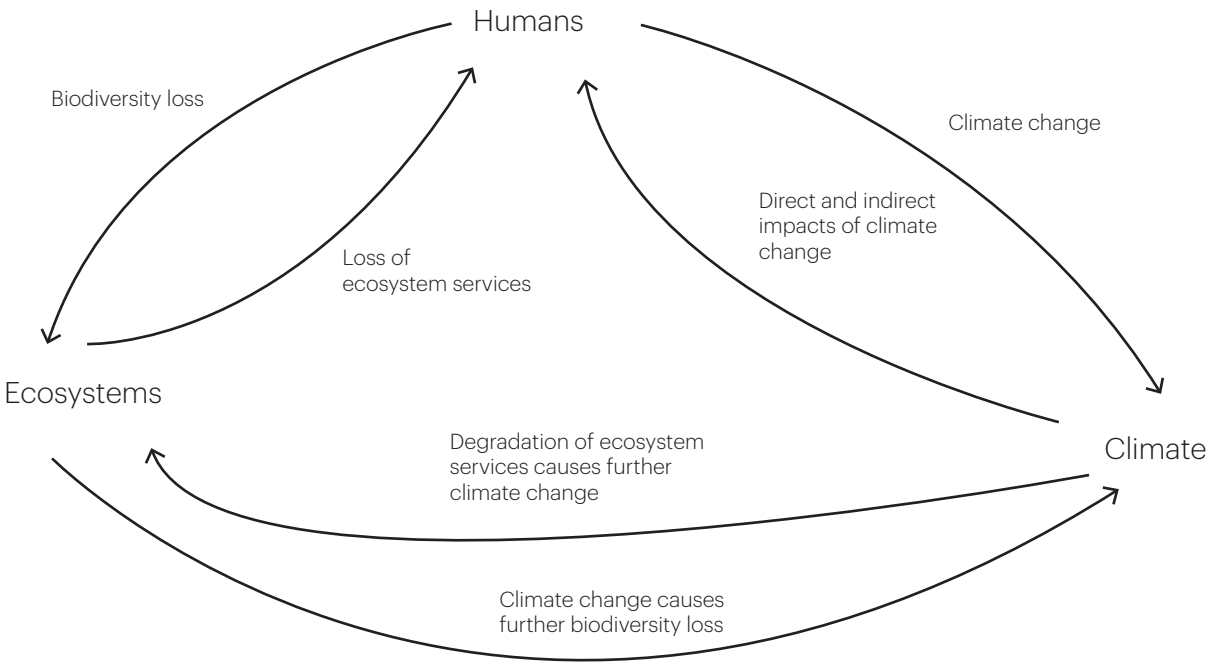
"The word ecology is derived from the Greek 'oikos', meaning "household," and logos, meaning, "study". Thus, the study of the environment at house includes all the organisms in it and all the functional processes that make the house habitable. Literally, then, ecology is the study of "life at home" with emphasis on "the totality or pattern of relations between organisms and their environment." (Odum and Barrett 1971)

According to Odum and Barret (1971): "Ecology was of practical interest early in human history. In primitive society, all individuals needed to know their environment, that is, to understand the forces of nature and the plants and animals around them - to survive. The beginning of civilization, in fact, coincided with the use of fire and other tools to modify the environment." The interdependency between disciplines of ecology and economy is the crucial aspect for the research and build up of the project hypothesis. Indeed, according to Odum and Barret (1971): "The word economics is also derived from the Greek root Oikos. As 'nomic' mean 'management', economics translates as "the management of the household" and, accordingly, ecology and economics should be companion disciplines. Unfortunately many people view ecologists and economists as advisories with antithetical visions. "

Subsequently, there is a rapid development of a new interface discipline, ecological economics, that is beginning to bridge the gap between ecology and economics. (Costanza, d'Arge et al. 1997) Indeed these theories helped to formulate first hypothesis about the project: Can we consider ecology as industry? What are the values of ecosystem services? What is the value of natural capital? What will be the replacement cost to clean soil contamination in the harbor? "The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system." (Costanza, d'Arge et al. 1997) This study provides a detailed compendium on describing, measuring and valuing ecosystem services.

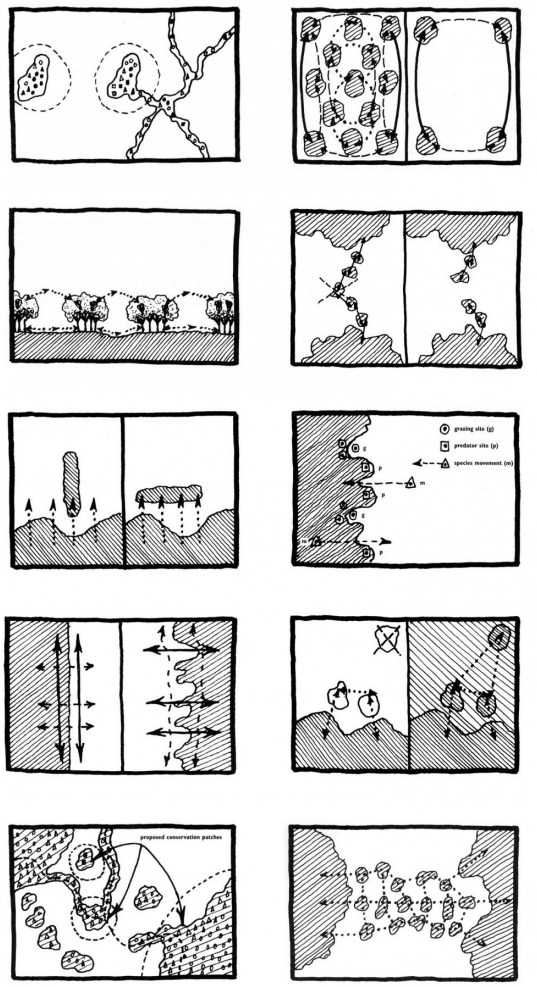


The ecosystem services benefits pyramid
Modified from: Patrick ten Brink, 2008



Relationship between humans, ecosystems and climate
Modified from: Maibritt Pedersen Zari (2014)

1.2.Theoretical Framework



Wenche E. Dramstad, James D. Olson and Richard T.T. Forman, Movement diagrams: Patches, Edges, Corridors, Mosaics, from Landscape Ecology Principles in Landscape Architecture and Land-Use Planning, 1996.

Landscape ecology

"Ecology is generally defined as the study of the interactions among organisms and their environment, and a landscape is a kilometers-wide mosaic over which particular local ecosystems and land uses recur. Thus landscape ecology is simply the ecology of landscapes, and regional ecology the ecology of regions. " (Dramstad, Olson et al. 1996) According to Darmstad, Olson et al. "The principles of landscape and regional ecology apply in any land mosaic, from suburban to the agriculture and desert to forest", in other words, they work equally in anthropic landscapes as well as natural areas.

"Like a plant cell or a human body, this living system, exhibits three broad characteristics: structure, functioning and change. Landscape structure is the spatial pattern or arrangement of landscape elements. Functioning is the movement and flows of animals, plants, water, wind, materials, and energy trough the structure. And change is the dynamics or alteration in spatial pattern and functioning over time. "(Dramstad, Olson et al. 1996)

According to Dramstad, Olson et al. (1996) structural pattern of a landscape or region is composed entirely of three types of elements: patches, corridors and matrix; and these were used in order to construct general principles or strategies called "syntaxes of landscape" throughout this project, and by considering how different elements could be combined creates variety of spatial configurations.

Landscape Urbanism

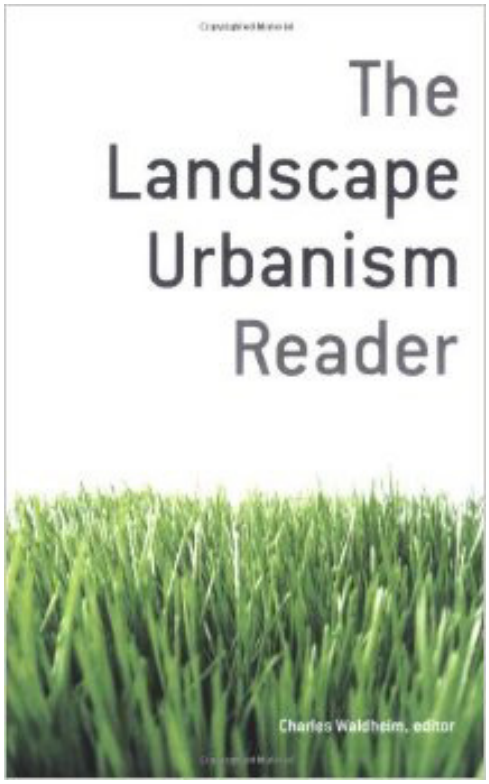
According to Waldheim (2006): "Landscape urbanism describes a disciplinary realignment currently underway in which landscape replaces architecture as basic building block of contemporary urbanism. For many, across a range of disciplines, landscape has become both the lens trough which the contemporary city is represented and the medium trough which is constructed."

The understanding of urban conditions as part of process is central to this theory, that evolved from landscape architecture, widening its focus to include cultural and historical processes as well as natural and ecological. (Pollak, 2006) In relation to urban design, the strength of landscape urbanism lies in the acknowledgment of temporality as a design tool and rejects design of 'blueprint plans' that are static and rigid and do not reflect to the reality that is highly dynamic and unpredictable. The curiosity and interest in this theory and it's methods was one of the main guidelines for the construction of the project.

Landscape infrastructure

According to Nijhuis & Jauslin (2015), "the concept of urban landscape infrastructure offers a renewed understanding of the landscape as infrastructure, which needs to be explored on its opportunities and possibilities for strategic regional design and local interventions. It stimulates design disciplines like architecture, urban planning and landscape architecture to cooperate and review the agency of design giving shape to the built environment, and establishes relationships between ecology and socio-cultural aspects, between process and form, between the space of flows and the space of places."

Along with these notions, the project looks more in depth into green landscape infrastructures, deriving from ecological and social process relationships with an emphasis on connectivity (Ahern, 2006) where green space acts as an organizational structure for development.



The Landscape Urbanism Reader, cover
Charles Walheim, editor, 2006

1.3. Problem analysis & Problem statement

Introduction

The Port of Rotterdam is one of the most important junctions for the trade of goods in the world, an international logistics hub and the most important gateway to Europe for more than 500 million consumers. The port's industrial cluster is of global stature: it is the largest industrial cluster in northwest Europe. The port contributes significantly to the national economy with a total added value that represents approximately 3.3% of the Netherlands' gross national product. Directly and indirectly the port provides for 145,000 jobs. (Wurpel, Akker van den et al. 2013)

Fossil fuels provide a constant basis underlying Rotterdam's growth. Therefore, the port continues to create plans for growth in respect with the continuous growth in liquid bulk and containers, especially in the long-term vision, Port Vision 2030. This plan emphasizes the ambition to be Europe's most important port and industrial complex and to be leading in efficiency and sustainability. (Wurpel, Akker van den et al. 2013)

At the same time, the underlying basis for development, fossil fuels, are the reasoning for decades of the environmental degradation to the landscape: in terms of air, water and soil pollution and loss of biodiversity. The current economical shifts towards sustainable forms of energy generation are expected to rapidly gain ground in Europe, as well as throughout the world. It would appear that over the coming decades a transition from a linear, fossil economy to a circular, bio-based economy will unfold in Europe. (Willems, Eijk van der et al. 2016)

What can be expected with regard to pollution, biodiversity loss, industry and non-renewable resources? Can Rotterdam maintain its position with a strategy that is based mainly on fossil fuels? Reflecting on these questions creates an opportunity to rethink and imagine the transition of port of Rotterdam from a nature-based perspective. Along with the initial assumptions and motivations, this process helped in order to produce a research question and sub research questions that will guide the development of the research and design process.

1. Increasing economic uncertainties for the Port

According to the Port of Rotterdam Authority, there are a number of trends and factors heavily impacting the Port's development: increasing competition from surrounding ports and ports further in the Mediterranean and the Baltic, the joining of forces by shipping companies, ongoing scale increases in the container shipping sector and the development of new trade routes influenced by the shift in the balance of the world economy. This is compounded by fundamental changes in the energy market like the rise of shale gas In the US (which has a negative impact on the competitive position of the European petrochemical industry), the energy transition in Germany and the rapid advance of nonfossil, centralized and decentralized power generation, influenced by climate change and depletion of raw materials. (PoRA, 2014)

Summary of the uncertainties:

-increasing competition from surrounding ports and ports further in the Mediterranean and the Baltic

-ongoing scale & technology increases in the container shipping sector

-development of new trade routes

-fundamental changes in the energy market like the rise of shale gas In the US

-the energy transition and the rapid advance of nonfossil, centralized and decentralized power generation, influenced by climate change and depletion of raw materials (ex. Germany)

Ambitions of Port of Rotterdam

"In 2030, Rotterdam is Europe's most important port and industrial complex. It is a strong combination of the Global Hub and Europe's Industrial Cluster, both leaders in efficiency and sustainability. Rotterdam is closely linked to other North West European industrial and logistics areas. Leading businesses make long-term investments in the most modern facilities. Close cooperation between businesses, government and knowledge institutions results in a high-quality labour market, living environment and accessibility. Our adaptive powers are unique. This makes the complex an important cornerstone for the welfare of the region, the Netherlands and Europe in 2030." (PoRA, 2014)

The port develops their long-term vision on the basis of four different economic scenarios to assess future developments in cargo handling. The scenarios are based on four main factors in forecasting cargo flows: economic growth, the volume of world trade, oil prices and environmental policy. In all scenarios that predict growth, economic ambitions are in line with the sustainability ambitions. However, the harbor vision document doesent provide any map and is more a 'business plan' that acknowledges the importance of scenario making and long term strategic planning.

Ambitions of Rotterdam

The development of Rotterdam centers around two main ambitions: economy and sustainability. This is recognizable in the Rotterdam climate initiative whose program objective is clean air, more green spaces, dry feet, cleaner energy at lower costs, and job creation in the city as well as in the port and industrial complex.

The programe is develops on the fact that the city and the port are inextricably linked, both in terms of benefits (such as employment, income, activity, and energy) and burdens (environmental footprint and traffic, for instance). (RCI, 2016)

2. Environmental degradation

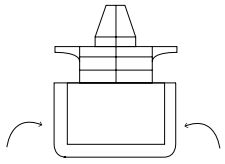
Water pollution

Almost all human activities can have harmful impacts on the water. In the case of Port of Rotterdam, water pollution can be influenced by several things, like management of waste and effluents, management of ballast water, oil spills, antifouling, management of sludge, management of hazardous cargo, and etc. (Boer & Verbraak, 2010)

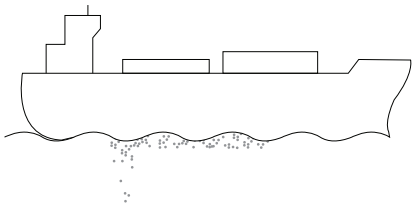
In order to control their balance, ships make use of ballast water. Their intake and discharge may occur at places with completely different ecosystems, which may result in releasing of alien species in the environments in which they have no natural predators. The release of this type of species may result with appearance of invasive species that are harmful for their environment.
The management of waste and effluents regards the waste products that are being generated by shipping or industrial activities in the harbor and can affect the marine environment in case they are not handled properly. Secondly the water and the sediments can be affected for example by the oil mineral spills in the port, which can occur both accidentally or illegally. In the Port of Rotterdam, spills regularly occur; for example, in 2008,193 spills occurred. However this number has decreased from 289 spills in 2007. Compared to the number of spills in 1993 (600 spills) the occurrence has dropped with almost two third. (Boer & Verbraak, 2010)
Fouling is a process of accumulation of marine organisms on the lower surfaces of vessels under the waterline, which in result increases the drag and weight of the hull which reduces the performance of the vessels – and increases its energy consumption. Antifouling is a process of applying special type of paints on the lower part of the vessel. The antifouling substances leach into the water and subsequently the bottom, and according to Boer & Verbraak (2010): "This leaching process presents danger, as a number of these compounds are found to be highly toxic, such as biocide antifoulings." (Boer & Verbraak, 2010)

Due to the natural process of sedimentation in rivers and the coastal seas, dredging needs to take place to keep the waterways in the Port of Rotterdam at proper depth for shipping. The sludge in the waters of Port of Rotterdam comes mainly from the upstream, and yearly 20 million m3 of sludge is being dredged each year (PoR, 2005). The quality of the dredged sludge in the Port of Rotterdam is improving, however, still 1.5 million m3 is of contaminated (metals, PAC, PCB) sludge is being dredged each year (PoR, 2005) and being disposed in the Slufter, a depot built primarily to store the contaminated sludge from dredging activities in the port and the waterways leading to the port. (Boer & Verbraak, 2010)

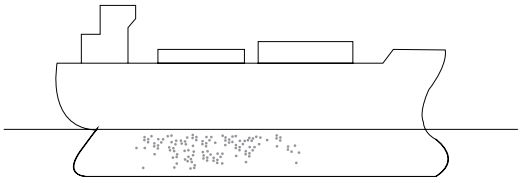
Almost all commercial ports are confronted with the handling of dangerous substances; examples include petrol, natural gas, LPG and products produced by the chemical industry. Handling these substances requires special care due to the risks involved for the general environment and also for the workers handling such transshipments. (Boer & Verbraak, 2010)



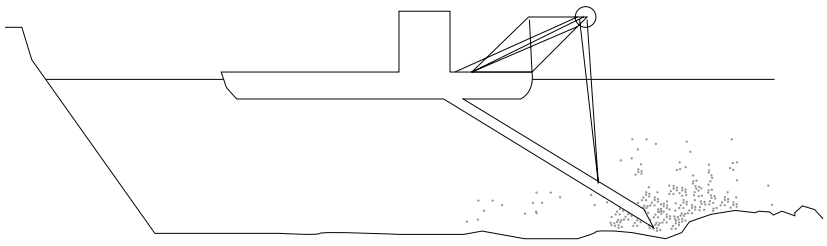
Ballast water



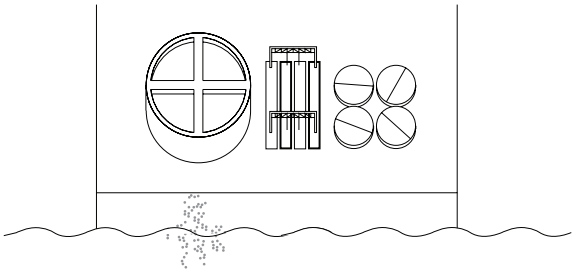
Oil spills



Antifouling



Dredging & Sludge management



Waste and effluents

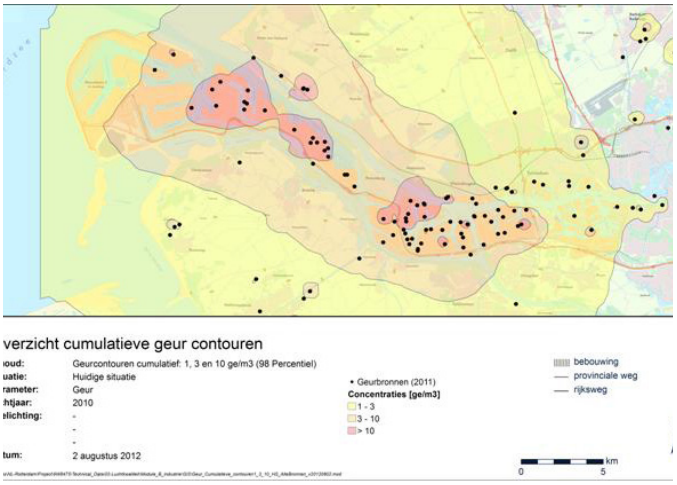
2. Environmental degradation

Air pollution

According to European Environment Agency: "Air pollution is both an environmental and a social problem, as it leads to a multitude of adverse effects on human health, ecosystems, the built environment and the climate. Air pollution poses the single largest environmental health risk in Europe today. Air pollutants are emitted from anthropogenic and natural sources; they may be transported or formed over long distances; and they may affect large areas." (Ortiz, 2015) Despite improvements over several decades, air pollution continues to damage human health and the environment. (Guerreiro, Leeuw, & Foltescu, 2013)
By reading the document 'Environmental impacts of International Shipping: A case study of the port of Rotterdam' (Boer & Verbraak, 2010) the conclusions were that the application of fossil fuels in transport and industrial processes in Port of Rotterdam leads to the emission of air pollutants, which can result in serious consequences for nature and even for the health of people living or working in these areas.

Regarding the NOx (mono-nitrogen oxides), SO2 (Sulfur dioxide) and PM10 (particulate matter) as the most relevant substances as described in EU Directive2008/50, we can see in the table 2 depicted the emissions of ships and industry. The table shows that industry is the main source of air pollutants, except for fine particles.

Furthermore, the levels of NO2 and PM10 are measured at various urban locations throughout the port area (DCMR, 2009). The data below show that air quality does not meet the standards set by EU Directive 2008/50. These stations are all located in the vicinity of residential areas. (DCMR, 2009).



Air and smell pollution data maps from Environmental assesment documents: Milieueffectrapport Havenbestemmingsplannen Deelrapport Geur – Versie mei 2013

	Maritime		Industry	
	Sailing	***Manoeuvring***	***Berthing***	
NO_X	1	4	4	17
Fine particulates (combustion)	0.1	0.2	0.3	0.2
SO_2	0.6	3	2	31

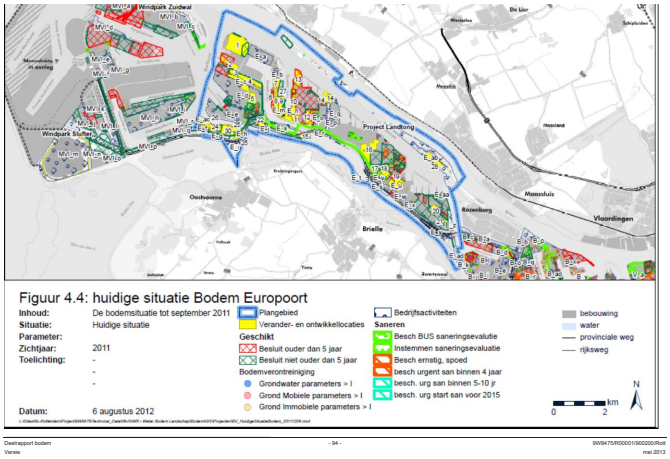
Note: sailing comprises emissions from the point of entering of the pilot. Industry emissions apply to 2007. Dry bulk transhipment generates another 0.4 ktonnes fine particles. Maritime emissions apply to 2004.

2. Environmental degradation

Soil contamination

The main activities that are taking place in the Rotterdam harbor are the transshipment and processing of bulk goods such as oil, chemicals, coals and ores. As a result of the long-term presence of these industrial activities the soil and groundwater have become contaminated. This contamination is substantial, complex and not limited to one particular site but affects (ground) water systems at a regional scale. (Ter Meer et al., 2007)

The main industry in the port are petrochemical activities and oil refining, followed by coal and gas fired power plants. "Soil contamination is mainly located close to waste land-fills, industrial/commercial activities diffusing heavy metals, oil industry, military camps, and nuclear power plants. "(Panagos, Liedekerke, & Yigini, 2013)



Soil contamination data maps from Environmental assesment documents: Milieueffectrapport Havenbestemmingsplannen Deelrapport Bodem – Versie mei 2013

Soil pollution in the harbor of Rotterdam. It is visible what is left when the structures of the petrochemical industry has left. Years of soil contamination due to the leakage of chemical substances from th storage or refining activities. These could be considered as the industrial scares.

3. Loss of Biodiversity

According to the definition by E. O. Wilson (1988) the term biodiversity covers variety of biological life trough several scales: the variety of species (both plant and animal), as well as the variety of genes within these species, or variety of ecosystems, which these species inhabit. (Wilson, 1988) The increasing use of this term is due to the fact that, in an ecological context, global biodiversity itself is being lost under frightening rate. (Chapin et al., 2000) According to science, biodiversity loss can affect the wellbeing of society and have negative economic impacts, since it underpins ecosystem function and the provision of ecosystem goods and services, which are therefore threatened. (Balmford et al., 2002)

According to the CBD (The Convention on Biological Diversity) five main direct threats to biodiversity globally are: habitat loss and degradation, invasive alien species, pollution and nutrient load, overexploitation and unsustainable use and climate change. (EEA, 2010)

Certain areas in the Port of Rotterdam, situated on the Rhine–Meuse–Scheldt delta, in the history, before the industry settled, used to be nature reserves and focal point for the birds migration. It is not strange due to the fact of presence of the brackish water, an interchange between the freshwater head and the saline mouth of the delta lie a number of zones marked by intermediate salinity values, each with distinct characteristics pertaining to the water clarity and type of substratum, thus hosting different communities of organisms. (Nienhuis, 2008) For example, it was observed that the nature reserve De Beer which was once at the mouth of the New Waterway, was a wonderful example of a dynamic dune system where the sea had free rein. Large beach plains made an ideal location for a number of coastal breeding birds such as the common tern and the sandwich tern. De Beer developed into a nature reserve, also unique for its size (1,300 hectares) in the Netherlands. (Buijsman, 2007)

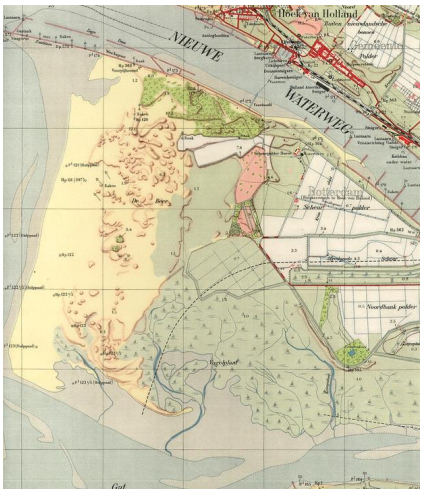


Fig. X.Y.
Topografische kaart, 1938

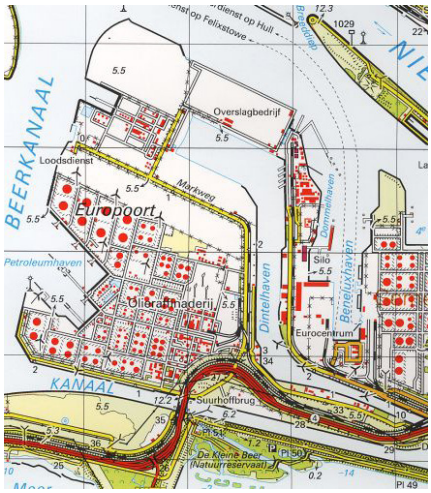


Fig. X.Y.
Topografische kaart, 2007

Vanished nature monument De Beer, arround 1963

In commission of the Dutch museum of Photography, Rotterdam, Paul Bogaers realized an exhibition and a publication on the subject of the vanished nature reserve "De Beer", nowadays known as the large-scale port and industrial area Eurpoort. In the early 1960's this unique nature site, especially renowned for its large variety of bird species, was entirely sacrificed for the expansion of the ports of Rotterdam. Bogaers combined photographs of his own hand with historical material on the subject, largely found in the collection of the museum. Thus he discovered that the main continuity in the history of the area, strikingly enough, is nature.
Source: http://paulbogaers.com/broedplaats-europoort/

1.4. Problem statement

In this section, a conclusion is drawn based upon the analysis performed above. The problem is found to be complex, which is why it required extensive research.

1. Increasing economic uncertainties for the Port

-increasing competition from surrounding ports and ports further in the Mediterranean and the Baltic

-ongoing scale & technology increases in the container shipping sector

-development of new trade routes

-fundamental changes in the energy market like the rise of shale gas In the US

-the energy transition in Germany and the rapid advance of nonfossil, centralized and decentralized power generation, influenced by climate change and depletion of raw materials

2. Environmental degradation

-Air pollution - The application of fossil fuels in transport and industrial processes in Port of Rotterdam leads to the emission of air pollutants, air quality does not meet the standards set by EU Directive 2008/50

-Soil contamination - The main activities that are taking place in the Rotterdam harbor are the transshipment and processing of bulk goods such as oil, chemicals, coals and ores. As a result of the long-term presence of these industrial activities the soil and groundwater have become contaminated.

-Water pollution - In the case of Port of Rotterdam, water pollution can be influenced by several things, like management of waste and effluents from ships and industries, management of ballast water, oil spills, antifouling, management of sludge, management of hazardous cargo

3. Loss of biodiversity

Certain areas in the Port of Rotterdam, situated on the Rhine–Meuse–Scheldt delta, in the history, before the industry settled, used to be nature reserves and focal point for the birds migration.

1.5. Objectives and hypothesis

1. Anticipate economical alternatives

-Taking into consideration the value of ecosystem services and natural capital and regard them 'methaporically' as the new industry for the harbor, while also envisioning other possible economic alternatives

2. Define, protect and preserve industrial & cultural heritage

-In this objective the 'industry can be regarded as landscape', with certain cultural values that should be preserved and emphasized as aesthetical value of the landscape.

3. Remediate existing ecological damages

-Start remediating ecological damages caused by industry by using 'ecological infrastructure' and phytoremediation as a cost-effective approach

4. Promote biodiversity and ecological protection

-Biodiversity loss can affect the wellbeing of society and have negative economic impacts, since it underpins ecosystem function and the provision of ecosystem goods and services, which are therefore threatened.

Hypothesis

Create landscape of co-existance, rather than landscape of exclusion, where natural and urban processes can benefit from each other, rather than work against each other.

1.6. Research question

How could the development of the Port of Rotterdam into a 'Productive Landscape Park' remediate existing ecological damages and give 'new meaning' to the economy of the port?

Spatial reasoning and heritage
How to design for spatial reasoning building upon cultural and natural heritage as aestethical value of the landscape?

Time
How can a process based design approach, be applied in order to formulate a strategy which can make this design development more accessible, robust, feasible and clean?

Relational Summary

THEORETICAL FRAMEWORK

Ecology, Ecosystem Services and the Natural Capital

Landscape ecology

Landscape urbanism

Landscape infrastructure

PROBLEM ANALYSIS AND PROBLEM STATEMENT

Increasing economic uncertainties for the Port

-increasing competition from surrounding ports and ports further in the Mediterranean and the Baltic

-ongoing scale & technology increases in the container shipping sector

-development of new trade routes -fundamental changes in the energy market like the rise of shale gas In the US

-the energy transition in Germany and the rapid advance of nonfossil, centralized and decentralized power generation, influenced by climate change and depletion of raw materials

Environmental degradation

-Air pollution - The application of fossil fuels in transport and industrial processes in Port of Rotterdam leads to the emission of air pollutants, air quality does not meet the standards set by EU Directive 2008/50

-Soil contamination - The main activities that are taking place in the Rotterdam harbor are the transshipment and processing of bulk goods such as oil, chemicals, coals and ores. As a result of the long-term presence of these industrial activities the soil and groundwater have become contaminated.

-Water pollution - In the case of Port of Rotterdam, water pollution can be influenced by several things, like management of waste and effluents from ships and industries, management of ballast water, oil spills, antifouling, management of sludge, management of hazardous cargo

Loss of Biodiversity

Certain areas in the Port of Rotterdam, situated on the Rhine–Meuse–Scheldt delta, in the history, before the industry settled, used to be nature reserves and focal point for the birds migration.

OBJECTIVES AND HYPOTHESIS

Anticipate economical alternatives
Taking into consideration the value of ecosystem services and natural capital and regard them 'methaporically' as the new industry for the harbor, while also envisioning other possible economic alternatives

Define, protect and preserve industrial & cultural heritage.
In this objective the 'industry can be regarded as landscape', with certain cultural values that should be preserved and emphasized as aesthetical value of the landscape.

Remediate existing ecological damages
Start remediating ecological damages caused by industry by using 'ecological infrastructure' and phytoremediation as a cost-effective approach

Promote biodiversity and ecological protection.
Biodiversity loss can affect the wellbeing of society and have negative economic impacts, since it underpins ecosystem function and the provision of ecosystem goods and services, which are therefore threatened.

HYPOTHESIS
Create landscape of co-existance, rather than landscape of exclusion, where natural and urban processes can benefit from each other, rather than work against each other.

RESEARCH QUESTION

How could the development of the Port of Rotterdam into a productive landscape park remediate existing ecological damages and give 'new meaning' to the economy of the port?

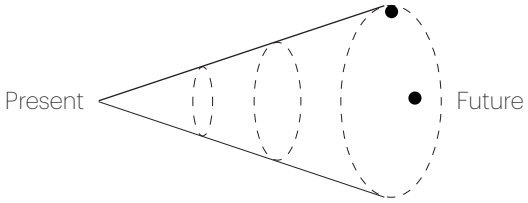
SPATIAL REASONING & HERITAGE
How to design for spatial reasoning building upon cultural and natural heritage as aestethical value of the landscape?

TIME
How can a process based design approach, be applied in order to formulate a strategy which can make this design development more accessible, robust, feasible and clean?

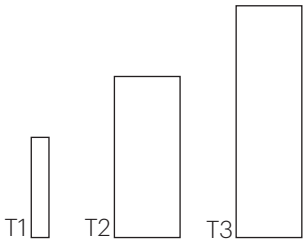
1.7. Methodology

Introduction

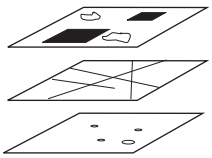
In order to research and design for such a complex urban system as port of rotterdam, different methods were used together. They are described in the following paragraph.



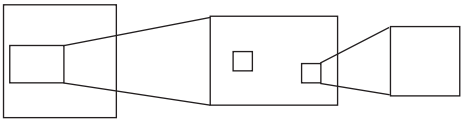
Scenario making



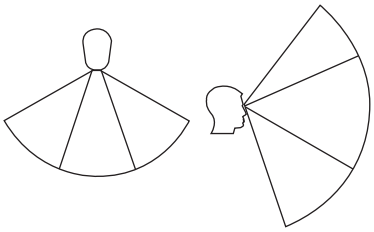
Process based design approach



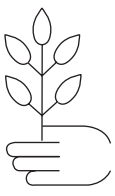
Layering



Multiscalar approach



Landscape perception



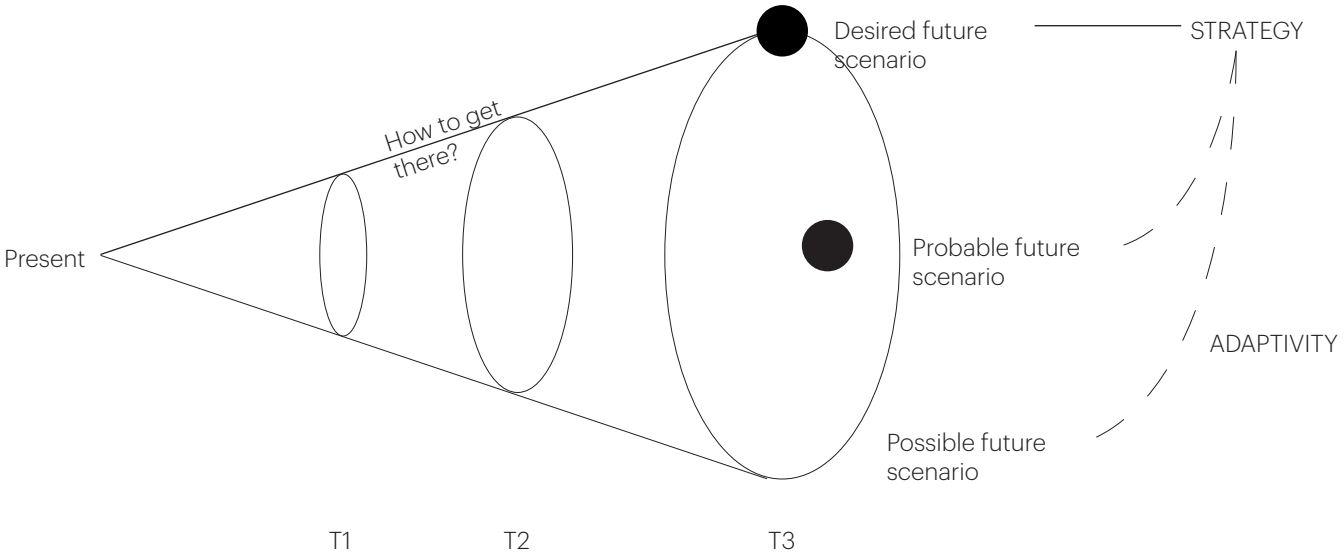
Nature based design

Scenario making

In the 20th century, scenario planning emerged as a potent tool for testing potential strategies against unknown and unpredictable futures. Initially based on military strategic planning and war-games, scenario planning was subsequently adopted by corporations as a tool to foresee possible futures and to act quickly, most famously by Royal Dutch Shell in the 1970s. (Lindgren & Bandhold, 2009) Running multiple narratives within models of future social, political, economic, and environmental conditions could anticipate unexpected outcomes.

Today, the adaptation of our built environment is the key response to rapidly changing urbanisation conditions. Under this lens, scenario planning is a method that allows 'design for process' rather than designing 'comprehensive plans' that are static, rigid and fixed. Design for process has the capacity to deal with complexity, uncertainty and indeterminacy.

In this case 'normative scenario method' was used in order to construct landscape imagination. This method starts with a view of a possible, often desirable future or set of futures that are of particular interest and than works backwards to explore possible pathways, narratives and strategies leading to this future. (Lindgren & Bandhold, 2009) Looking further ahead opens more possibilities; therefore 'time' becomes main aspect in the landscape imagination project. These imaginations are developed on the basis of analysis, trends and statistics, existing harbor scenarios and visions, site visits, reference projects and personal impressions. Together they constitute an exploration of the desirable future. Lastly, application of this method allows to reflect and evaluate how adaptive could this strategy be, while therefore responding to uncertainties.

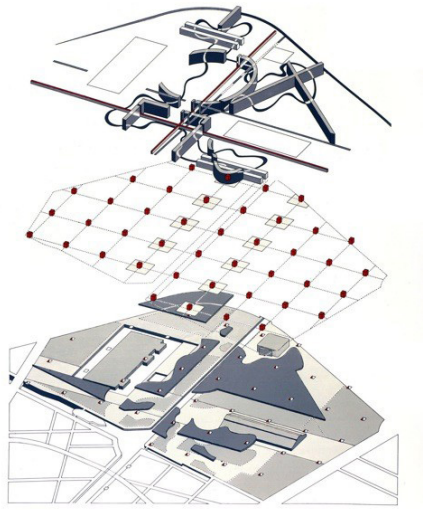

Desired future scenario
STRATEGY
How to get there?
Present
Probable future scenario
ADAPTIVITY
Possible future scenario
T1
T2
T3

Layering

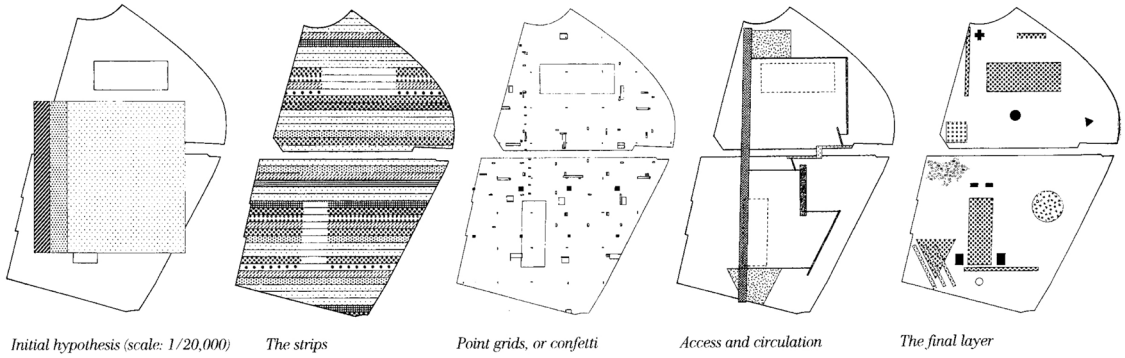
According to Corner & Hirsch (2014): "Layering is the superimposition of various independent layers upon the other to produce a heterogeneous thickened surface." Tschumi and Koolhaas were amongst the first to develop a layering strategies in design and planning in their perspective proposals for the Parc de la Villete in Paris.

Bernard Tschumi divided three systems of the park into what he calls points, lines and surfaces. Points, red cubes distributed in a 120 metre grid, were initially designed without any functional considerations. Their only role was to create matrix that work to organize the park and act as a reference points to visitors within the park. (Papadakis, 1988) Lines form the mayor walkways throughout the park, while surfaces concerns mainly with the materiality and the program, constructed from naturalistic elements of gravel, grass and compacted earth, to more solid made of metal or concrete.

They divide, the programmatic and logistical aspect of the park into a series of layers, thought independently from each other. In this way not only the mapping of the site and existing context is achieved but also mapping the complexity of intended program.



Bernard Tschumi: Parc de la Villette competition proposal, 1982: Lines, points and surfaces



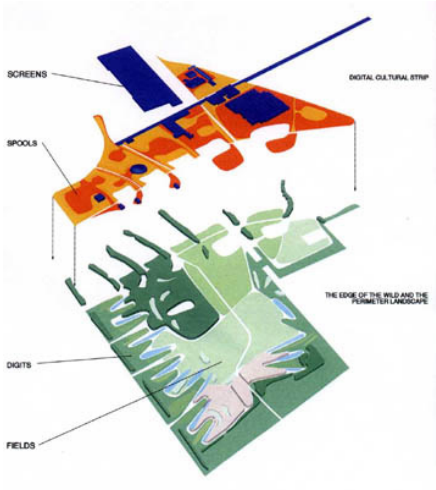
OMA: Parc de la Villette competition proposal, 1982: The strips, point grids or cofetti, access and circulation

This method helps both to analyze and synthetize the enormous complexity of data and give possibility to see relationships between different layers when overlaid together.
Bernard Tschumi again applied this method later in the project for Downsview park where his strategy was overlay of screens, spools and digits over fields. Digits act as "fingers of nature, they act both as a boundary and an extended definition", spools are "basins of attraction", while 'screens' are common identity of the military buildings that will house many programmatic activities and events and seduce visitors. (Tschumi, 2001)

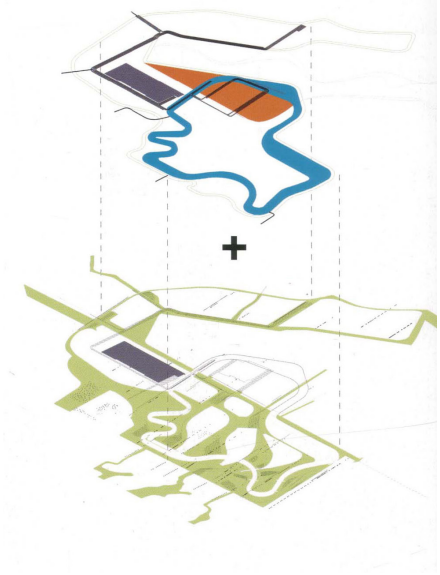
James Corner together with Stan Allen applied this method for the project of Downsview park, as well where he overlaid circuits and trough-flows. Different but complementary, circuits accommodate all activity programs, event spaces and circulation; trough-flows support all the hydrological and ecological dynamics of the site. (Corner & Allen, 2001)

Subsequently, Corner used this method again the project of Freshkills Landscape park in 2006 where he proposed threads, islands and mats as leading systems. Threads are the lines that direct flows of water, and matter around the site and are organized along the existing site lines, contours, and pathways. Islands both provide nest of protected habitat as well as program activity. Surface mats provide patch-like mosaics of mostly porous surfaces to provide self-sustainable coverage, erosion control and native habitat. (Corner, 2005)

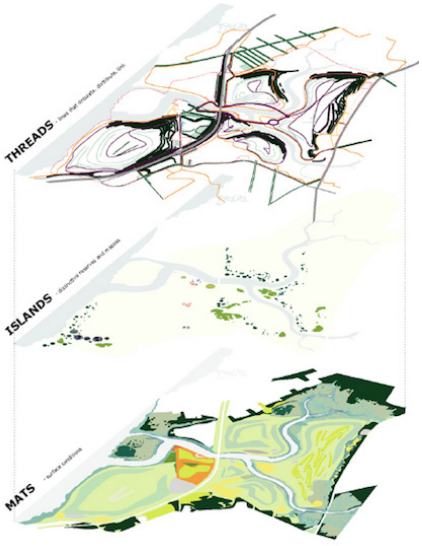
One can see the relation between these projects, in method that works with overlaying and transforming different spatial structures (systems) mainly coming from geometrical notions of points, lines and surface, into spatial frameworks and strategies for the organization of complexity.



Bernard Tschumi: Downsview park competition, Toronoto, 2000: Screens, Spools and Digits



J. Corner/ Field Operations and S. Allen: The digital and the coyote, Downsview park competition, Toronoto, 2000: Circuits and Trough-flows



J. Corner: Lifescape, Freshkills park competition, 2006: Threads, islands an mats

Process based design approach

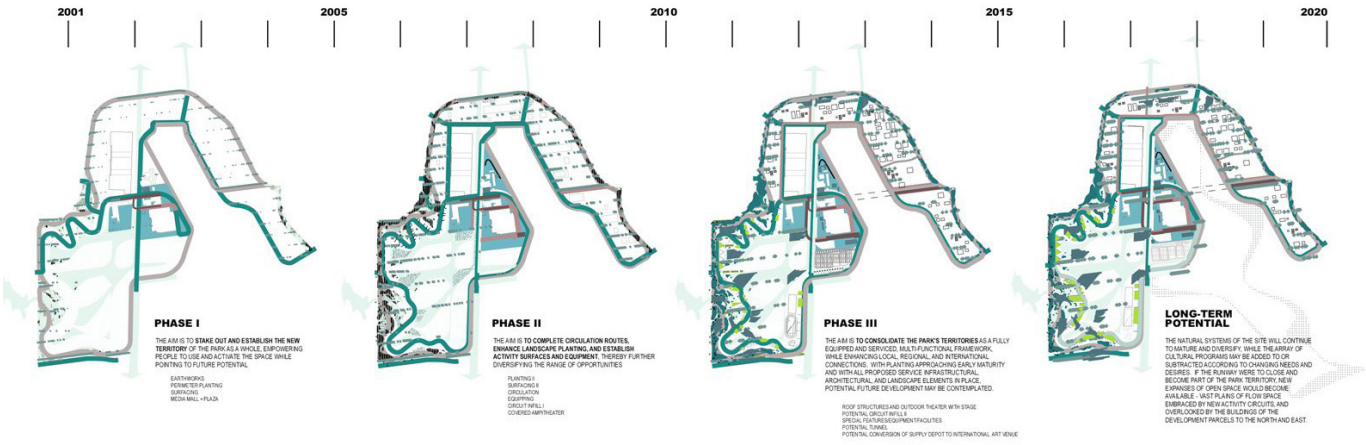
The process based design approach coming from the background of landscape architecture and landscape urbanism and according to Corner (2009) is a method that works effectively in dealing with time, scale and complexity, while designing 'time and process' rather than the form. It rejects statics of the 'blueprint' plan and tries to develop operational strategies for immediate or further future.

Investigations into how time can be represented in landscape, and observations of how practice nowadays represents time are one of the main aspects of this method. Time could be regarded as design tool, coming from the fact that city making is part of a long and unpredictable process while also restoring or reintroducing the natural processes and features of landscapes in cities. (Corner, 2009)

Herby complexity could be described by multiplicity of urban functions and ecologies, number of stakeholders involved, clients, governments and government agencies, many different communities. The method deals with complexity because of the ability to analyze and synthetize different layers while projecting new programs and strategies. (see Layering method)

Lastly, the matter of scale is being overcome by providing both development strategy and more detailed design. (see Multiscalar approach method)

Two projects that are the best exemplary of this design method are James Corner and Stan Allen/ Field Operations, Downsview Park Competition (Toronto, 2000) and James Corner Fresh Kills Landfill competition (New York, 2001). Both design proposals contain detailed diagrams of phasing, animal habitats, succession planting, and hydrological systems as well as programmatic and planning regimes. (Waldheim, 2006)



James Corner / Stan Allen design proposal for Downsview park in Toronto. Emergence trough adaptive management.

Multiscalar approach

The matter of scale regards the incapacity of designers in trying to find a working relationship between large-scale strategy, and more detailed design and city making.

Hereby under there is the scale comparison of different park projects, one can observe different park typologies, but also different design typologies. Examples range from regional park landscape to a more local urban park, and from development strategy to urban design. Therefore, the multi scalar approach method should be used in order to be able to provide a development strategy for the whole port as well as more detailed design of the park.

IBA Emscher park - Ruhrgebied, Germany

Rotterdam Harbor Park, The Netherlands

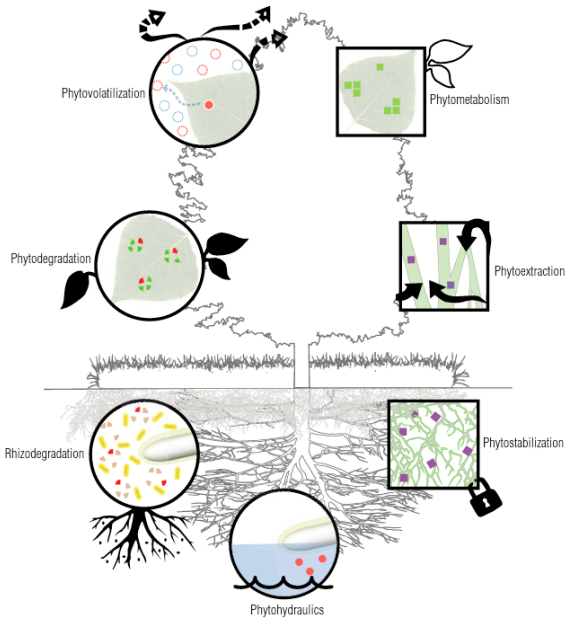
Fresh Kills landscape park, NY

Parc la Villete, Paris

Nature based design

"Nature-based solutions are actions, which are inspired by, supported by or copied from nature. They have tremendous potential to be energy and resource-efficient and resilient to change, but to be successful they must be adapted to local conditions. Many nature-based solutions result in multiple co-benefits for health, the economy, society and the environment, and thus they can represent more efficient and cost-effective solutions than more traditional approaches." (EC, 2015) More specifically four principal goals have been identified by European Commission (2015) that can be addressed by nature-based solutions: enhancing sustainable urbanization, restoring degraded ecosystems, developing climate change adaptation and mitigation, improving risk management and resilience.

Under these notions, following methods were identified In order to adapt better to the local conditions of Rotterdam.
Phytotechnology is the use of vegetation to remediate, contain or prevent contaminants in soils, sediments and groundwater, and/or add nutrients, porosity and organic matter. (Kirkwood & Kennen, 2015) Phytoremediation has the capacity to assist in the remediation of polycyclic aromatic hydrocarbons, oils, greases, and heavy metals, which are among the common toxics found in urban brownfields. The simultaneous treatment of these multiple contaminants makes phytoremediation a cost effective and attractive option for urban brownfield areas. (Raskin & Ensley, 2000) Phytoremediation can take place without minimal disturbance of the site and is process-oriented tool that takes a long time, often years or decades. The time dimension could be turned into an advantage and a design tool that allows staging and distinction of cleaning process while performing remediation and simultaneously creating green infrastructure. (Sleegers, 2010) Plants typically used in phytoremediation include hybrid poplars, willows (Populus ssp., Salix ssp.), grasses, reeds, and cattails (Festuca ssp., Lolium ssp., Phragmites spp., Typha spp.), pennycress and mustard (Brassica ssp., Thlaspi ssp.) (Marmiroli and McCutcheon, 2003). These plants' root systems help to rebuild soil structure in the rhizosphere, and through the deposition of organic material from leaves, branches and root cells.

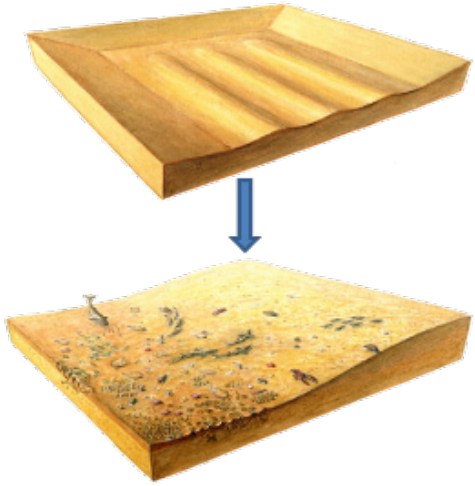


Phytomechanisms summary (Kirkwood & Kennen, 2015)

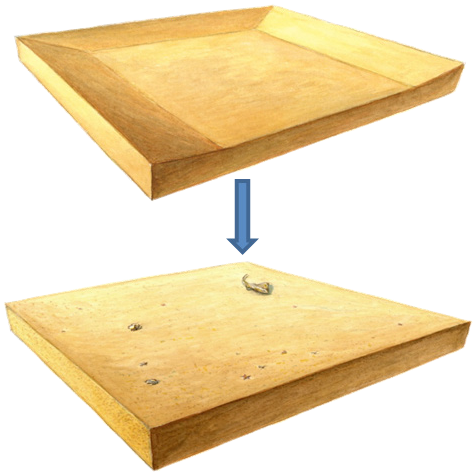
‘Building with nature’ concept uses the natural processes, while creating integrated and flexible solutions. In this way, it seeks to safeguard the economy and boost ecology, while being both cost effective and sustainable. The method suggest to design infrastructure that can serve more than just one purpose, that is aligned with natural processes rather than working against them, and that is adaptable to cope with changing conditions such as sea level rise and climate change. (De Vriend & Van Koningsveld, 2012)

Since ‘Building with nature’ comes in many shapes and forms, an example from Ecoshape consortium is shown underneath.

In the construction of Maasvlakte 2, last major expansion of the Rotterdam port involves the extraction of lots of sand off the shore, which is having negative consequences for the relevant ecosystems. Instead of leaving the sea floor flat after sand extraction for the port development, seabed landscapping project created artificially irregular terrain, in this way biodiversity and productivity can recover much better.



Building with nature design, Ecoshape



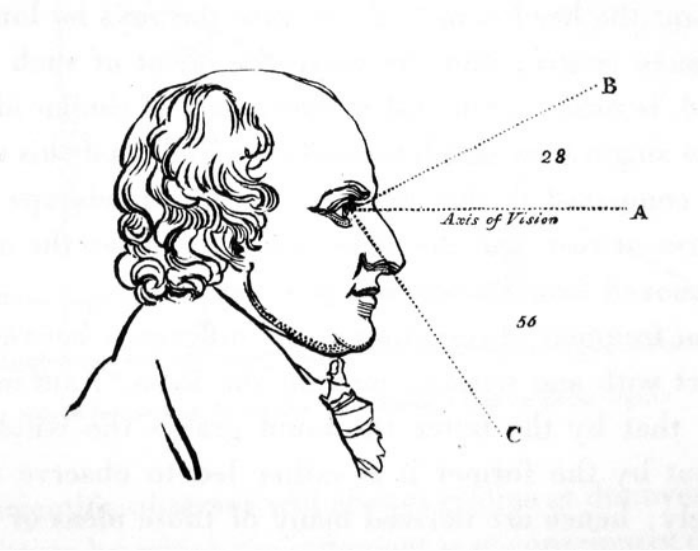
Traditional design, Ecoshape

Perception and sernsory environment

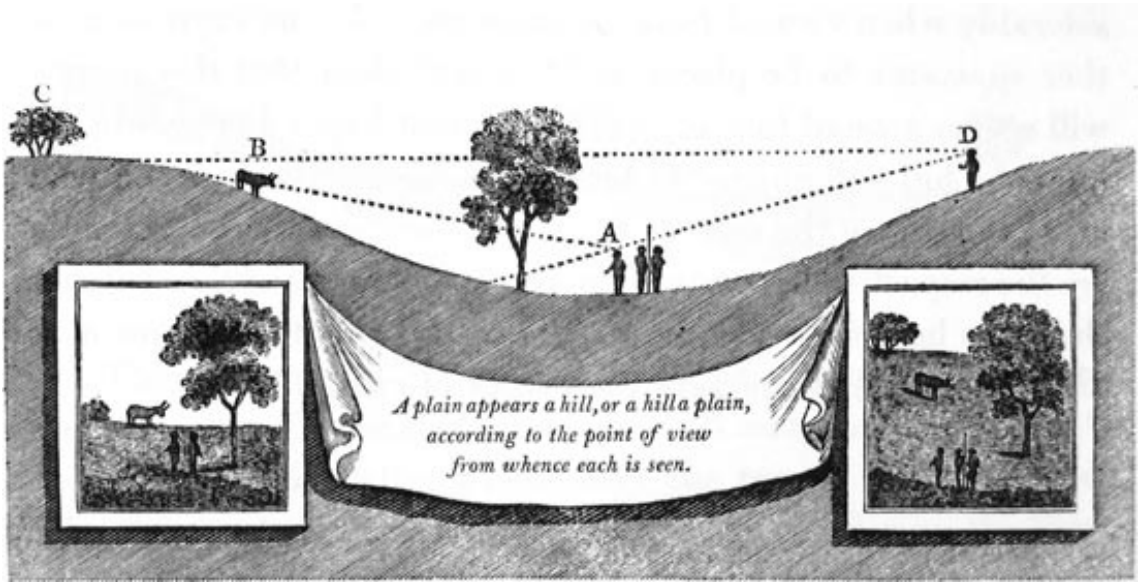
In order to design for spatial reasoning built upon combination of cultural (industrial) and natural (ecological) value the methodology of landscape perception was applied. This method works with analysis of existing imagery, i.e. the existing landscape quality and production of new viewpoints as well as adding content to the existing. For this method is important to determine 'field of view'. Human field of view is approximately 120 degrees, binocular field of view.

Humphry Repton in his 'Observations on the theory and practice of Landscape Gardening (1803)' explains how landscape perception depends on the location of the observation point. For example people tend to see more downwards, because their vertical field of view is not equally developed, therefore we have better perception if we are on higher observation point. In the design this was crucial aspect in order to translate industrial artifacts into landscape.

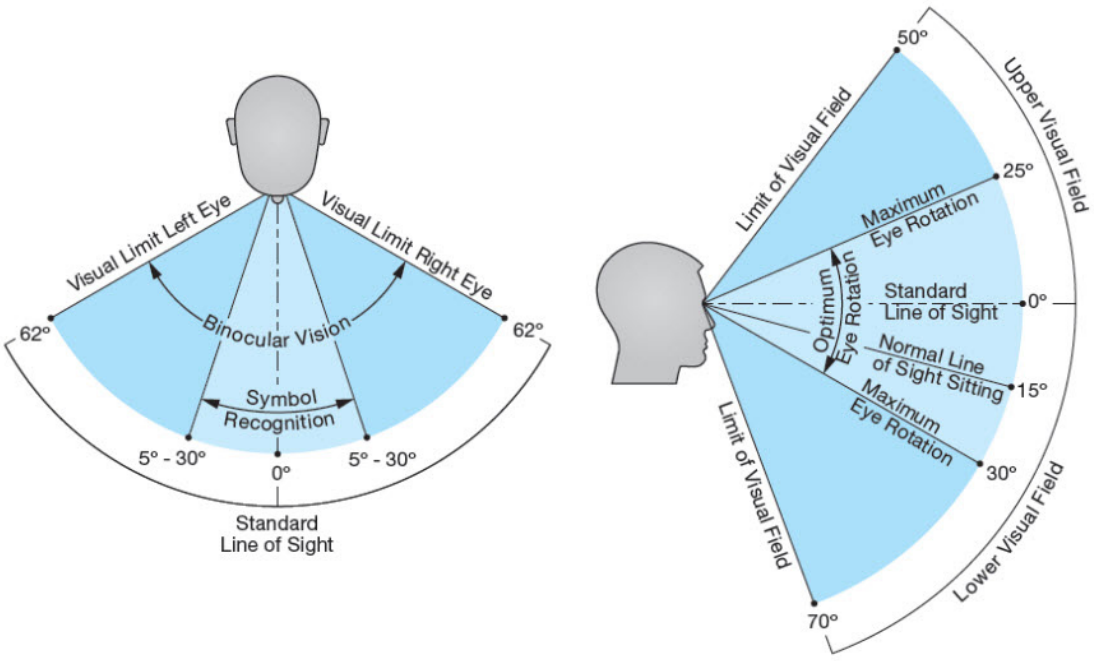
Part of this method engages the design from personal experience and site visits.



Vertical field of view, Humphry Repton, 1803



Relation between observation point and field of view
Humphry Repton, 1803



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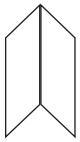
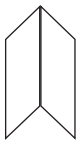
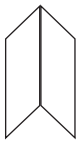


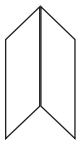
Ecology,
Ecosystem services
and the Natural
capital



Landscape ecology



Landscape urbanism



Green landscape
infrastructure

Problem statement

-Increasing economic
uncertainties for the Port
-Environmental degradation
-Loss of biodiversity

Objectives

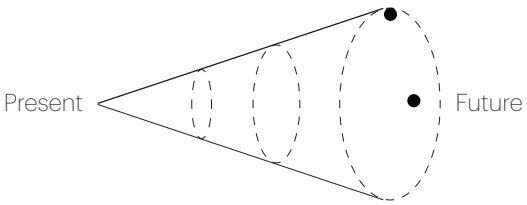
-Anticipate economical alternatives
-Define, protect and preserve indus-
trial & cultural heritage
-Remediate existing ecological
damages
-Promote biodiversity and ecological
protection

Hypothesis

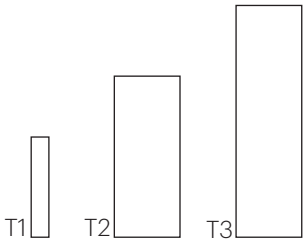
Create landscape of co-existance,
rather than landscape of exclusion,
where natural and urban processes
can benefit from each other, rather
than work against each other

Research question

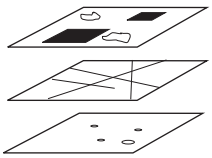
**How could the development of the
Port of Rotterdam into a produc-
tive landscape park remediate
existing ecological damages and
give 'new meaning' to the econo-
my of the port?**



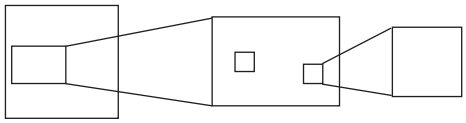
Landscape imagination



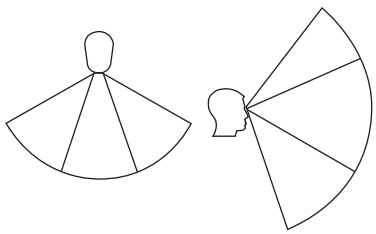
Process based design approach



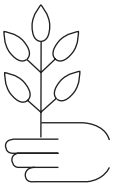
Layering



Multiscalar approach



Landscape perception



Design with nature

LEGGEND

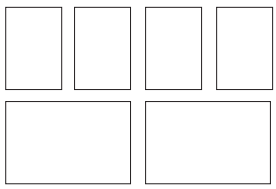
Analytical reading

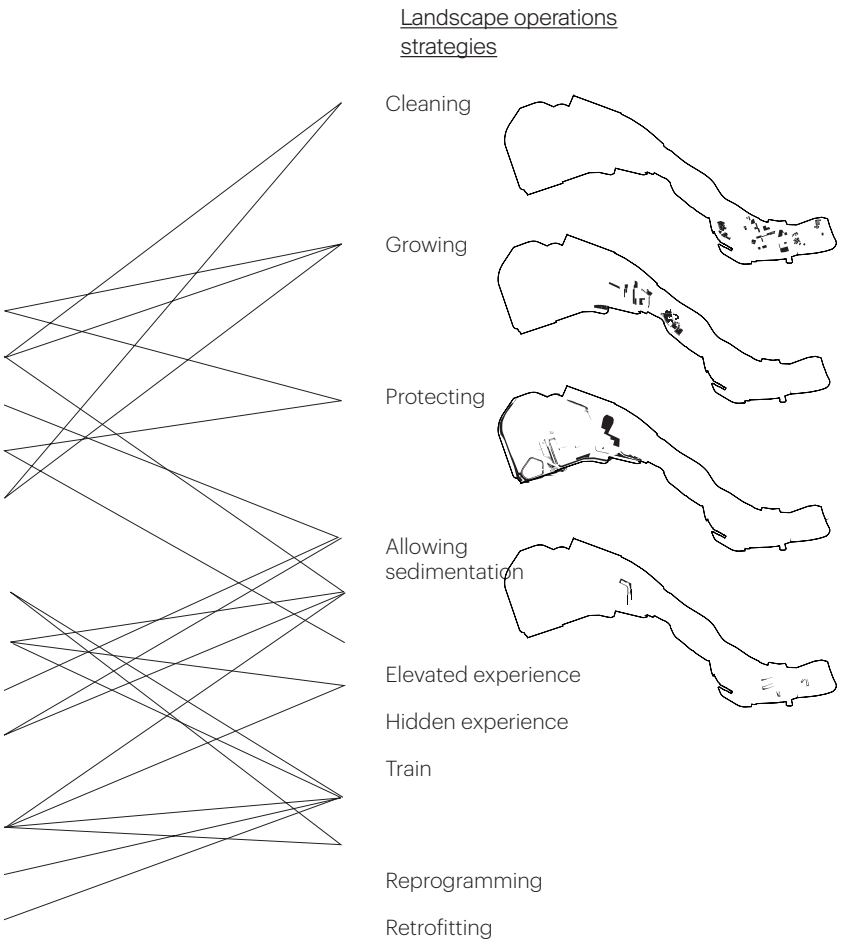
Landscape
- Landcover/ open space
- Soil contamination
- Water depth
- Fauna/ Flora
- Soil typology

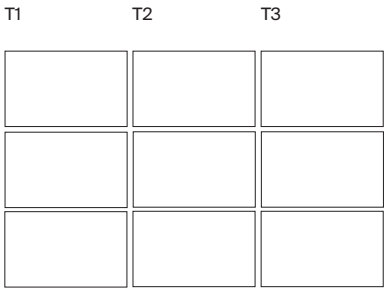
Accessibility
- Vehicular accessibility
- Non vehicular accessibility
- Edge typology
- Accessible edges

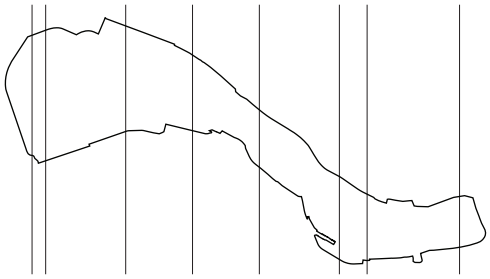
Occupation
- Occupation
- Security zone
- Commercial

Pin up design process

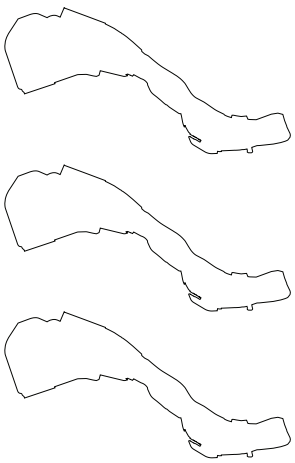


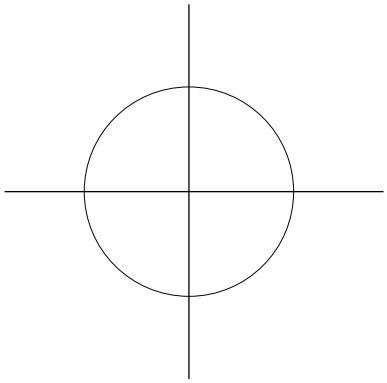

Landscape operations
strategies
Cleaning
Growing
Protecting
Allowing
sedimentation
Elevated experience
Hidden experience
Train
Reprogramming
Retrofitting
Framework
Reflection
Spatial
manifestation





Reflection





Pin up working method

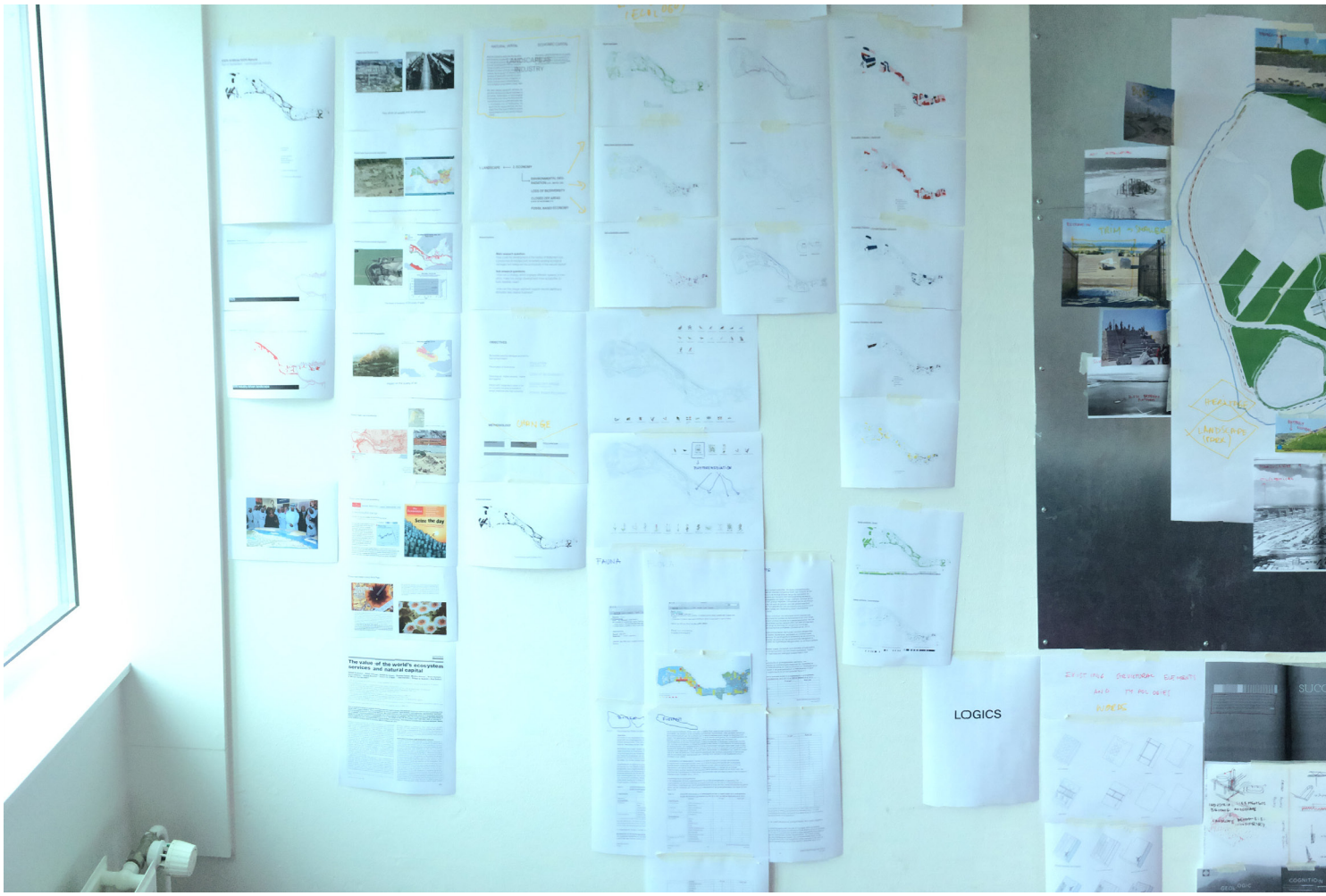
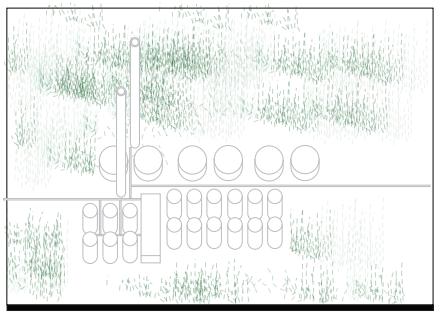


Figure showing the working methodology of the learning and research processes. The scale of the project and it's complexity can sometimes be overwhelming. The wall pin-up method allows to always have a sight on the project and the possibility to ''zoom in'' and ''zoom out'' and is also a helpful way in order not to lose data and organise the content.

2. Analyitical reading of the landscape

2.1. Introduction

The port of Rotterdam is a 40 km long terminal located at the confluence of two mega-systems, the Holland's North Sea zone and the Rhine Maas Delta. This favorable geographical location allowed the port to be the connection between the faraway locations from the "Russian oilfields to the Suez Canal, to China, to Brazil and the Panama Canal" passing trough the hinterland and the German Ruhr district. (Steenhuis 2015)



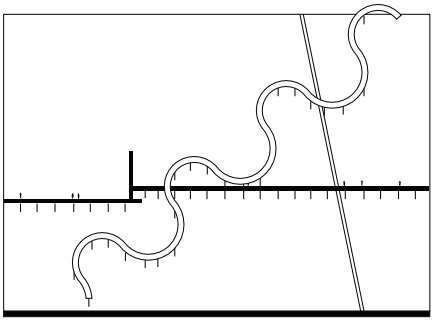
Landcover/ open space

Soil contamination

Water depth

Fauna/ Flora

Soil typology

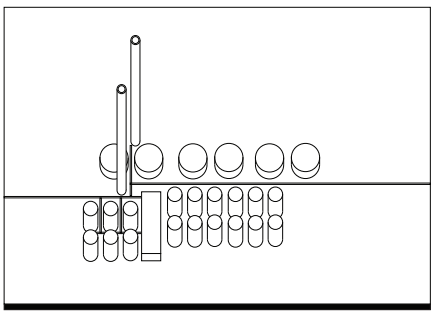


Vehicular accessibility

Non vehicular accessibility

Edge typology

Accessible edges

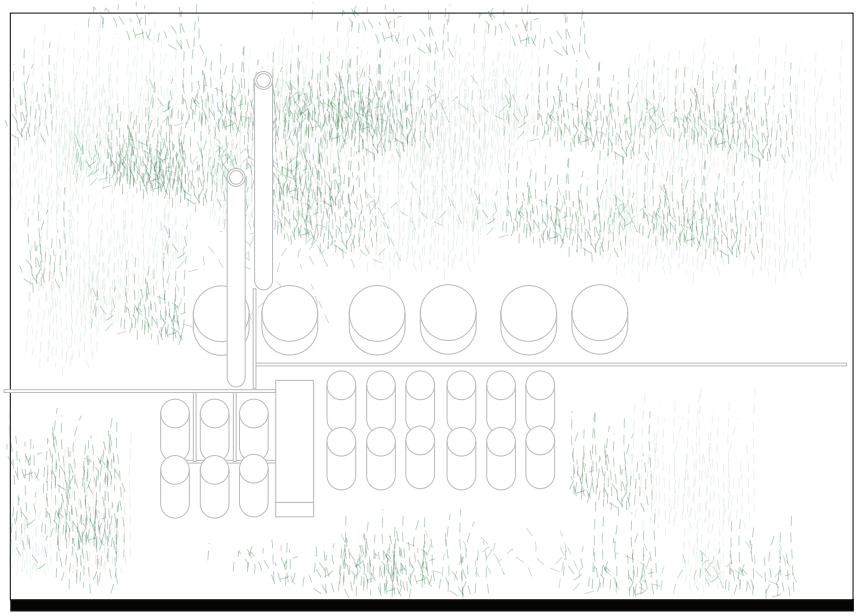


Occupation

Security zone

Commercial

2.1. Landscape and nature analysis



Landcover/ open space

Soil contamination

Water depth

Fauna/ Flora

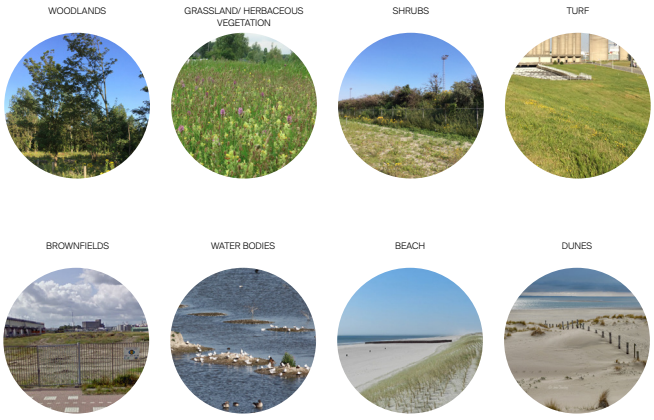
Soil typology

Landcover and open space

Land cover and
open space typology

- Woodlands
- Grass/ Turf
- Brownfields
- Dune beach
- Dune valley
- Surface water

Mapping of existing typology of open spaces. This layer is extremely important in order to project design in the existing context and work with existing features of landscape



Unique places

There is a lot of quality in the Port of Rotterdam. Indeed, the nature and industry are already very connected. Here are some examples of unique places related to open space and nature in the port.

1. Vogelvallei
The Port of Rotterdam Authority has redeveloped Maasvlakte's bird valley (The Vogelvallei), a nature reserve for birds, and enlarged it to 21 hectares. This redevelopment took place in close consultation with Bureau Stadsnatuur (Rotterdam's urban nature agency), H+N+S Landscape architects and various nature organisations.

2. Zeehonden Beereiland
Sea Lion collony are not a common sight on Dutch beaches since they are disturbed by people and pets. But they have found occasional spot in teh restricted areas of the port where people are not allowed.

3. Landtong Rozenburg park
Along with the Maasvlakte 2, latest addition to the port, the quality impulse project and the redevelopment of the Landtong Rozenburg as part of compensation

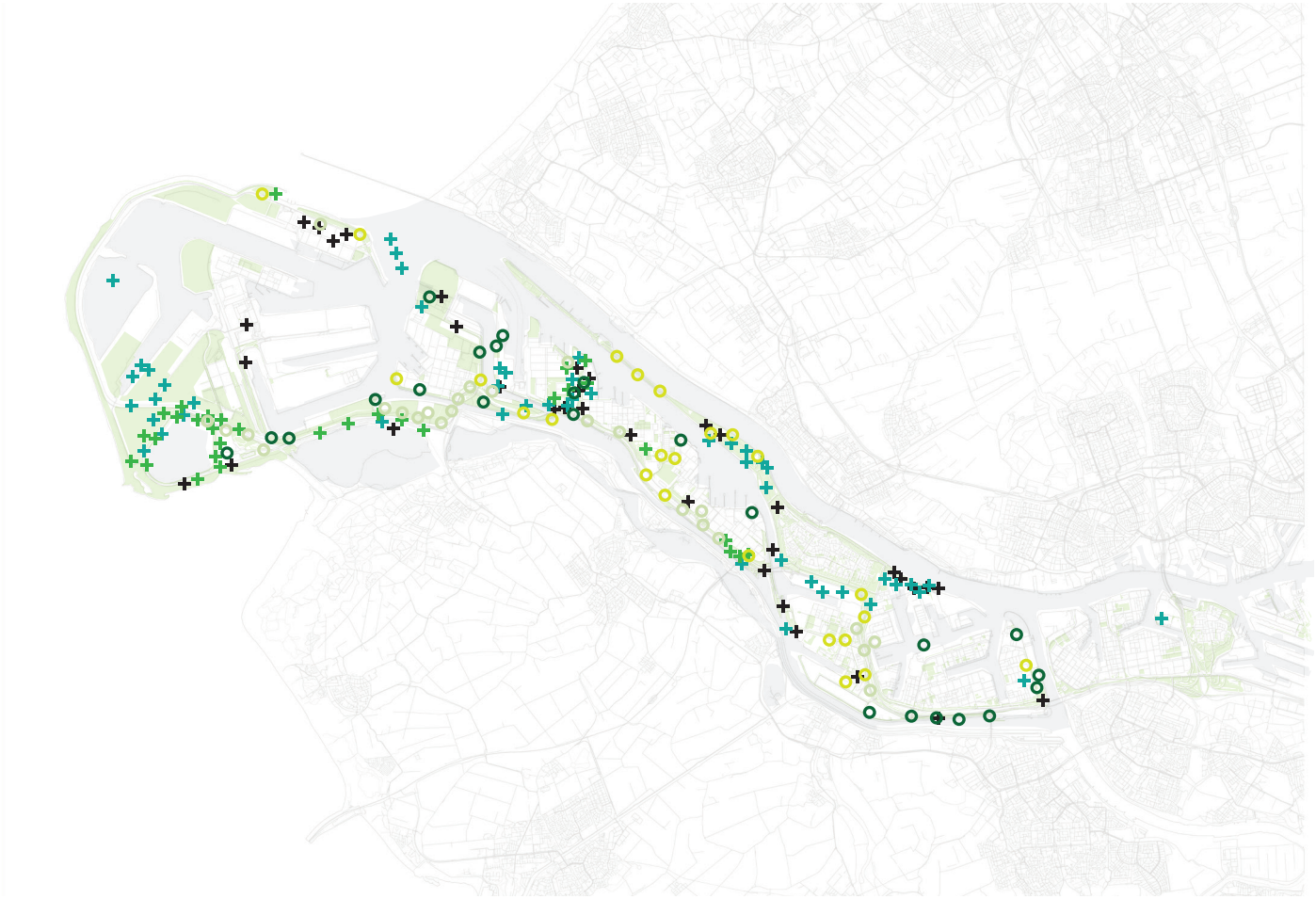
3. Landtong Rozenburg park
Park construction and viewpont for the harbor boats

4. BP Refinery office building
Built into an artificial dune, not just to mimic the nearby environment, but also to create a safe environment for the offices

5. Maasvlakte 2 beach
Part of the nature compensation project for the construction of the latest addition to the port

6. Calandbrug
Windshield and noise barriers installations that are designed as a land art project

Endangered Flora and Fauna of the Port



On biodiversity

Maasvlakte has a distinctive community, which partly resembles the coastal dunes and north (Area Hoek van Holland) and south (Area Oostvoorne). Thus, in the current situation along the northern and southern outskirts of the Maasvlakte a helmet dunes with vegetation present. The area consists of low pioneer vegetation (very) dry, chalky, sandy soil with a high proportion of mosses and grassy vegetation. The influence of the population of rabbits is large; they are, as it were, the grazing animals of the area through which succession is counteracted. Through their digging are permanently

Birds

Perdix perdix

Charadrius hiaticula

Anthus pratensis

Oenanthe oenanthe

Linaria cannabina

Larus fuscus

Larus argentatus

Tringa totanus

Alauda arvensis

Anas clypeata

Sterna hirundo

Luscinia megarhynchos

Buteo buteo

Accipiter gentilis

Picus viridis

Falco tinnunculus

Corvus frugilegus

Mammels

Halichoerus grypus

Pipistrellus pipistrellus

Epistecus serotinus

Pipistrellus nathusii

Amphibian & Insects

Epidalea calamita

Aricia agestis

Candidula gigaxii

Phaneroptera

Oedipoda caerulescens

Ochlodes sylvanus

Phaneroptera falcata

barren stretches of sand present. Locally dry storage locations (encroachment) mainly sea buckthorn and elder (Grutters et al., 2009). Spread over the Maasvlakte 1 are individuals of endangered and / or protected plant species. This concerns both for species characteristic of dry vegetation and types of (permanent) moist situations and

situations of transition from wet to dry. May be found locally high densities of one or more types. Especially the pipeline corridor along the Beerweg (and vicinity) is an important habitat for several protected orchids (Grutters et al., 2012). Other endangered and / or protected species (group) and which may be found concern include butterflies, dragonflies, grasshoppers, amphibians and (breeding) birds. Protected reptiles are not present. The sand lizard is present on the seawall south of the Slufter, which is just outside the boundary of the joint planning area is located. Of amphibians, the natterjack toad is found only on the Maasvlakte (Grutters et al., 2012).
Virtually anywhere at Maasvlakte breeding birds. It mainly relates to land brothers. The Slufter, temporary bird valley and clay maturing fields are the most species-rich. During the migration period is Maasvlakte also an important stop for migratory birds.

EUROPOORT
Compared to Maasvlakte, most (vacant) lots in the Europoort in a further succession stage. This is mainly due to the limited influence of the sea (wind, salt spray) and old age. The vacant lots in the east of the Europoort are largely covered with brushwood of reed and sea buckthorn. Such plots have been particularly valuable for breeding birds including marsh harrier, water rail and bluethroat. Europoort also houses a very rich flora, including various types of orchids that can occur locally in large numbers. Regarding numbers of the pipeline strip is on the south side of the Krabbe areas (along the Beerweg) compete with important nature reserves in the immediate vicinity. The pipeline strips and roadsides are in the Europoort green veining of the port and industrial area and can accommodate local high natural values (including types of wet dune valleys). In total, almost 2,000 hectares of (rail) roads and pipeline zones. To avoid security risks they may have no high or deep-rooting plants. For this reason, it is mown regularly wherein the cuttings is discharged. Because many of these plots are nutrient poor, do not mow it to happen too often. It also regularly built or replace a pipe, what the succession again that restoring and provides variation in vegetation structure (Grutters et al., 2009).
Compared to Maasvlakte 1 come in Europoort less characteristic dune-bound breeding bird species. In Europoort concerns mainly ground brethren such as linnet, partridge and redshank, the exception being the Geuzenbos (see below under the heading "Geuzenbos"). There are also some invertebrate species distributed on site listed on the Red List). The protected species was also observed scattered over several locations in the Europoort

BOTLEK-VONDELLINGENPLAAT
The plots in the Botlek Vondelingenplaat subarea are largely spent, the surface of undeveloped plots is relatively limited compared to the other areas. The surface of green structures and natural habitats is limited, also found here less protected and endangered species. Torrential Stones slopes offer some locations to place protective wall plants such as tongue fern and black handle. Orchids reach here their eastern distribution border in Rotterdam territory. Only at the height of the Botlekweg is a known growth instead of the bee orchid present. Feather scattered across the field some invertebrates found listed on the Red List. However, numbers are relatively limited

Flora

Thlaspi caerulescens

Cochlearia officinalis

Sedum reflexum

Liparis loeselii

Epipactis palustris

Dactylorhiza incarnata

Dactylorhiza praetermissa

Anacamptis pyramidalis

Anacamptis morio

Ophrys apifera

Parnassia palustris

Parietaria diffusa

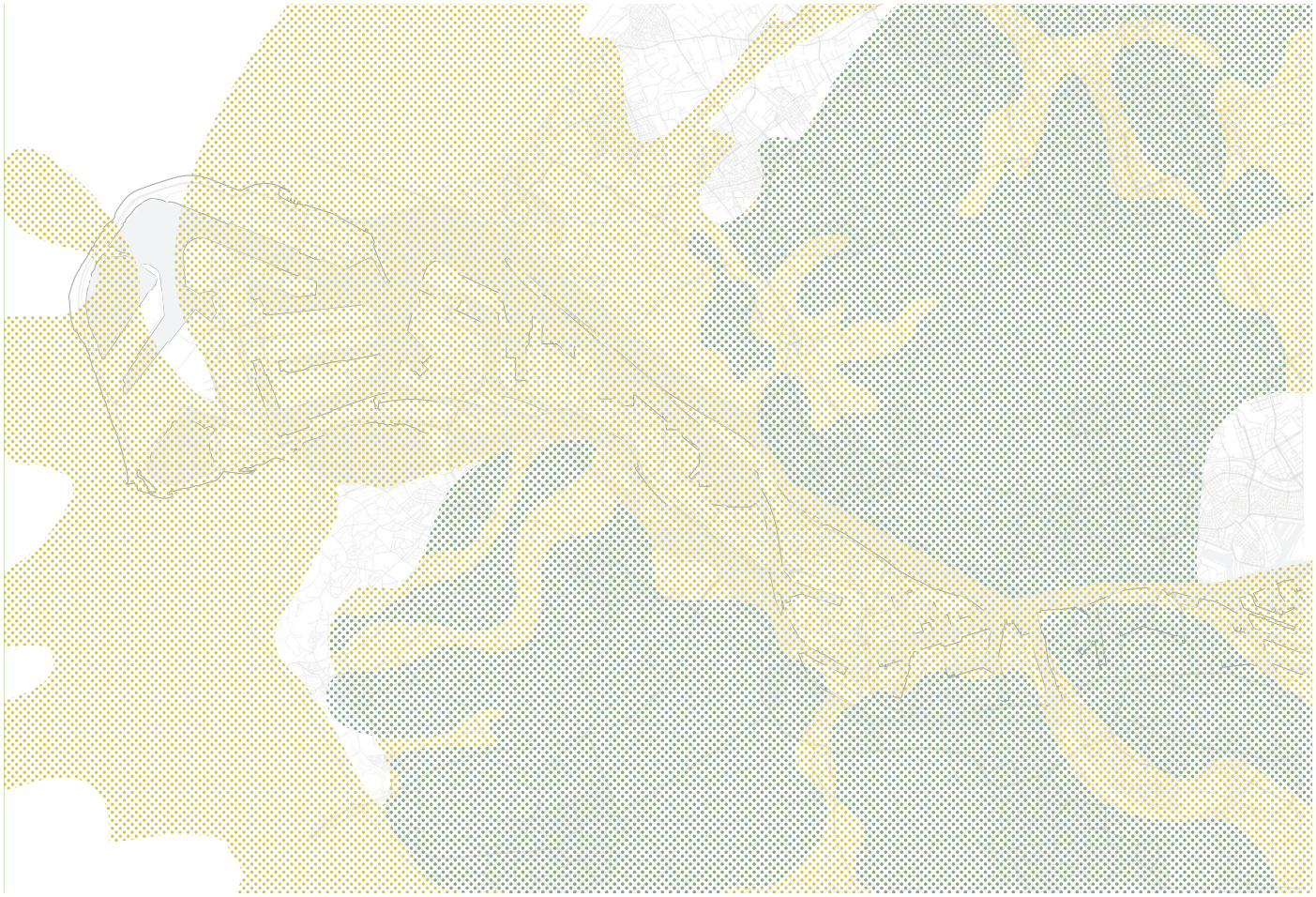
Sagina nodosa

Linum catharticum

Euphrasia stricta

Odontites vulgaris

Geological soil typology



Legend

Seaclay and sand with peat

Seaclay and sand

0 0,5 1 2 5

The soil typology map shows that most of the port is constructed on sea-clay. In some parts of the port, more upstream in the areas of Pernis and the 'Stad Havens' the soil typology is sea-clay with peat. This analysis was important to understand which type of plants and vegetation can grow in this area.

Soil contamination parameters

Legend

- Soil contamination parameters

0 0,5 1 2 5

The current situation shows that in the Botlek Vondelingenplaat sub-region, which is an older industrial area, most soil contamination is present. In this area the most change locations are also available, so there are likely greater effects. The areas Europoort and Maasvlakte later built as an industrial area, but here are soil contamination present, albeit to a lesser extent than in Botlek Vondelingenplaat. The expected impact in these areas are therefore smaller.

Water depth

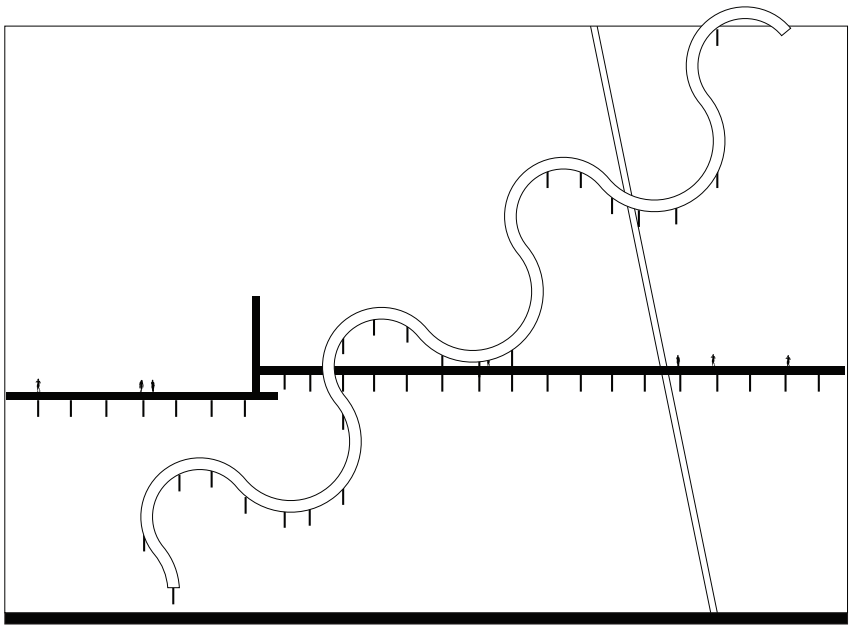
Legend

- 0-5m
- 5-15m
- 15-20m
- 20-25m
- 25-35m

0 0,5 1 2 5

Water depth in the port is very important for the navigation of vessels. Due to the fact that ships are getting bigger and bigger, certain areas of the port in the future wont be able to host bigger ships. For that reason, the port decided to construct Maasvlakt out in the north sea

2.2. Accessibility analysis



Landcover/ open space

Soil contamination

Water depth

Fauna/ Flora

Soil typology

Vehicular accessibility

Legend

A15 Highways

Secondary roads with cycle lanes

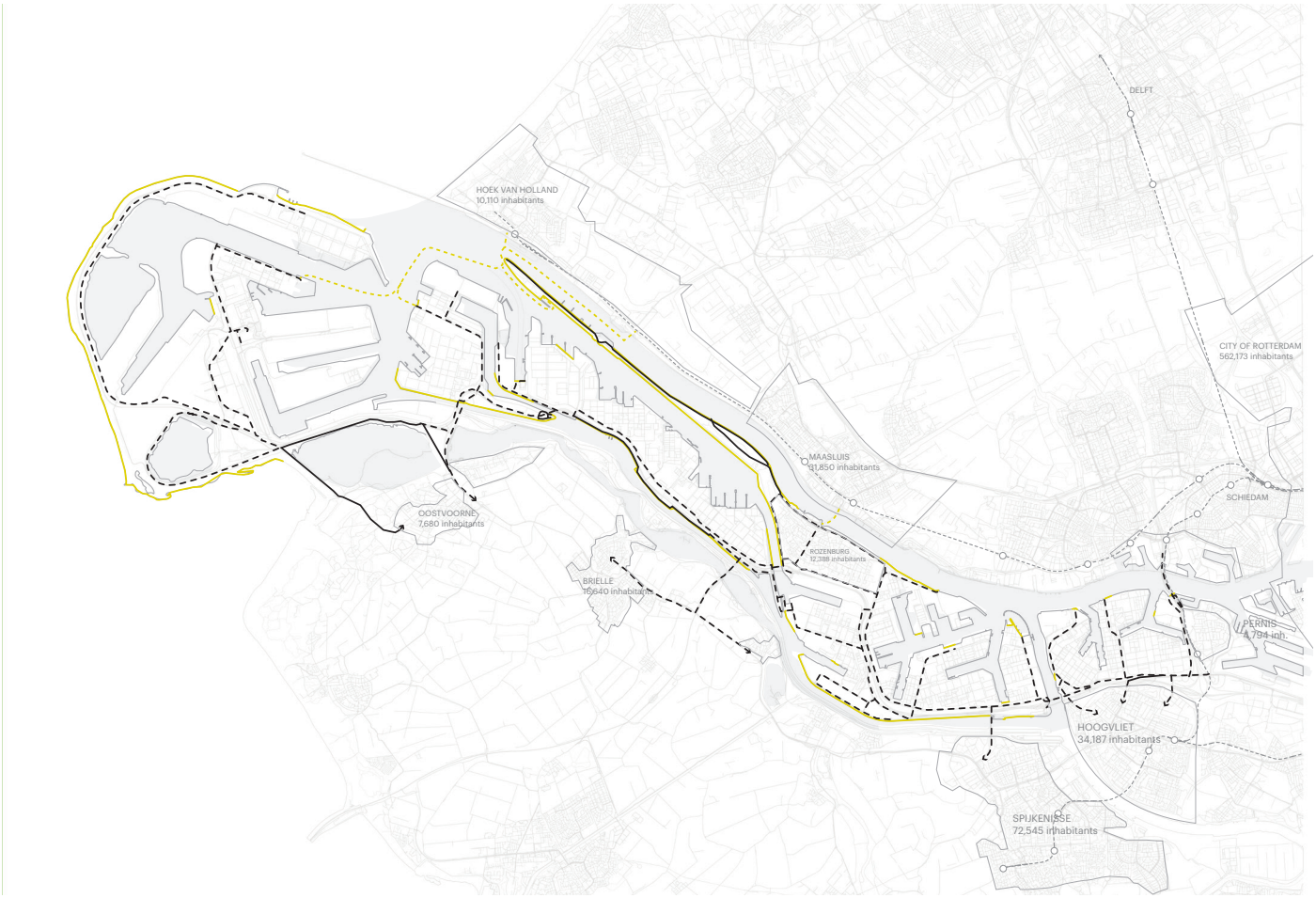
Secondary roads

Car ferry line

0 0,5 1 2 5

Port of Rotterdam is very well connected with the region via extensive infrastructure lines for mainland shipping. The government decided to build new bridge over the mass between Rozenburg and Maasluis, where today is operating car ferry and in that way connect even bet-ter the north and the south of the region

Non vehicular accessibility



Legend

- Roads with cycle lanes
- Recreational cycle lanes
- Ferry boat
- Public water side and quay
- Public transport (Metro & Train)

Internal accessibility is very restricted but still it is possible to reach some of the areas inside the harbor. The main corridor is mainly on the south side of the harbor, along the highway A15 corridor and than some diagonar roads that connect the highway with the river is some places. But still moving trough the harbor presents big issue to be tackled via the strategic design proposal.

Edge typology

Legend

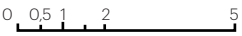
Hard edge quay walls

Basalt stone blocks

0 0,5 1 2 5

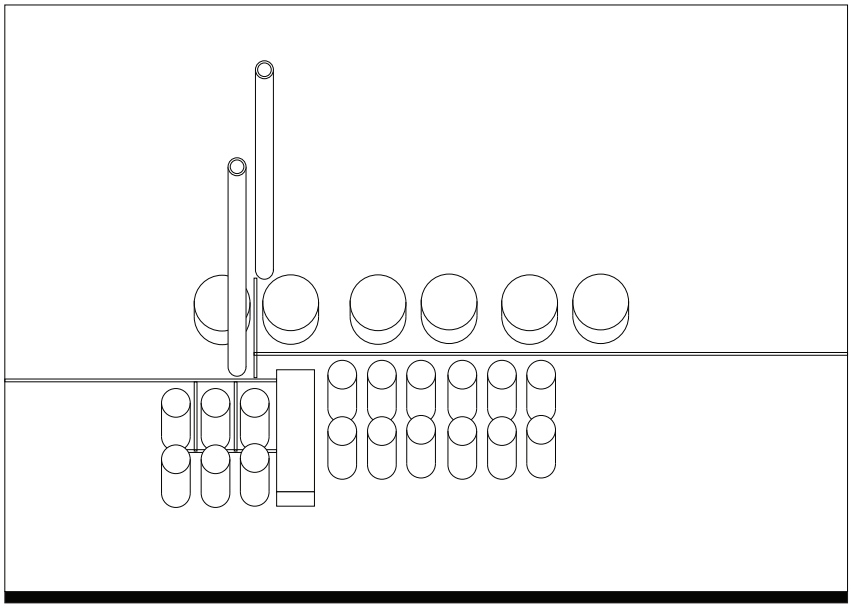
The contact with the water is restricted in the Port but still happens in some areas. There are 2 main typologies of kades in the port and both of them do not reinforce the biodiversity of the port. This should be taken into consideration while making a proposal in order to diversify the contact with water and also enhance the water-port cultural heretage.

Acessible edges



The contact with the water is restricted in the Port but still happens in some areas, mainly in relation to non-industrial areas and infrastructure lines on the south of the Port and Landtong Rozenburg area and Maasvlakte beach area.

2.3. Occupation and program analysis



Landcover/ open space

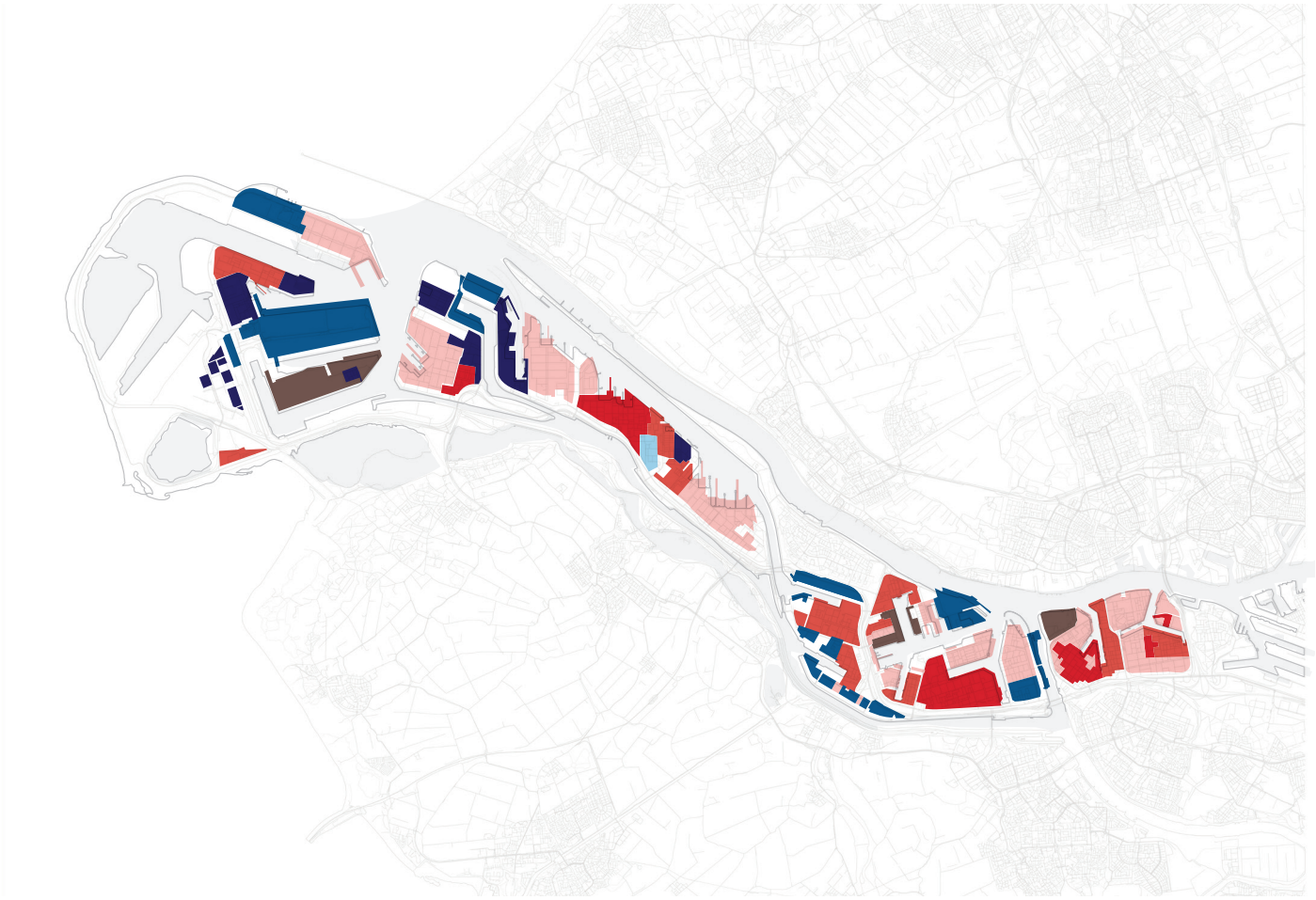
Soil contamination

Water depth

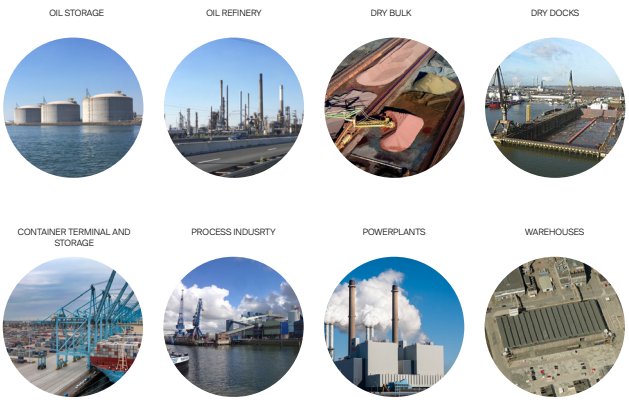
Fauna/ Flora

Soil typology

Occupation



0 0,5 1 2 5



Legend

- Oil refinery
- Storage oil and chem
- Chemical manufacturing
- Dry bulk/ Coal
- Bio powerplant
- Dry bulk/ Containers
- Other

Activity classification and occupation patterns of the port are excluseviely industrial. It is visible (in red) that the maijority of the port is dealing with petrochemical and chemical activities. Smaller number is reserved for dry bulk (mainly for iron ore and coal) which are divided into 4 main terminals. Apart from this, the logistical parts of the harbor are visible, the container terminals and ro-ro terminals.

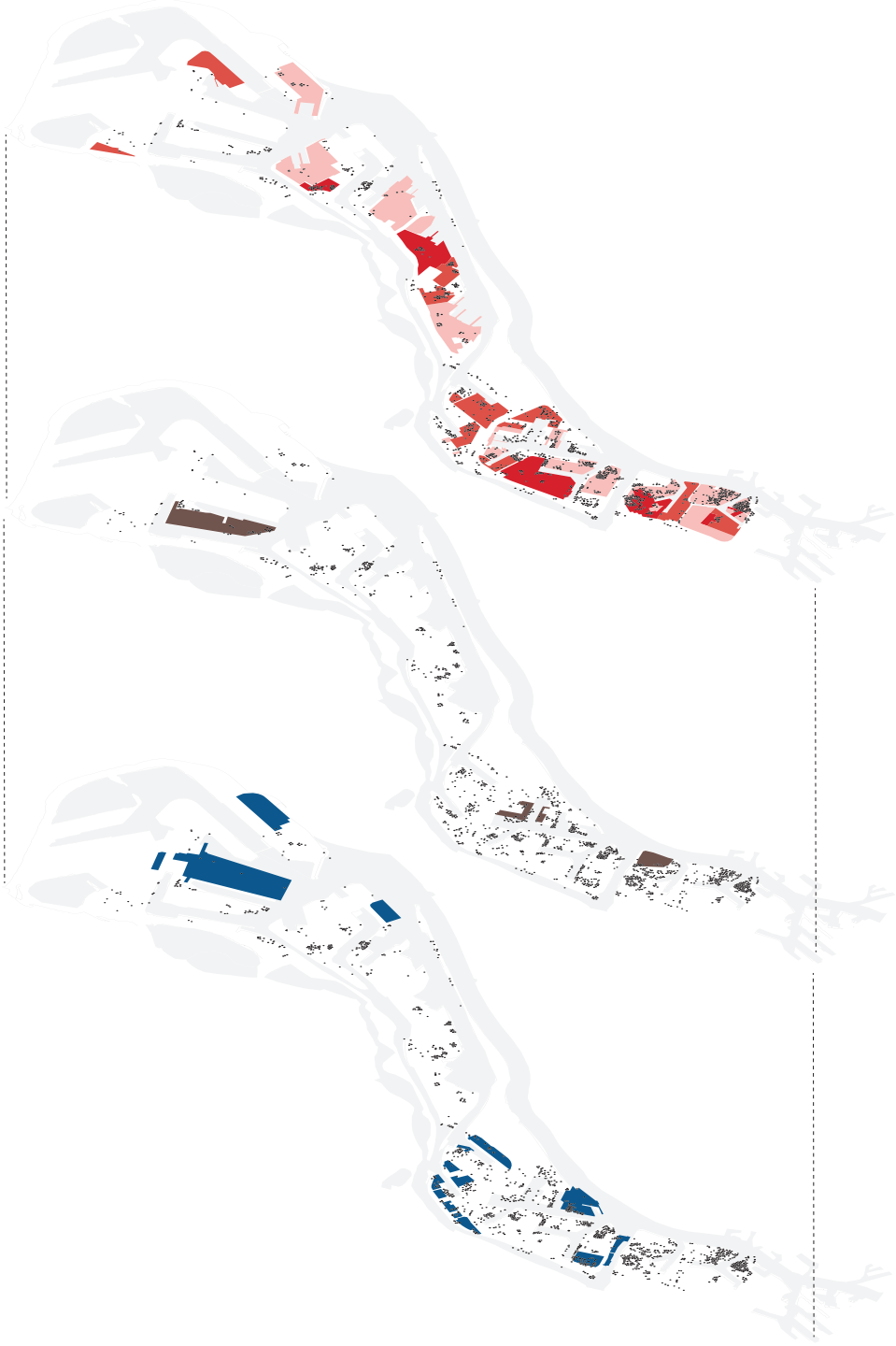


Fig. X.Y.
From the pollution parameters, it is visible that the majority of the petrochemical and chemical industries are related to the soil contmaination, via leakege, effluents, spills, etc.

Fig. X.Y.
Dry bulk is also a contaminating occupation that also creates problems inside the harbor waters at the bottom, due to the flow of goods from and to the cargo ships.

Fig. X.Y.
In a smaller measure the non bulk terminals and other are creating also degradation of the port substratum.

Public facilities

Legend

0 0,5 1 2 5

1. Eetkaffe botlekbrug
2. Restaurant de Punt
3. Picos Pit Stop
4. Freddy's
5. Hondenschool
6. Ruiterervaringen
7. Educatiefinrmatiecentrum
8. Paardenhhouderij
9. Modelvliegvereniging
10. Trial and offroad club
11. Restaurant de pioneer
12. The Pub
13. Petitrestaurant de Albatros
14. Mobiel snackbar Lenny
15. Schietbat Europoort
16. Routiers restaurant
17. Futureland
18. Snack bar
19. Snack bar

The port does offer public facilities but they are not enevly distributed. Trought the port there are mainly snack bars and restaurants (used mainly by the port workers, lorry drivers and beach visitors) and some other functions in the Landtong area park. These are dog training facilities, or horse riding schools, as well as the model aviation clubs. These facilities are mainly used by the inhabitants of the Rozenburg area.
Modified from: DCMR Milieudienst Rijnmond, 2010

Security zone

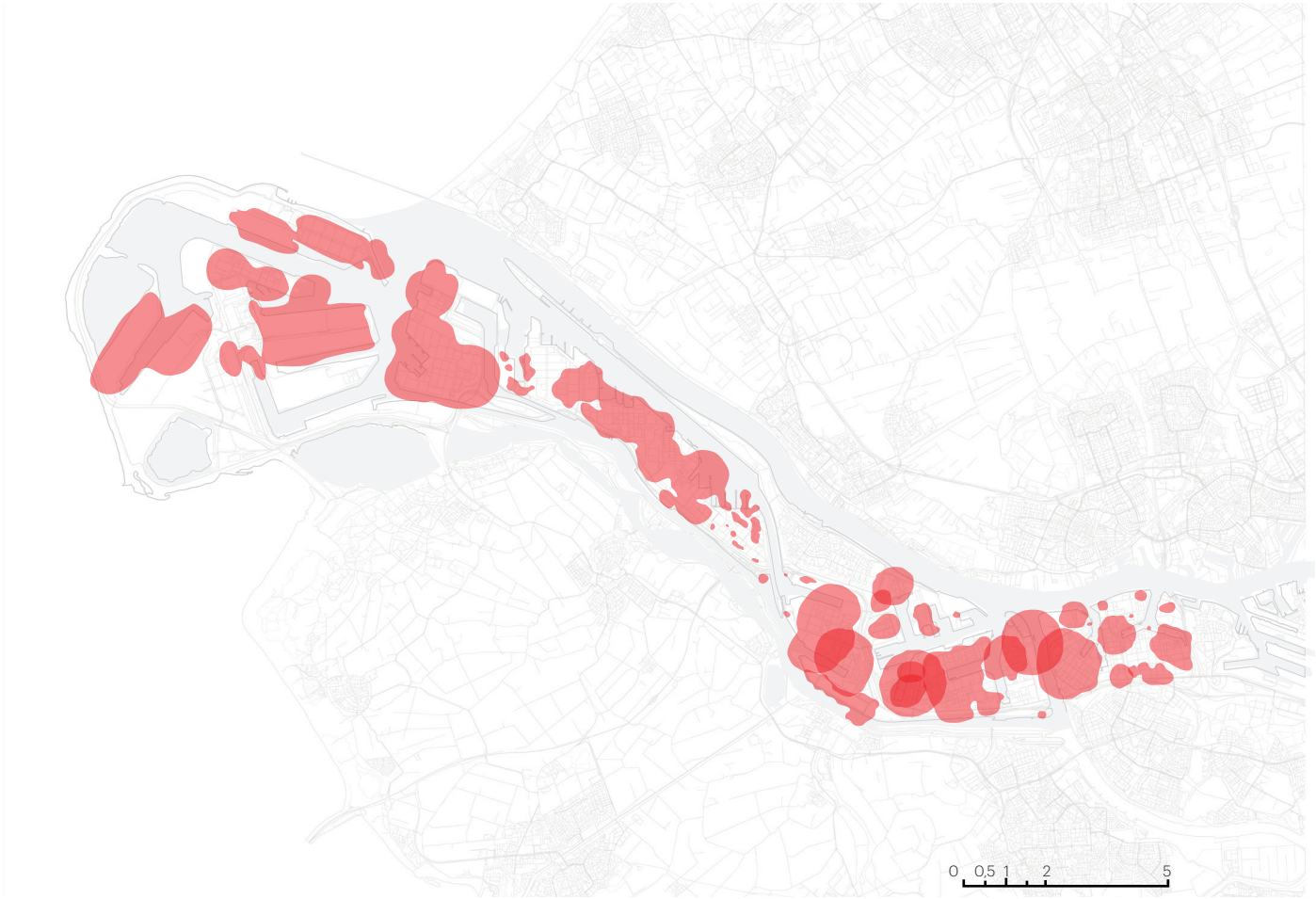


Figure showing the security perimeters due to dangerous industries. Some of the activities are forbidden or restricted in these areas. This doesent apply for the accessibility.
Modified from: Veiligsheidcontour; DCMR Milieudienst Rijnmond, 2010

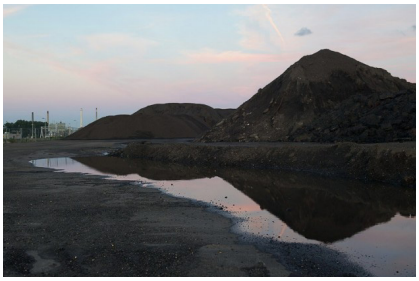
COGNITIVE DOCUMENTATION

Fig. X.Y.
PERNIS-BOTLEK
-Morphology: M, S
-Biodiversity:Low -Scale of Pollution: High
-Time: 60 years
-Water depth: Medium

Source: http://www.studiovandamme.com

Source: http://www.studiovandamme.com

Fig. X.Y.
EUROPOORT
-Morphology: L
-Biodiversity: High
-Scale of Pollution: Medium
-Time: 35 years
-Water depth: Medium



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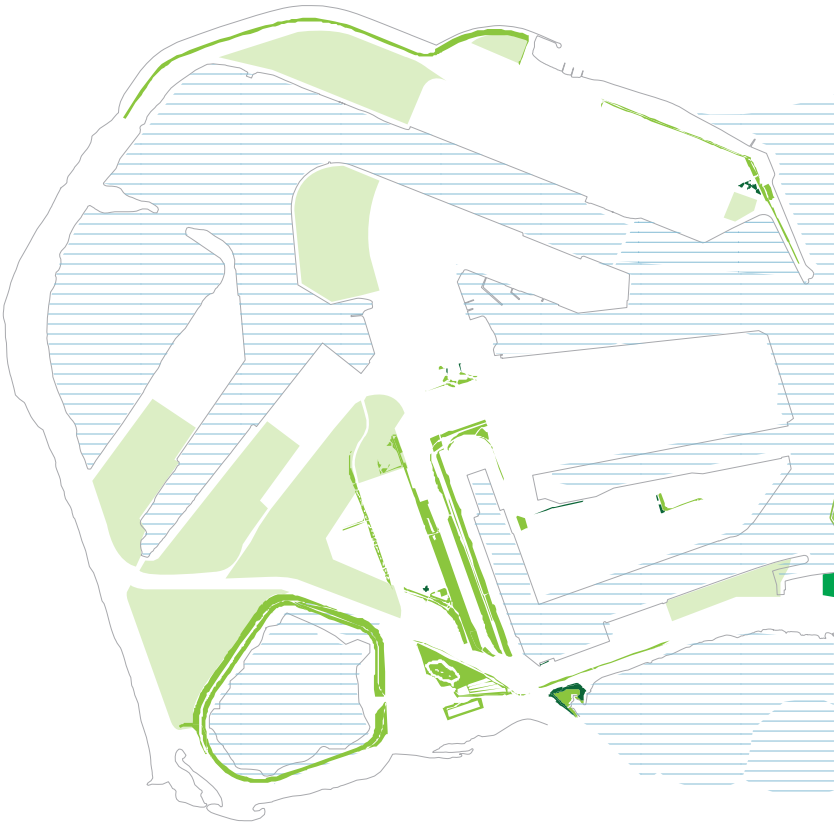


Fig. X.Y.
MAASVLAKTE
-Morphology: XL
-Biodiversity: High
-Scale of Pollution: Low
-Time: 10-15 years
-Water depth: High

Source: http://www.studiovandamme.com

Source: http://www.studiovandamme.com

Source: http://www.studiovandamme.com

Source: http://www.studiovandamme.com

Fig. X.Y.
Photo documentation


DESIGN ELEMENT
TRANSITION
CONTRASTS
LANDSCAPE
GEOLOGIC
COGNITION
SOCIETY

3.

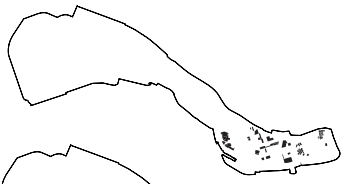
Landscape Operation Strategy

Multiscalar approach

The port of Rotterdam is a 40 km long terminal located at the confluence of two mega-systems, the Holland's North Sea zone and the Rhine Maas Delta. This favorable geographical location allowed the port to be the connection between the faraway locations from the "Russian oilfields to the Suez Canal, to China, to Brazil and the Panama Canal" passing trough the hinterland and the German Ruhr district. (Steenhuis 2015)

Landscape operations strategies

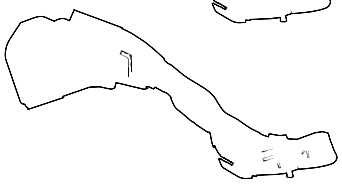
Cleaning



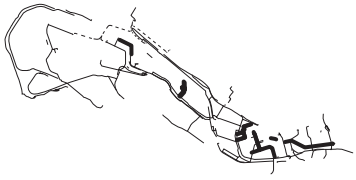
Growing

Protecting

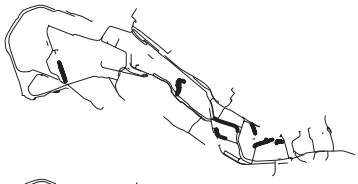
Allowing sedimentation



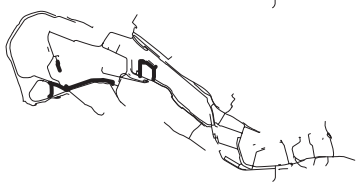
Experience pathways



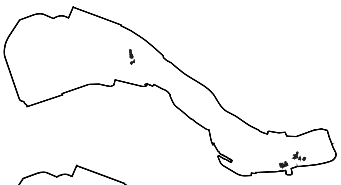
Adapted rail pathways



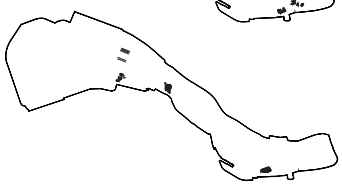
Hidden pathways



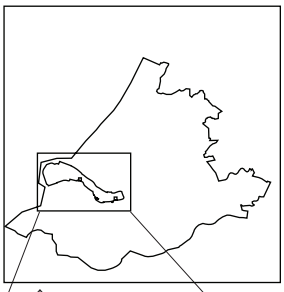
Retrofitting



Reprogramming

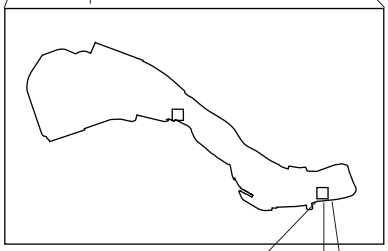


Macro

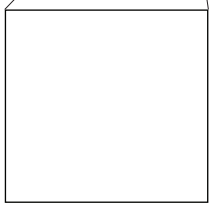


Reflection

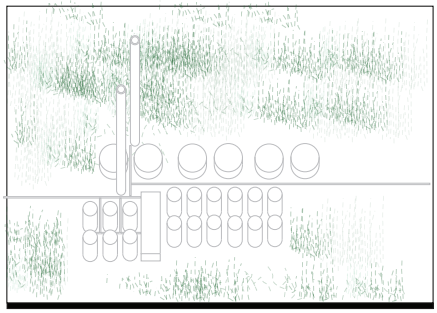
Meso

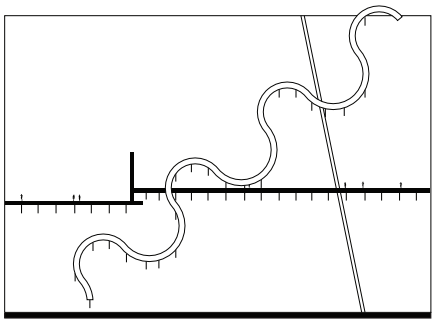


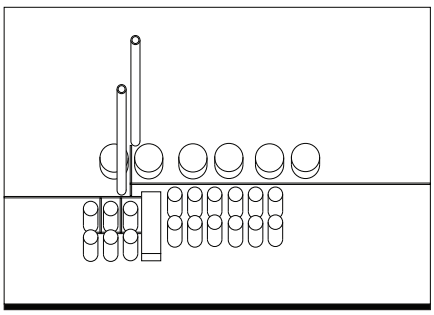
Micro

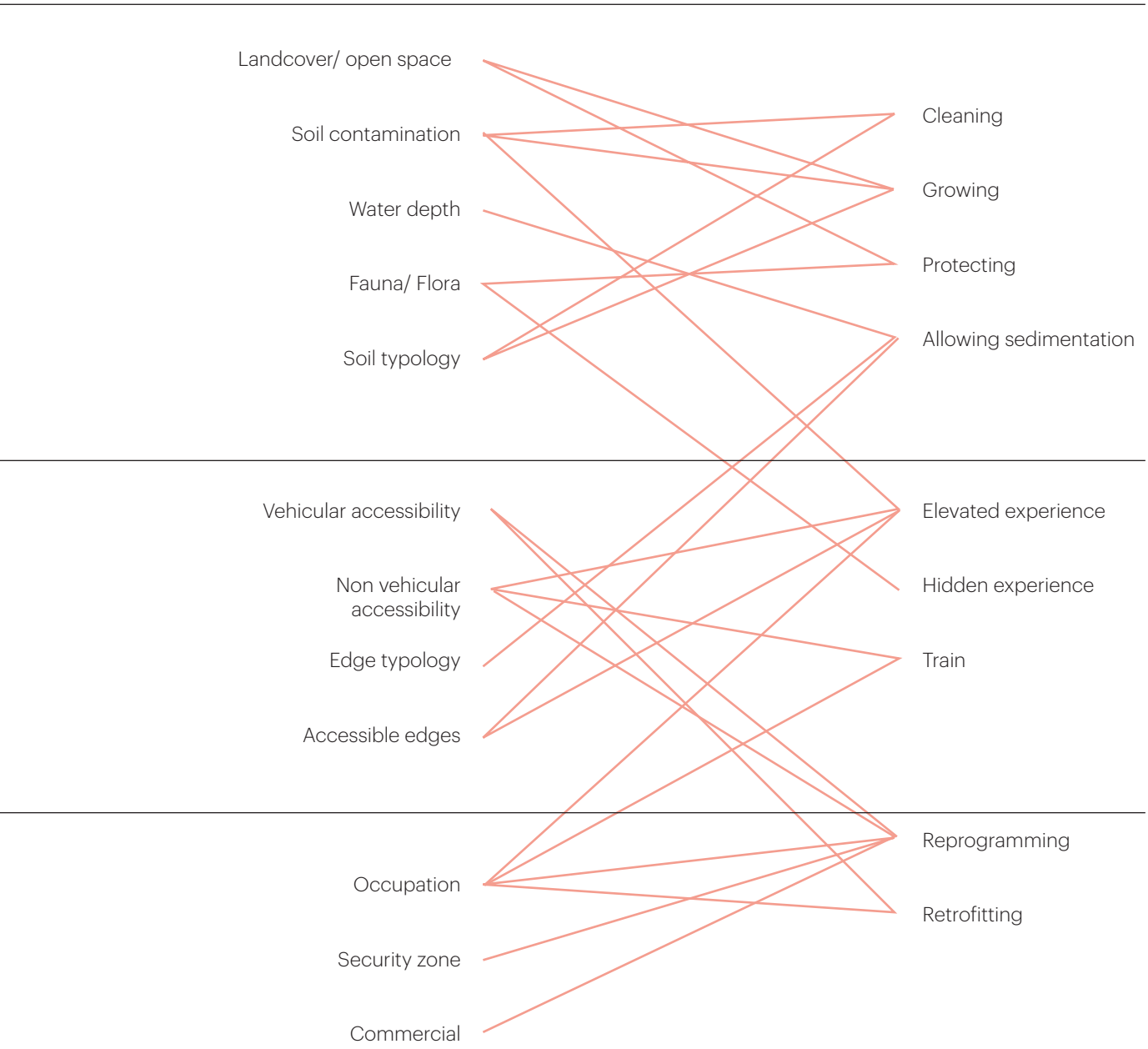


From analysis to landscape syntax

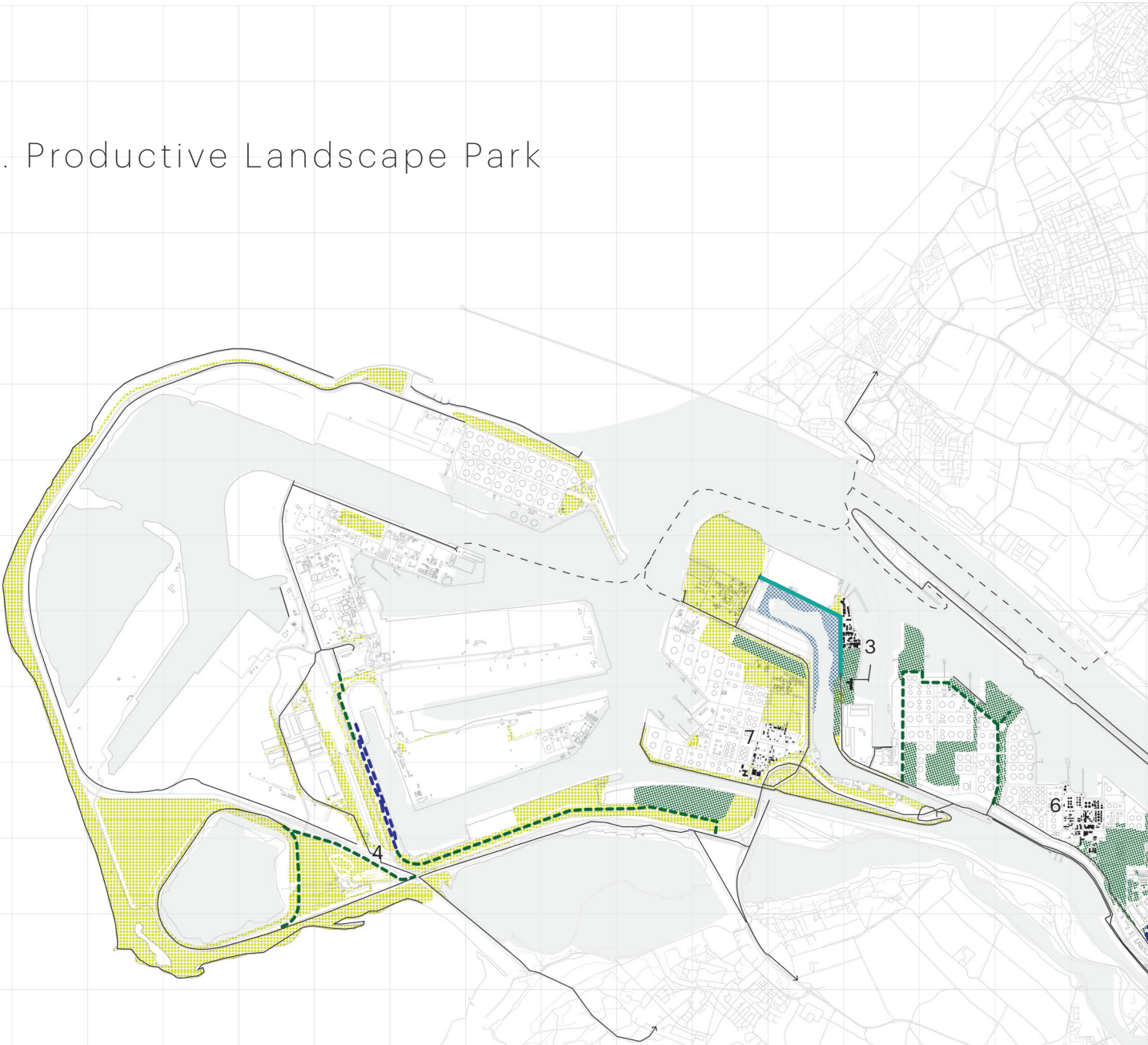







Landcover/ open space
Soil contamination
Water depth
Fauna/ Flora
Soil typology
Vehicular accessibility
Non vehicular accessibility
Edge typology
Accessible edges
Occupation
Security zone
Commercial
Cleaning
Growing
Protecting
Allowing sedimentation
Elevated experience
Hidden experience
Train
Reprogramming
Retrofitting

1.4. Productive Landscape Park



PATCHES

- Cleaning
- Growing
- Protecting
- Allowing sedimentation

CORRIDORS

- Sensory experience pathways
- Reclying railway pathways
- Hidden experience pathways
- Existing non vehicular accessibility

NODES

Re-programming

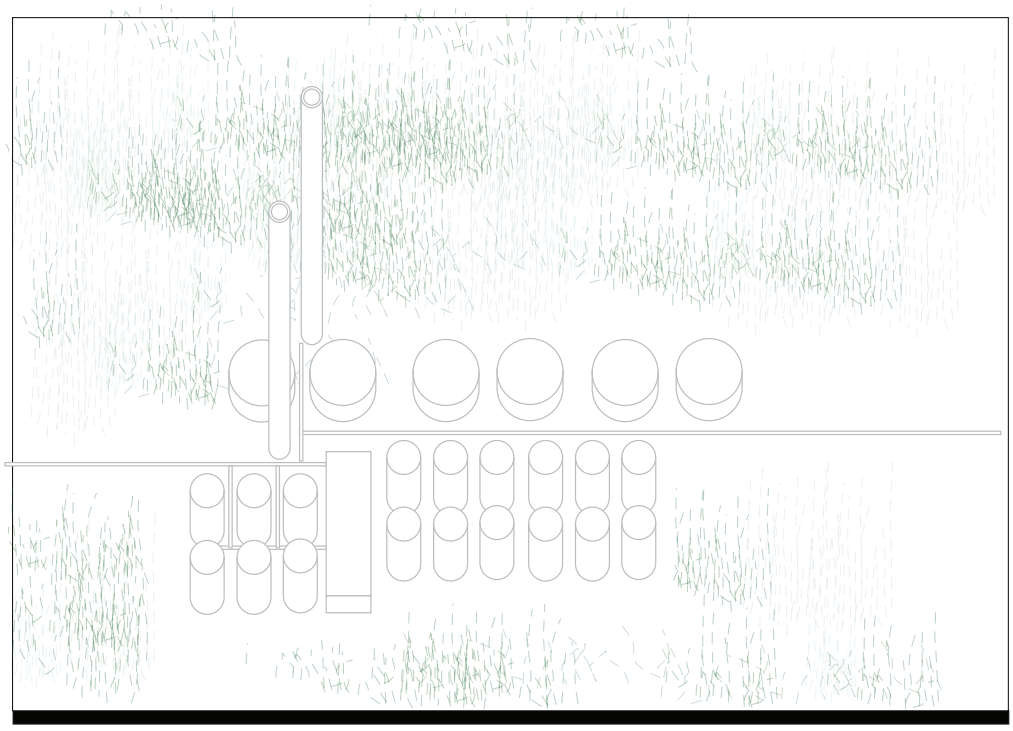
1 Refinery cultural heritage centre
2 Bio-chemistry research centre
3 Lunar landscape cultural heritage
4 Biodiversity institute

Retrofitting

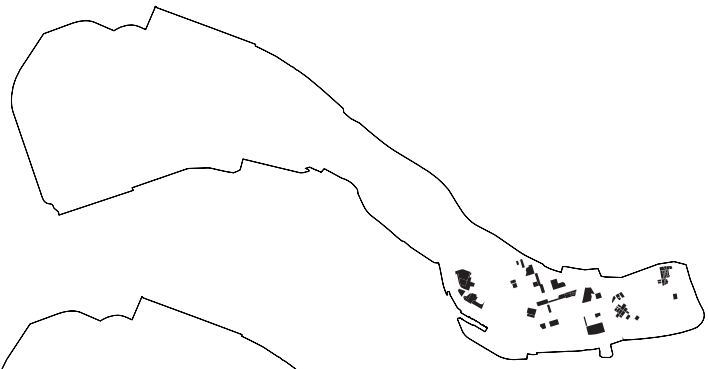
5 Biorefinery Botlek
7 Biorefinery Europoort
8 Biorefinery Europoort II


1
2
5

Patch landscape strategy

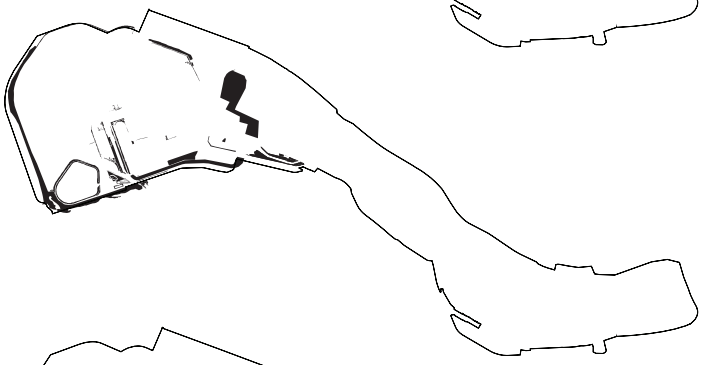


Cleaning



Growing

Protecting

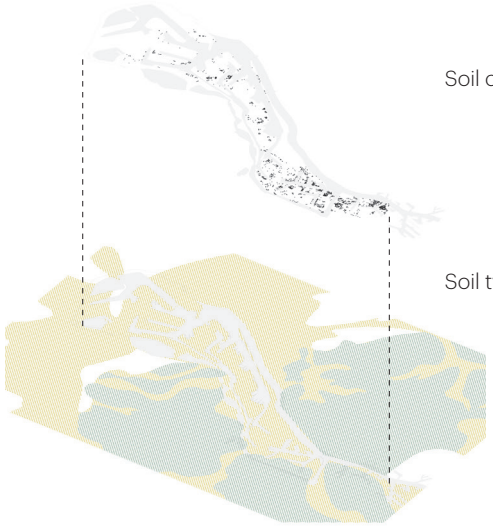


Allowing
sedimentation

Cleaning contamination

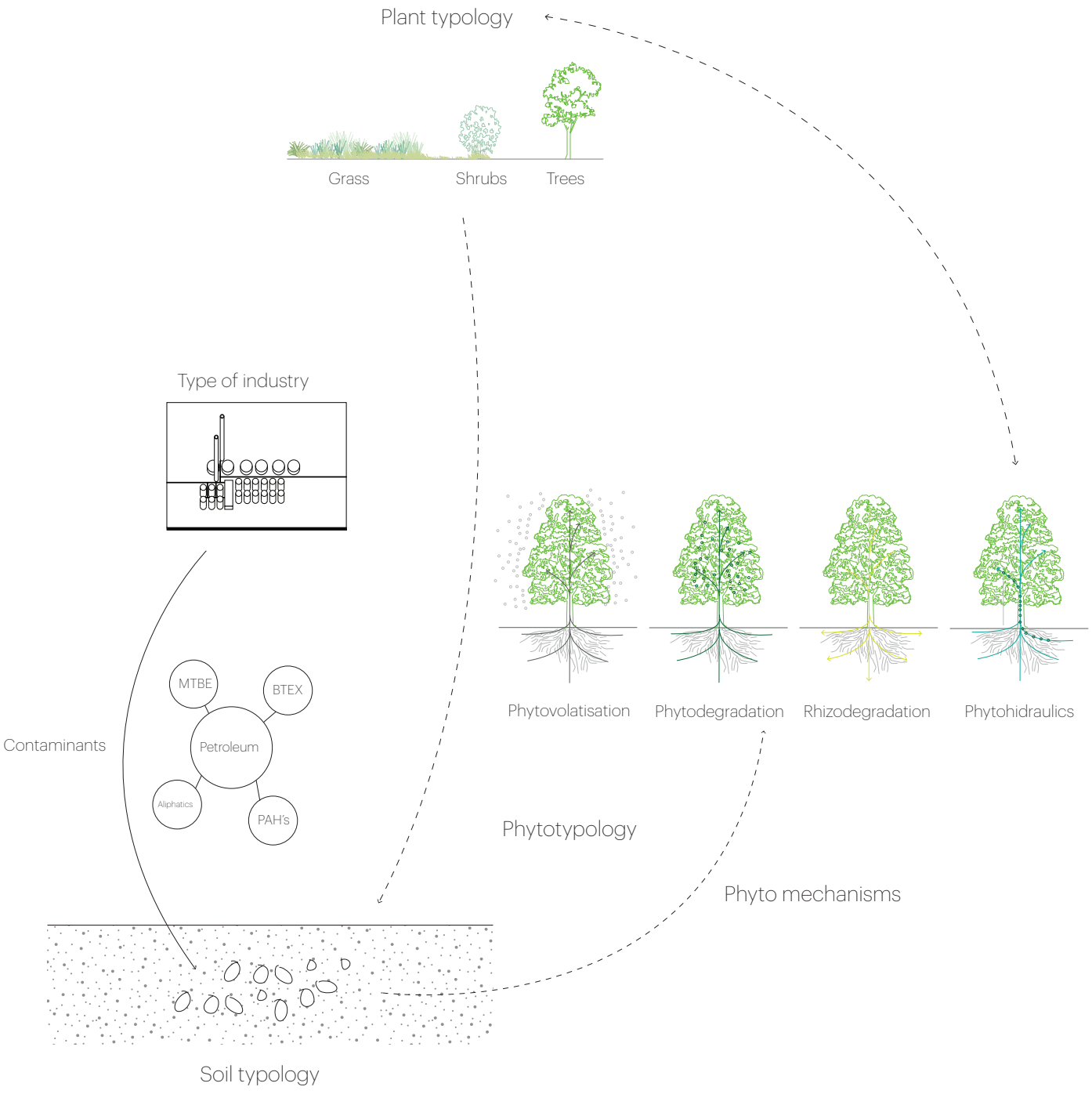
0 0,5 1 2 5

Analysis input



Organic pollutants
According to Kirkwood & Kennen (2015): "Organic pollutants are compounds that typically contain bonds of carbon, nitrogen and oxygen, are man-made and foreign to living organisms. Since these pollutants are compounds, many can be degraded, breaking them down into smaller, less toxic components." Organic contaminants may be degraded in the subsurface root zone, taken into a plant, bound to the plant tissues, degraded to from non-toxic metabolites or released to the atmosphere. Contaminant groups related to petro-chemical industry are: oil, gasoline, benzene, toluene, PAH's and additives such as MTBE and typical sources are fuel spills, petroleum extraction, leaky storage tanks, industrial uses, railway corridors. (Kirkwood & Kennen, 2015)

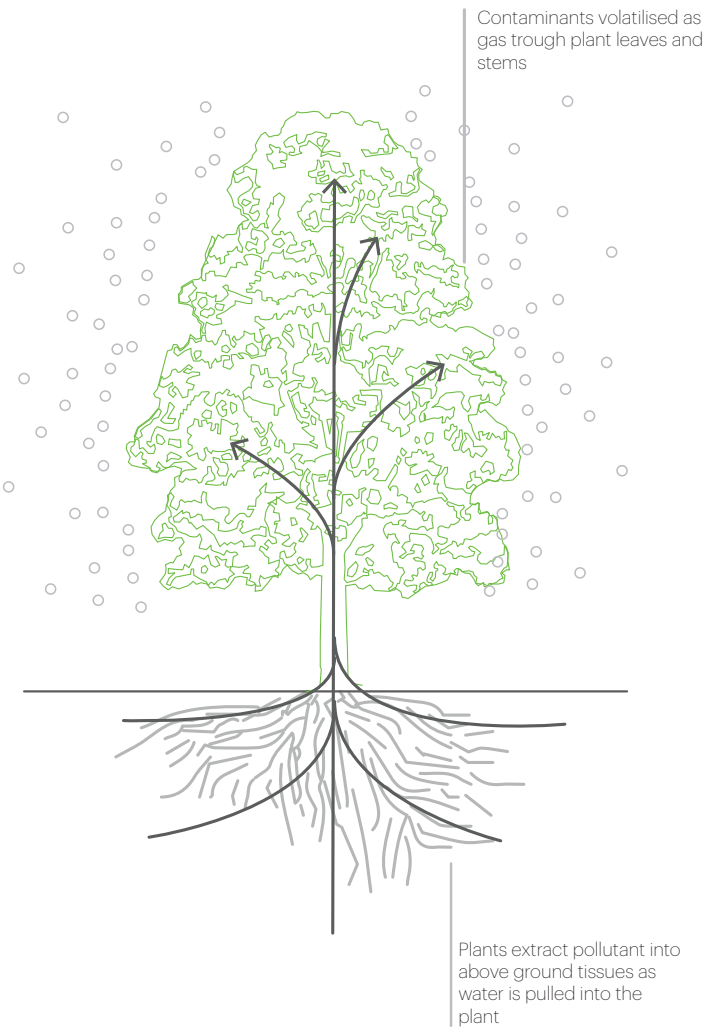
This strategy objective is to start cleaning contmaination and work together with the ongoing industry. In this way the soil can be remediated for the future purposes that might include more urban functions.



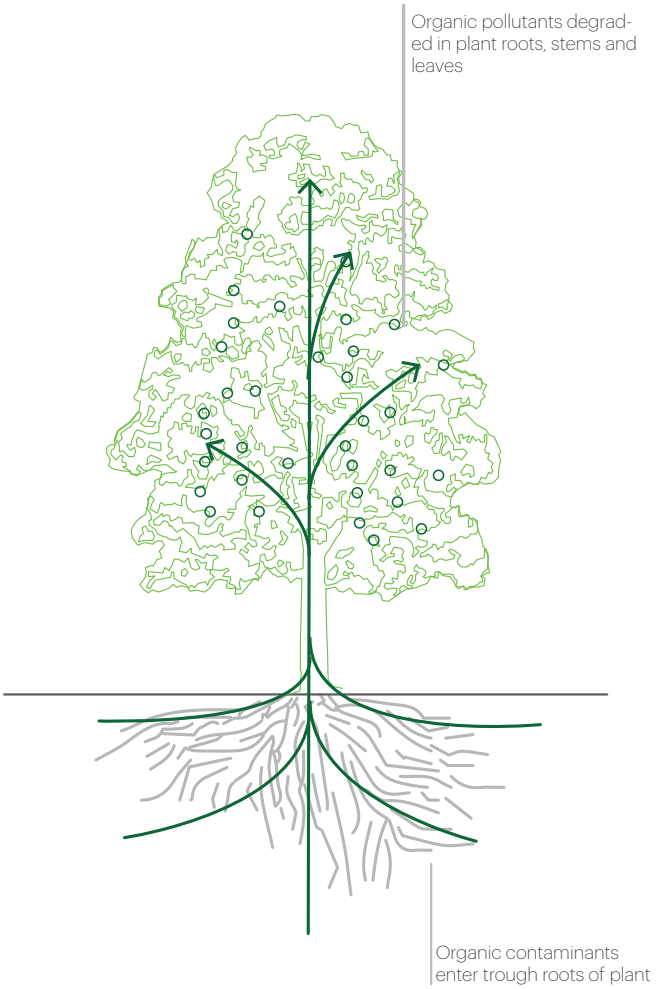
How things are related in Phytotechnologies

One must take various factors when planning for phytoremediation. First-hands, type of contaminants is important. In Port of Rotterdam soil contaminants vary from organic (petroleum compounds) to inorganic (metals). Once, type of contmainant is established, various types of pyhtomechanisms must be taken into consideration, regardin the plant typology, contaminant depth, mobilisation and etc.

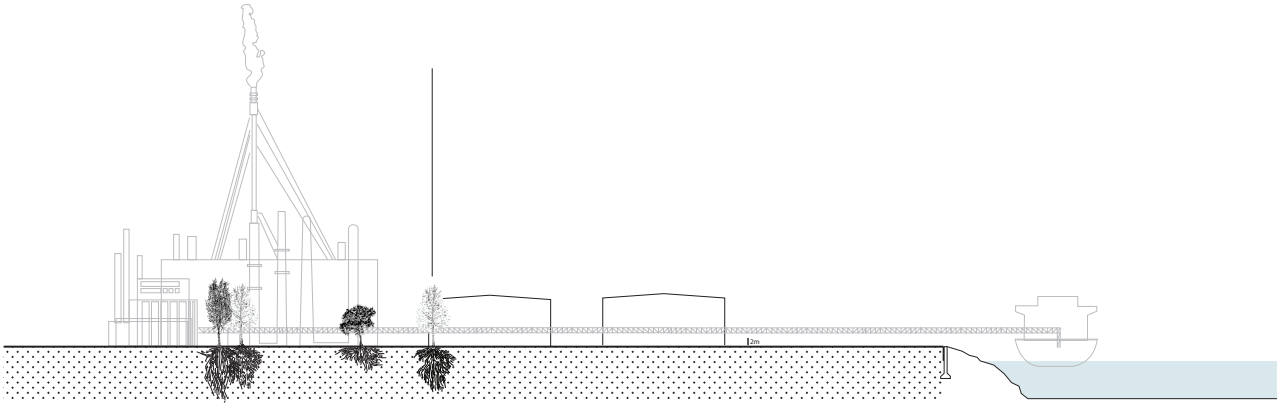
Main four mechanisms that are utilized in order to clean the organic pollutants and hydrocarbons are rhizodegradation, phtohidrauics, phytovolatilization and phytodegradation.



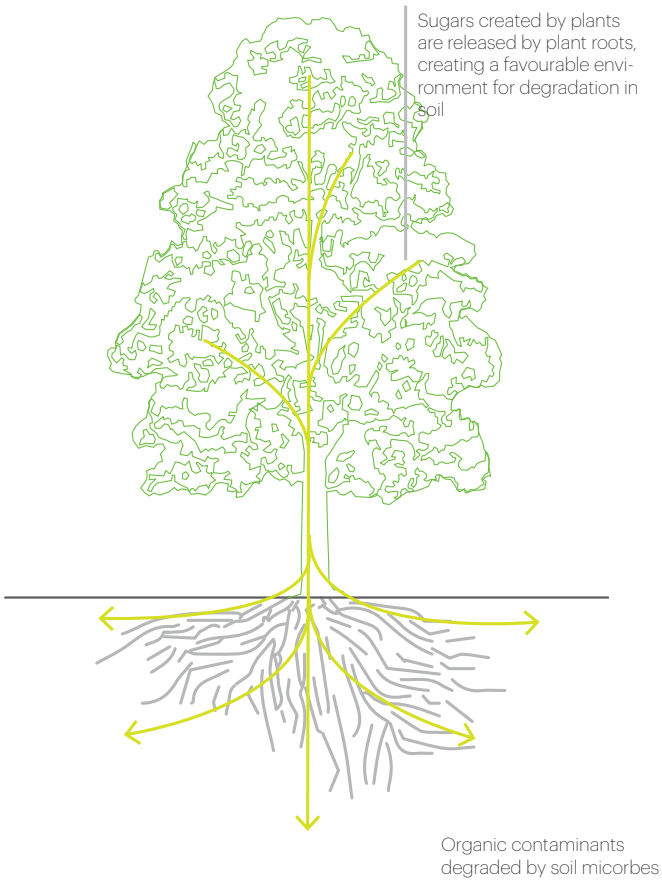
PHYTOVOLATISATION: Plant extracts and then releases contaminat as a Gas



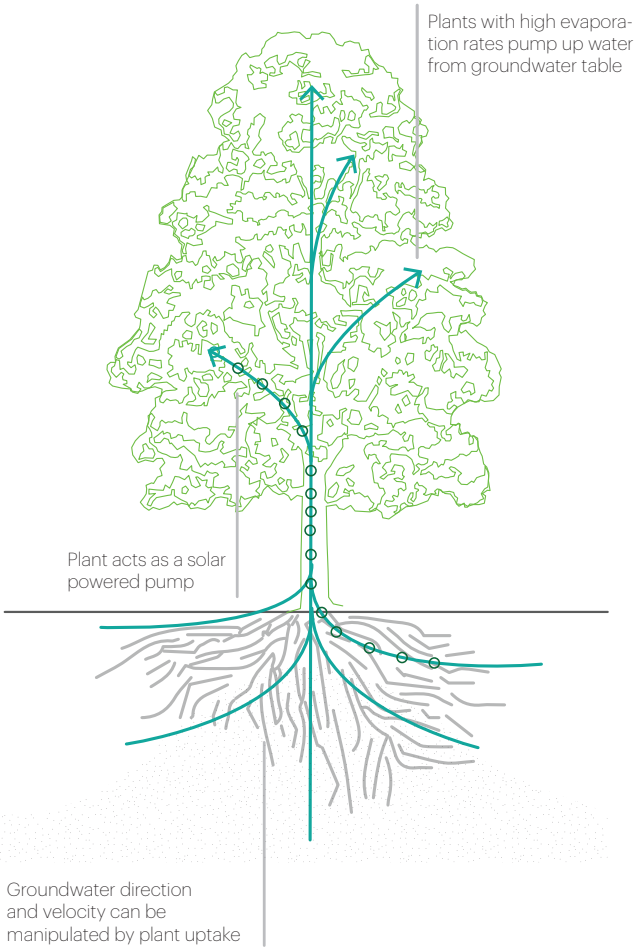
PHYTODEGRADATION: Plant destroys contaminant



PROCESS/ DYNAMICS



RHIZODEGRADATION - Soil Micorbes Destroy Contminant



PHYTOHIDRAULICS Plants change Groundwater Hydrology, Take up water and contaminants

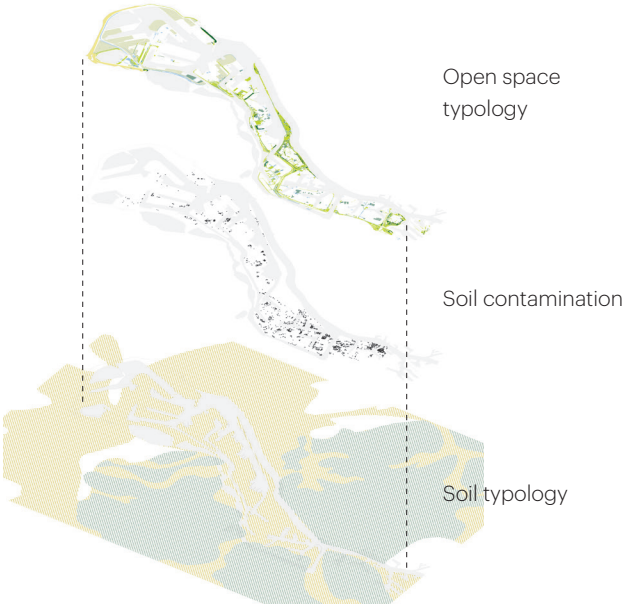
Modified from: Kirkwood & Kennen (2015)

Current state of petrochemical storages

Immagination of phytoremediation + petrochemistry

Growing

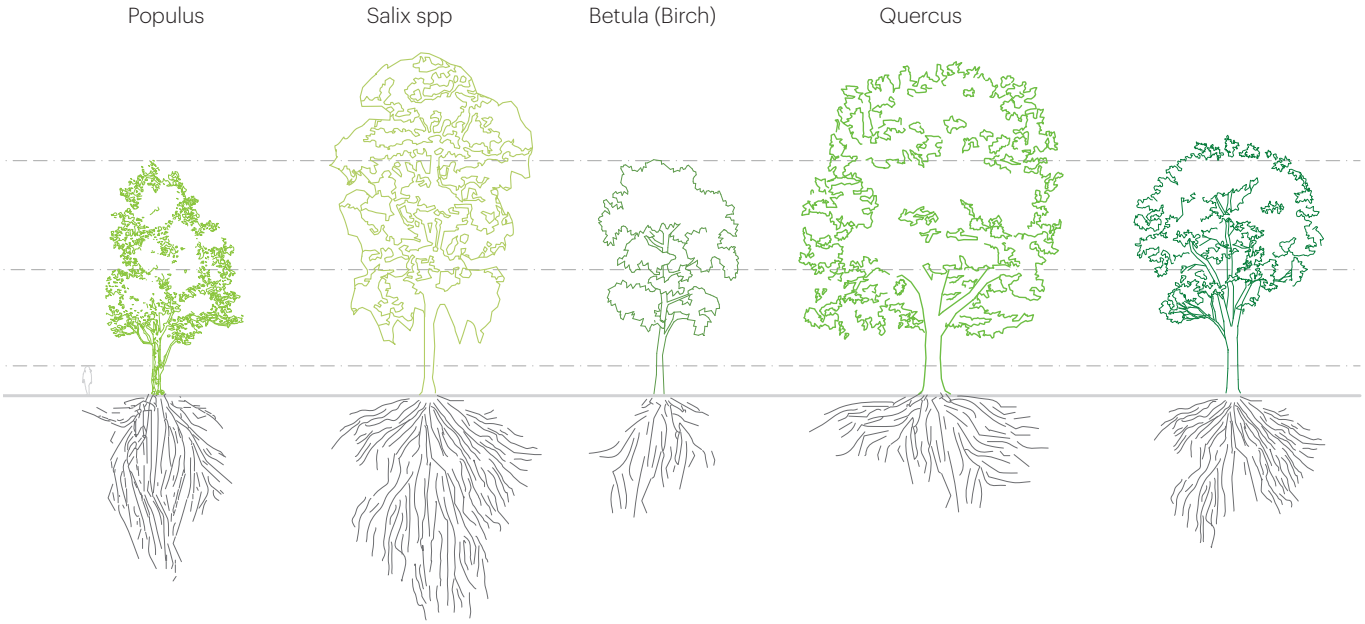
Analysis input



Problems:
In the areas of Europoort there are certain areas of open unused land, affected by the soil contamination issues. On the other hand there are some existing woodland areas and corridors (high power lines corridor) that already have embedded ecological qualities. The strategy seeks to maximize and use the possibility of these big areas as 'silviculture' farms, especially for types of plants that have the possibility to grow quickly in short period of time, giving high possibility to produce biomass.

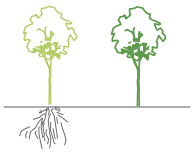
Objectives:
-Growing of trees, crop cultivation and differentiation of species
-Phytoremediation of contaminated soil
-Biomass production, air filtration for carbon sequestration

Operations that allow existing forest patches and new agri-forestation fields to combine inputs of energy and plant-ing, and turn poluted and underused patches into pro-ductive areas with beneficial products and services.

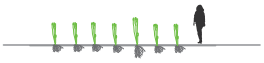


Tree plantation scheme
Different tree species were chosen that are suitable to grow in the Rotterdam region area. These tree species are both fast growing species that can produce higher amounts of biomass in shorter period of time. On the other hand, these tree's are the most used species when it comes phytechnology of the soil contaminated with hydrocarbon compounds (contaminants due to the petrochemical industry)

TREE PLANTATION

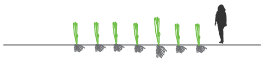


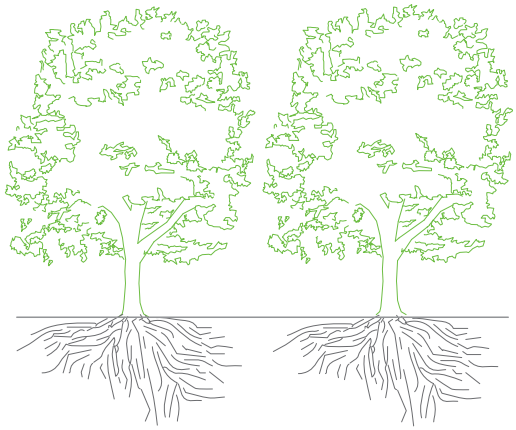
FOREST PLANTATION



Planting

ENERGY FOREST

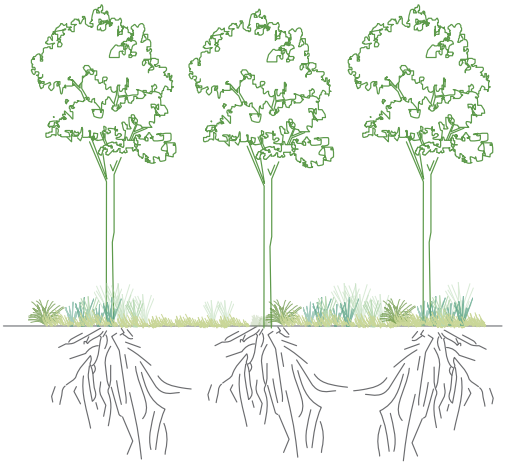




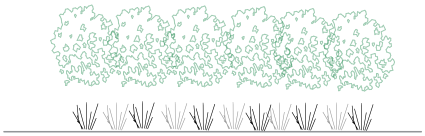
Tree plantation

Creation of natural areas

Intercropping / Fertilization



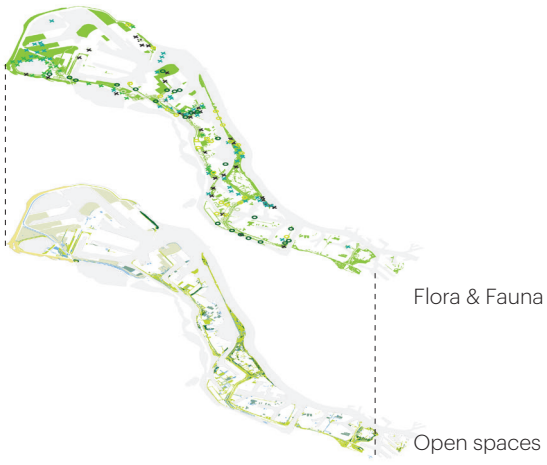
Diversified high forest



Protecting nature (contain+frame)

0 0,5 1 2 5

Analytical input



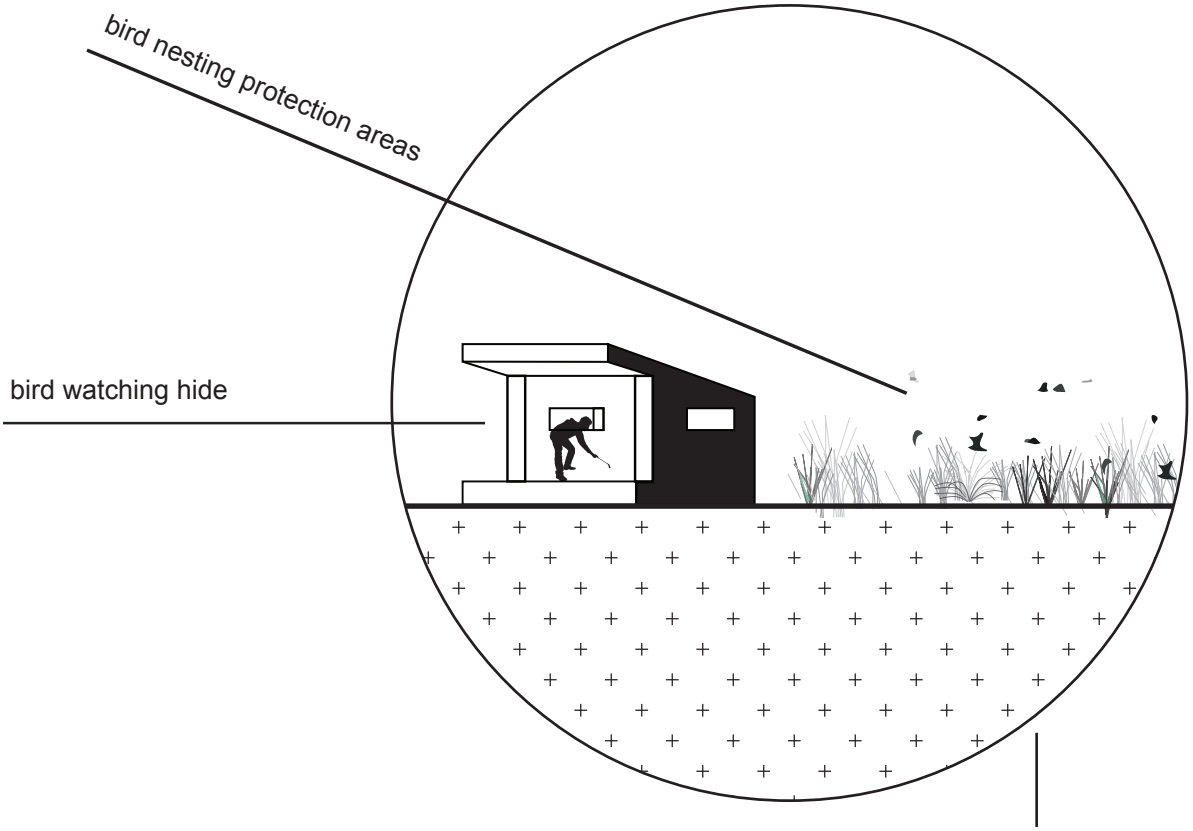
Objectives:
-contain and frame the nature reserves
-make preservation policies that forbid further industrial land consumption
-create observatories and hiding huts for nature watchers and researchers

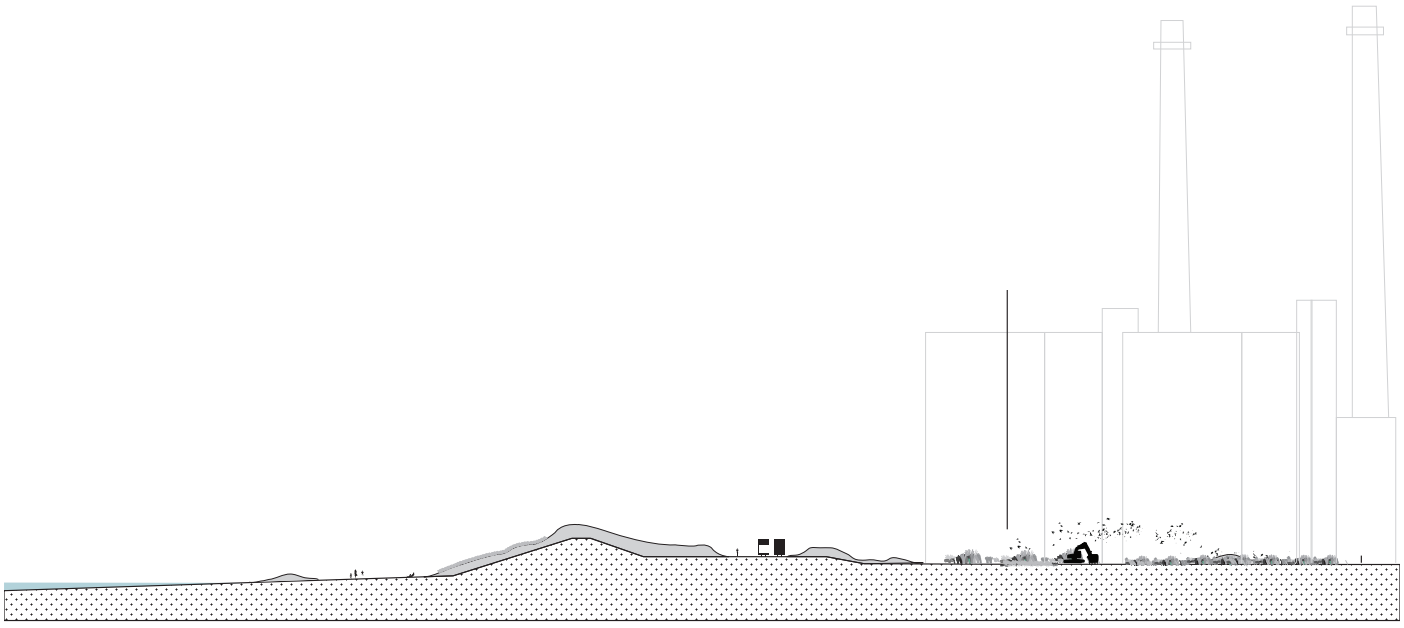
Port of Rotterdam has a distinctive community, mostly in the Maasvlakte area and the Europoort. Maasvlakte partly resembles the coastal dunes like the areas that surround it. The area consists of low pioneer vegetation (very) dry, chalky, sandy soil with a high pro- portion of mosses and grassy vegetation. Virtually anywhere in Maasvlakte you can find breeding birds areas: at the Slufter, temporary bird valley and clay maturing fields are rich in species.

During the migration periods, Maasvlakte and western parts of the Europoort (once a nature reserve) are of very important ecological importance. Compared to Maasvlakte, most (vacant) lots in the Europoort are in a further succession stage. The vacant lots in the east of the Europoort are largely covered with brushwood of reed and sea buckthorn. Such plots have been particularly valuable for breeding birds.

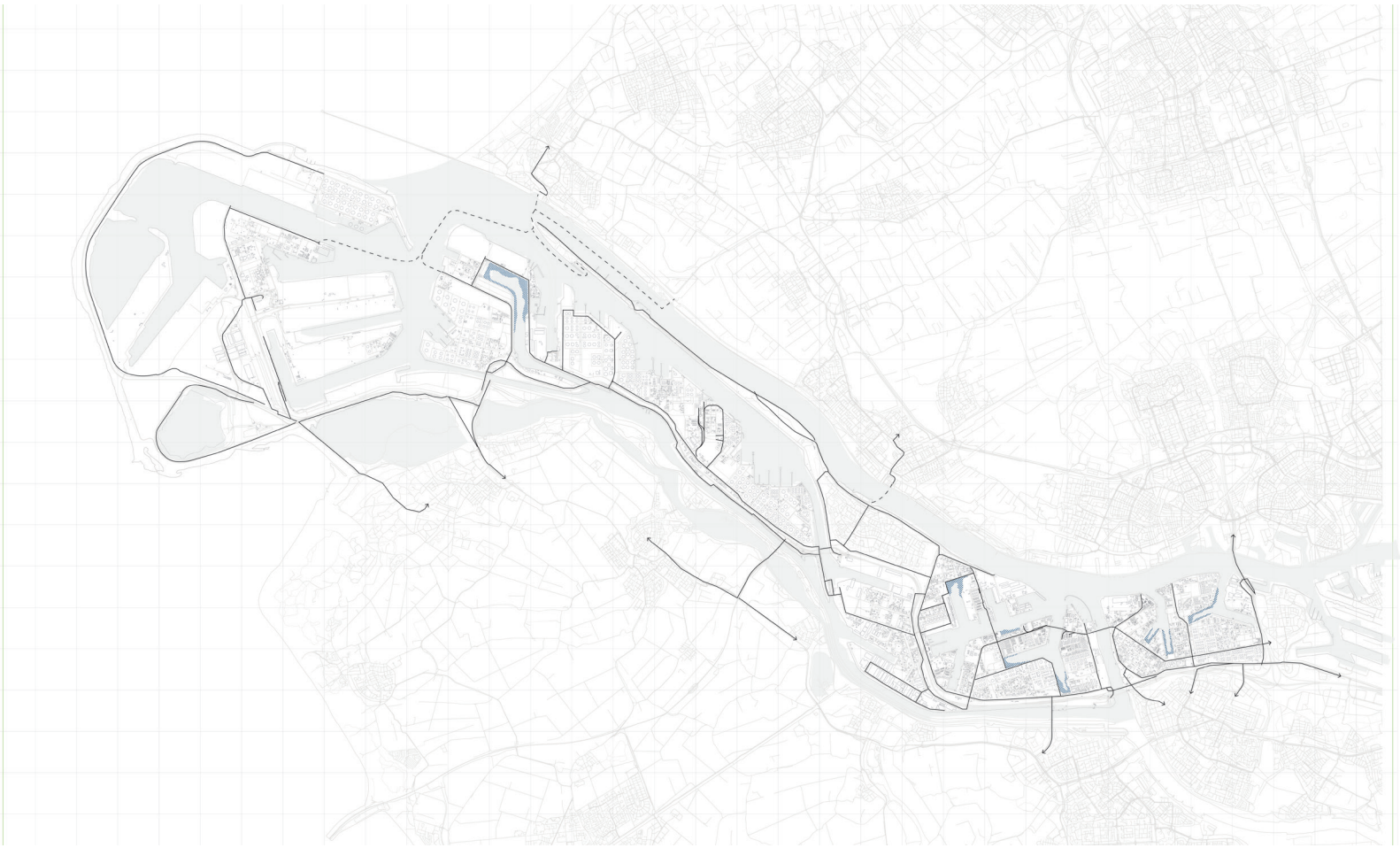
STRATEGY

Strategy is developed in order to protect the areas that already have high ecological quality, and mainly is working in creating frames that could protect both humans and animals. It also works in creating points of observation and protection for humans, especially in the areas where there is high accumulation of breeding bird. Lastly it works in creating policies for protection of nature areas, and discourages future industrial land consumption in favor of nature degradation.

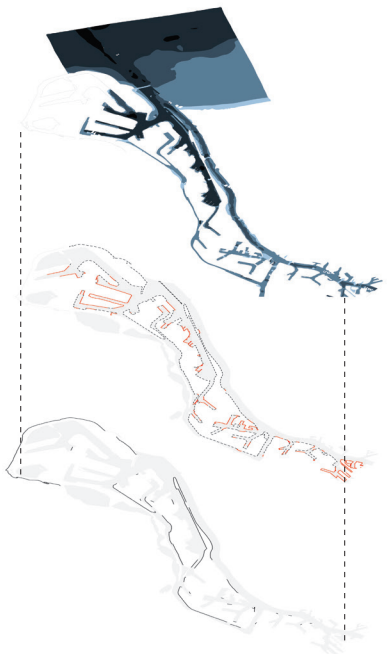

bird nesting protection areas
bird watching hide



Allowing sedimentation



Analytical input



Objectives:
-Sludge sedimentation management
-Creation of 'riparian zones' and more ecological quays that work towards water purification
-Better connection with water in new public areas of the park

Due to the natural process of sedimentation in rivers and the coastal seas, dredging needs to take place to keep the waterways in the Port of Rotterdam at proper depth for shipping.

Dredging itself is quite expensive process and environmentally unfriendly, because it contributes to biodiversity loss. Certain areas of the harbor (especially in Botlek area) are quite affected by this process because of their orientation towards the east, i.e. the river flow.

Current situation

Allowing sedimentation and depositing sludge
(15-20 years)

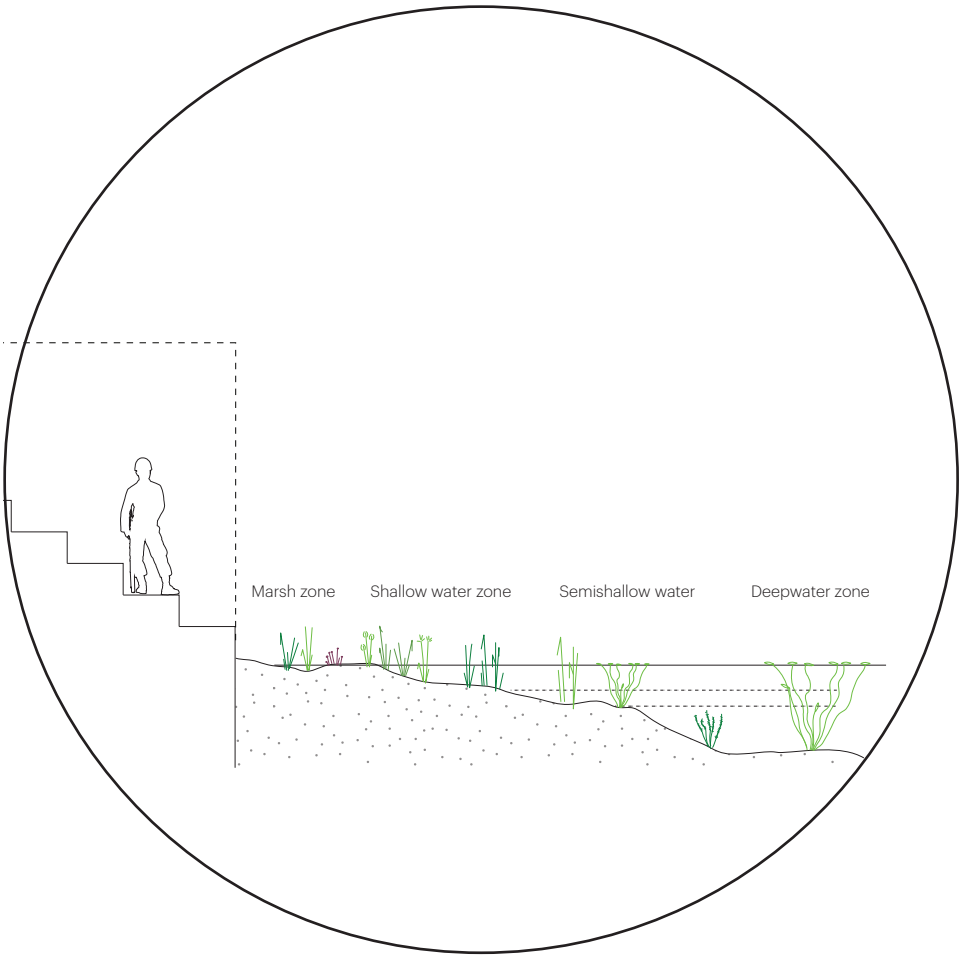
Creation of wetlands and mudflats and intertidal
areas (30-40 years)

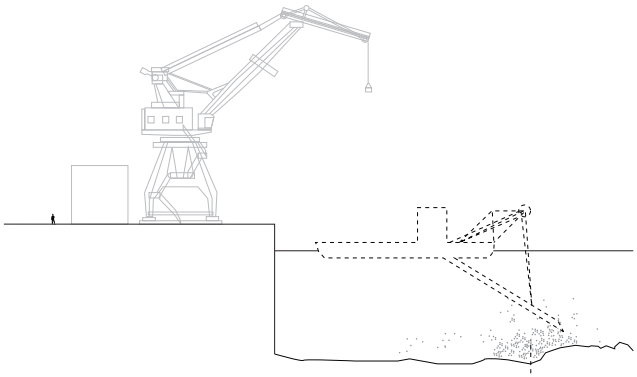
FINISH

The sludge in the waters of Port of Rotterdam comes mainly from the upstream, and yearly 20 million m3 of sludge is being dredged each year (PoR, 2005). For years big part of the sludge was contaminated (metals, PAC, PCB) and deposited in the Slufter, a depot, built to store contaminated sludge from dredging activities in the harbor. The quality of the dredged sludge in the Port of Rotterdam is improving each year, leading to less contaminated sludge being deposited in the Slufter. (Kibrit, 2013) The rest of the sludge that is not contaminated is being deposited in the North sea.

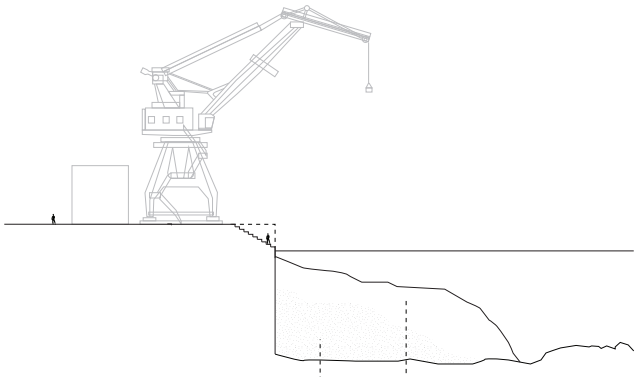
STRATEGY

The strategy is developed according to working with several natural processes.
Firstly, the areas of the harbor basins that in the future will go trough the transition of program (point strategy) like the areas of the Refinery cultural heritage center in Pernis, or some areas in Botlek close to the Bio-Chemistry research center will allow sedimentation processes and stop being dredged. The clean dredged sludge from other important waterways in the harbor and other harbor basins is being deposited in these 'underused' basins and start formation of more natural shorelines that can allow for the development of wetland areas and transition zones. These in turn have beneficial impacts in terms of water quality and biodiversity. In certain places, there could be 'edge softening' which accounts for demolition of quay walls and creation of slopes and steps for better accessibility and experience of water and wetlands areas.





1 Dredgin harbor basins and waterways

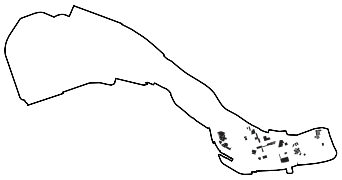


2 Depositing clean sediments dredged from other waterways in the port to the underused harbor basins

3 Allowing natural sedimentation from the upstream

Refference matrix

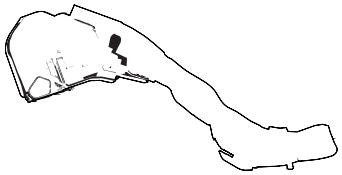
Cleaning



Ford factory, Genk, Belgium

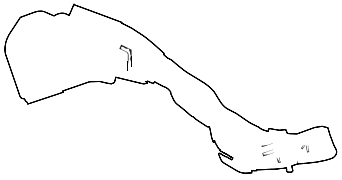
Growing

Protecting



Bird watching hide, Grainage architects

Allowing sedimentation



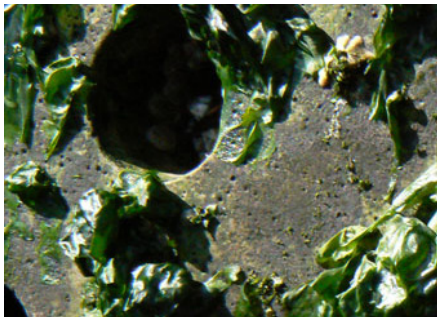
Mud-motor for salt marsh development, Harlingen, Ecoshape

Martijn van Wijk

Poplar trees in 2010 after 3 growing seasons

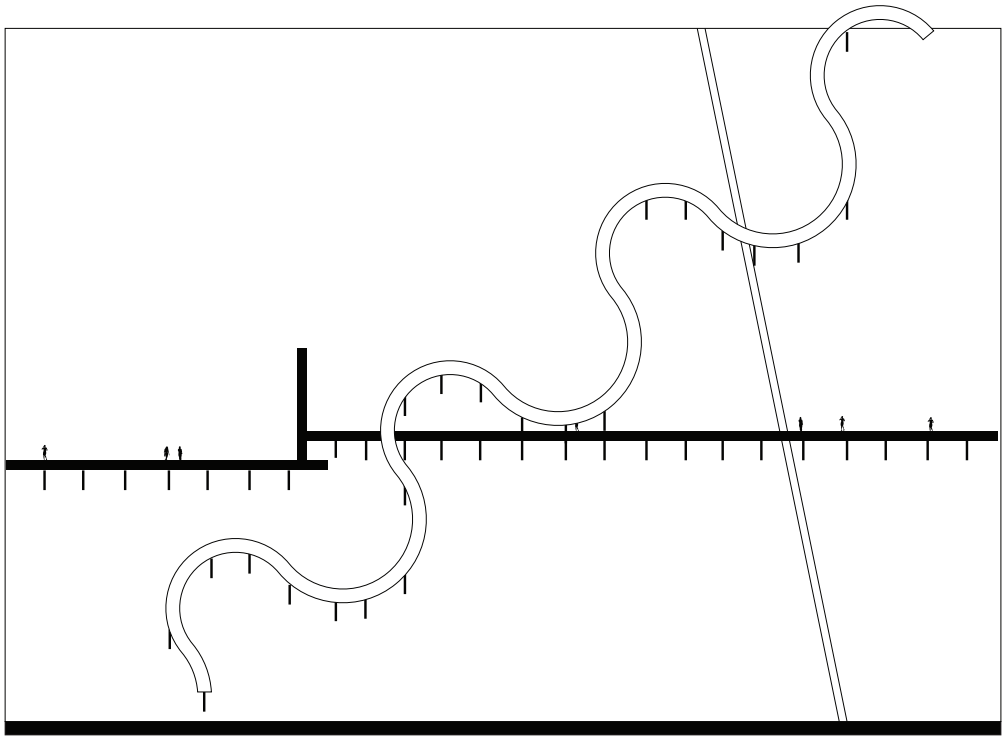
On-sit

Framing nature, Maasvlakte

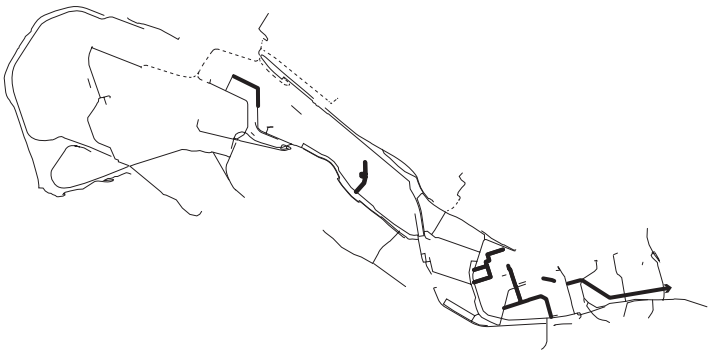


Eco beton project, Deltares
The concrete today is smooth and doesent allow for nature to develop. In this way with installments of holes in the concrete, in the intertidal areas can host organisms that attract other species like birds

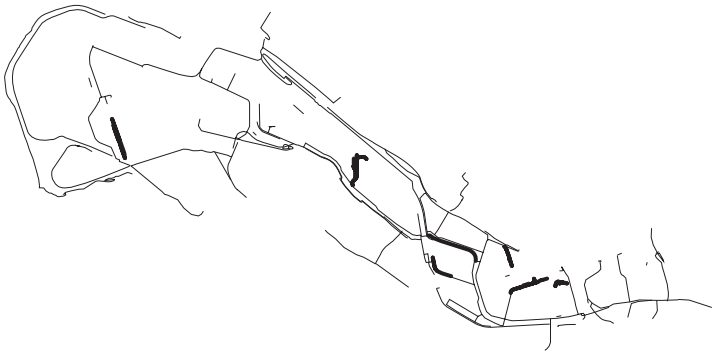
Corridor



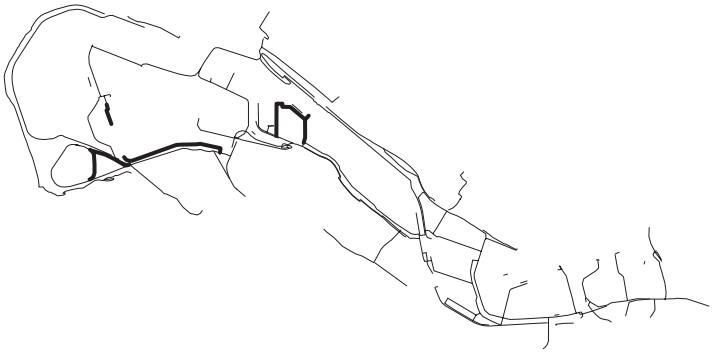
Experience pathways



Adapted underused railway tracks

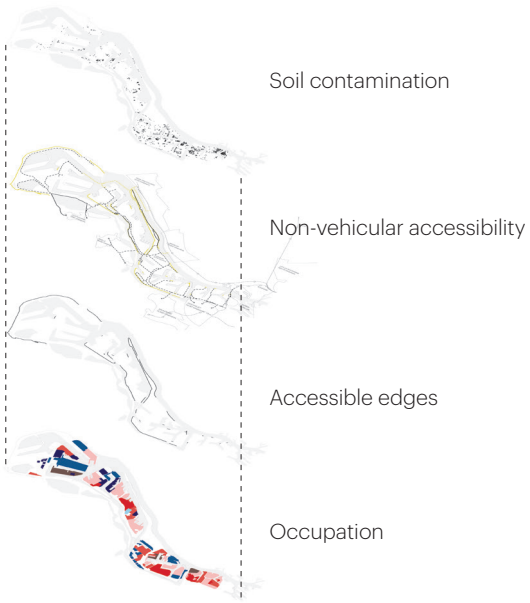


Hidden pathways



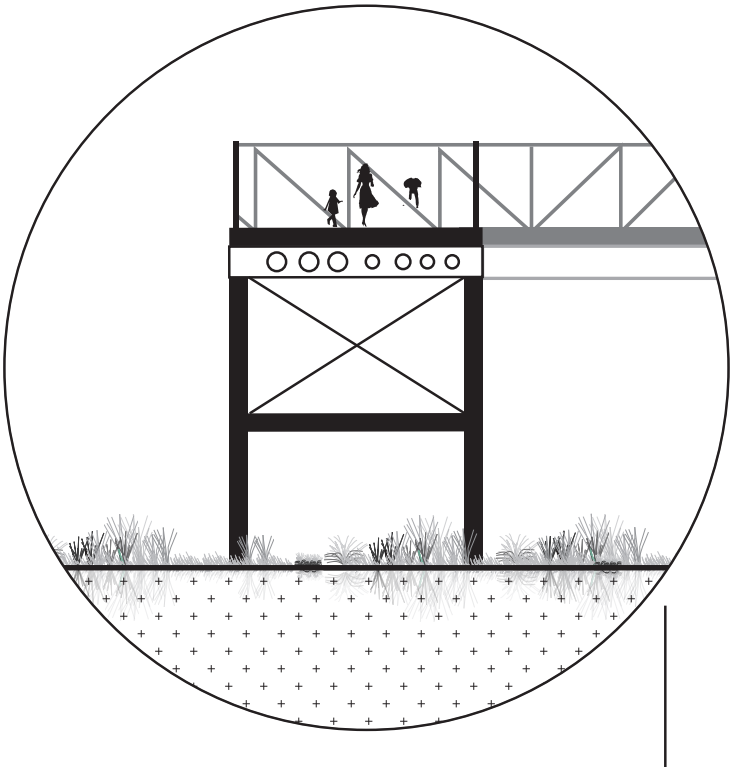
Experience pathways

Analytical input



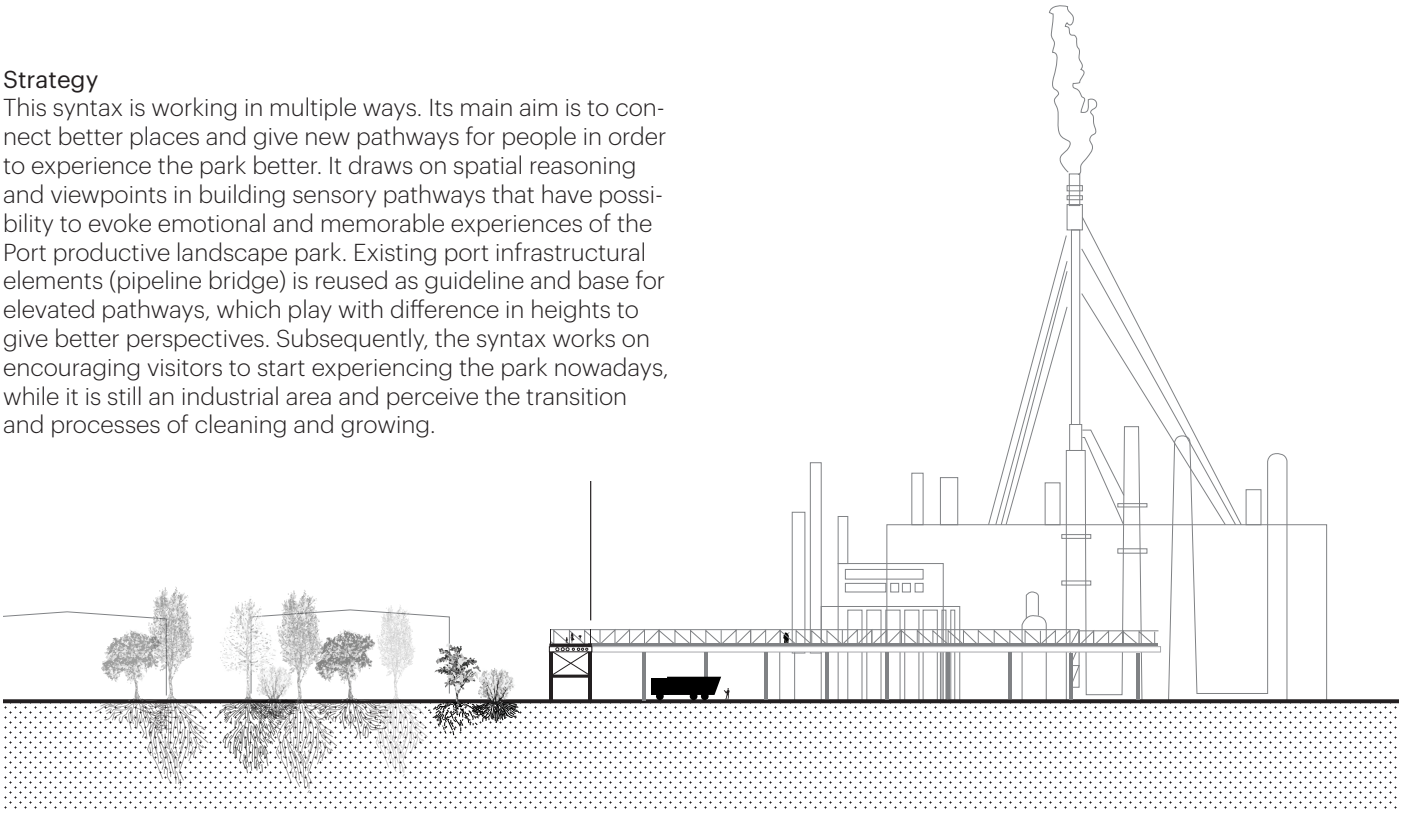
Objectives
-Give possibilities of experience of existing landscape and industry
-Create new accessibility corridors and connect better with existing routes and public transport nodes
-Reuse existing structures and elements like pipelines, spill-over dikes, etc.
-Build new pathways according to sensory experience and spatial reasoning
-Protect people from soil contamination, and industrial activities while allowing co-existance
-Create vertical connections for better reading of the landscape

The current non-vehicular accessibility in the port is very restricted. This happens due to the dangerous and logistical industrial activities, and security issues. In order to protect their efficiency, industries in the Port build fences around their sites. Furthermore, the river basins and the water itself is another big barrier when it comes to non-vehicular accessibility, which allows recreational activities. Therefore big parts of industrial heritage are hidden somewhere inside the industrial sites, and they are out of reach to the visitors of the 'Park'.



Strategy

This syntax is working in multiple ways. Its main aim is to connect better places and give new pathways for people in order to experience the park better. It draws on spatial reasoning and viewpoints in building sensory pathways that have possibility to evoke emotional and memorable experiences of the Port productive landscape park. Existing port infrastructural elements (pipeline bridge) is reused as guideline and base for elevated pathways, which play with difference in heights to give better perspectives. Subsequently, the syntax works on encouraging visitors to start experiencing the park nowadays, while it is still an industrial area and perceive the transition and processes of cleaning and growing.

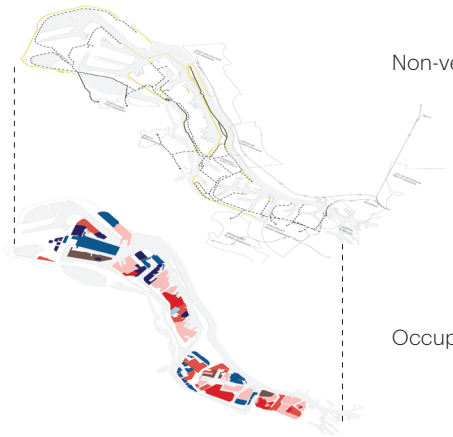


Imagination of experience pathways in Lunar landscapes (coal and iron ore terminals)

Imagination of experience pathways in Pernis Industrial garden

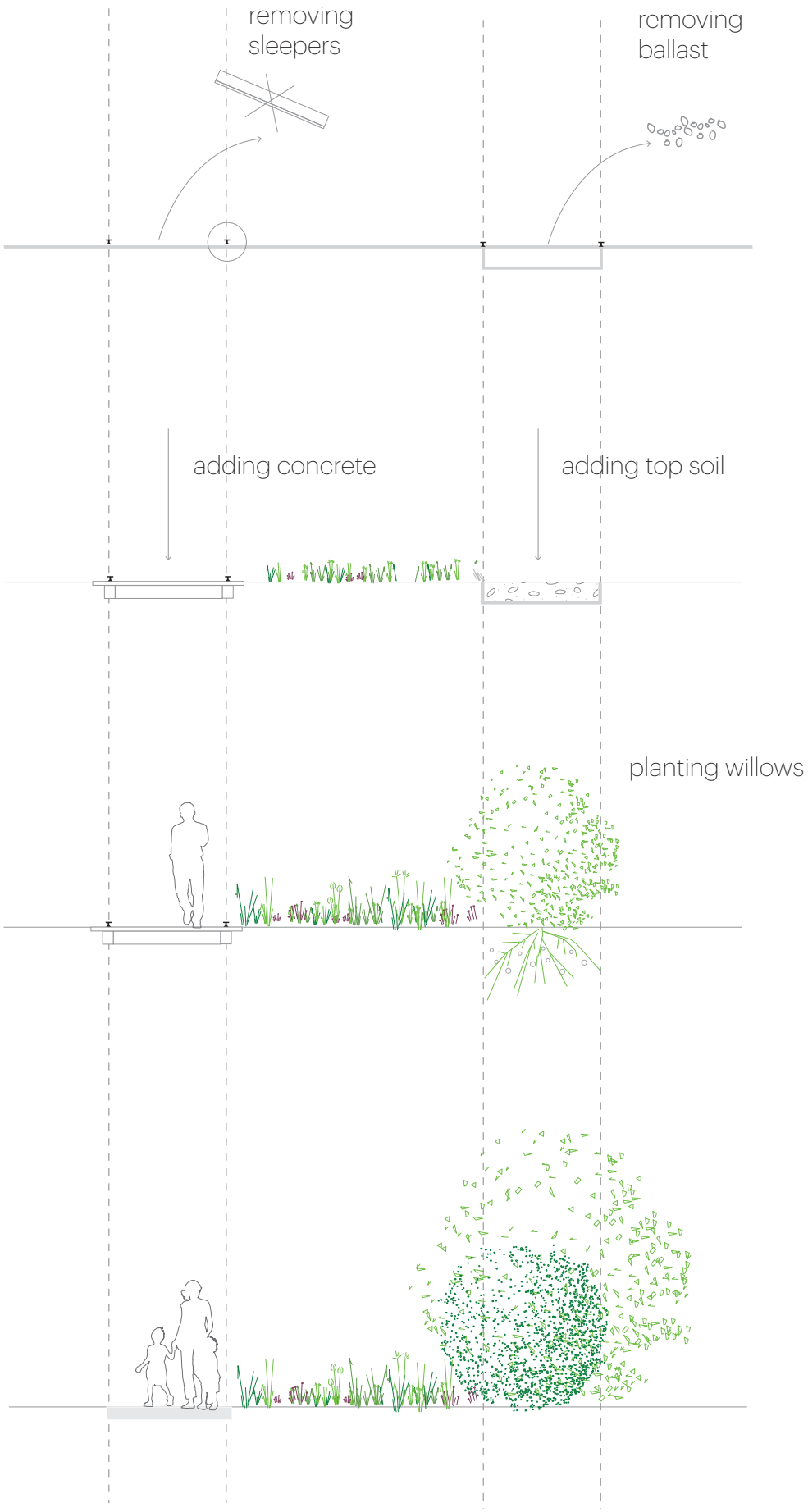
Adapting underused railway tracks

Analytical input



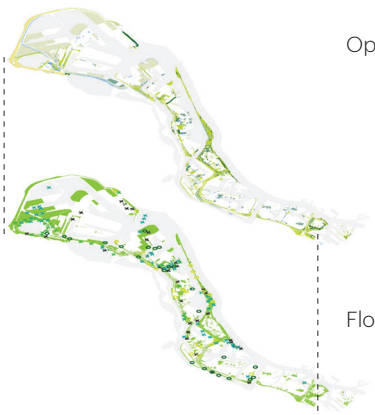
Objectives
-Give possibilities of experience of existing landscape and industry
-Create new accessibility corridors and connect better with existing routes and public transport nodes
-Reuse existing structures of railway tracks
-Design according to sensory experience and spatial reasoning
-Clean the contamination

Strategy
The harbor as an industrial landscape contains large lines of infrastructure and cargo railway lines. In the future, with the change of the program in the harbor, certain railway tracks will become obsolete. The structure can be used in order to create new accesses and adapt existing environment.
In series of steps, the operations include removing some parts of the railways in order to adapt it for the new use. The rail tracks could be used pathways and as plantation lines. In this way the soil under the railways can be remediated. The two combinations can be combined in different rhythms in order to create different scenery.


removing
sleepers
removing
ballast
adding concrete
adding top soil
planting willows

Hidden pathways

Analytical input

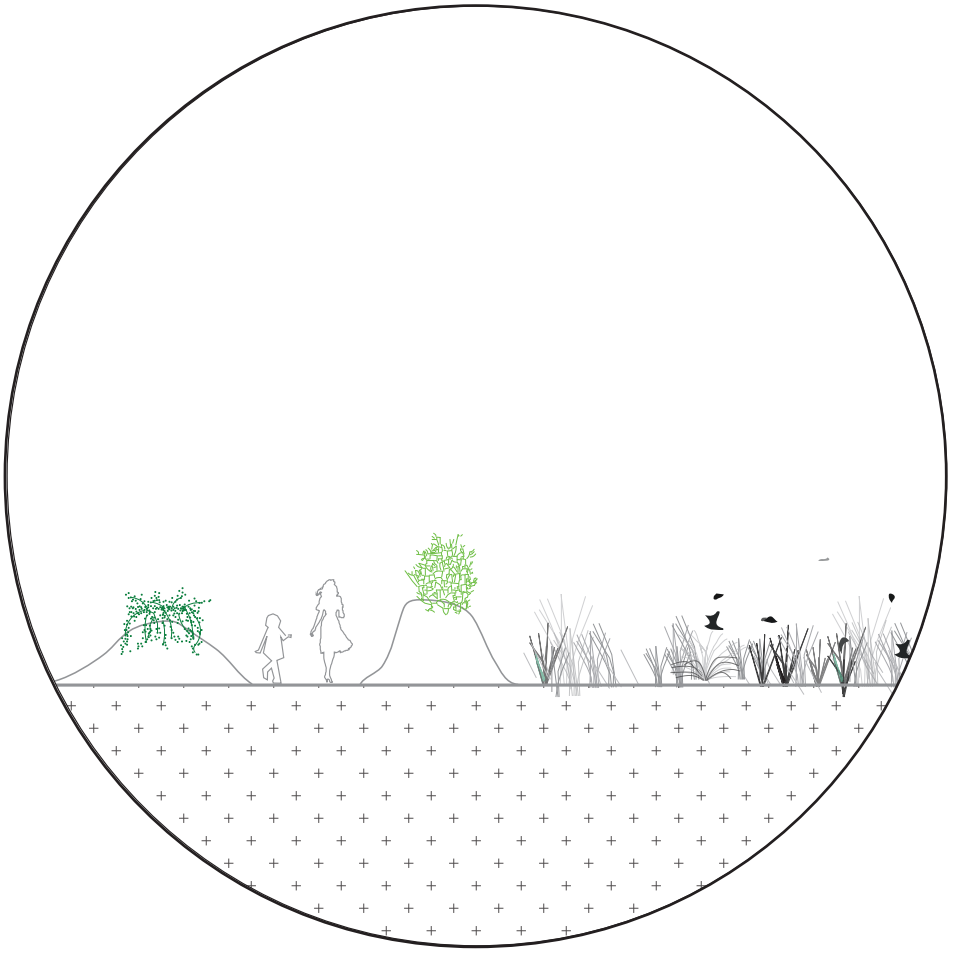


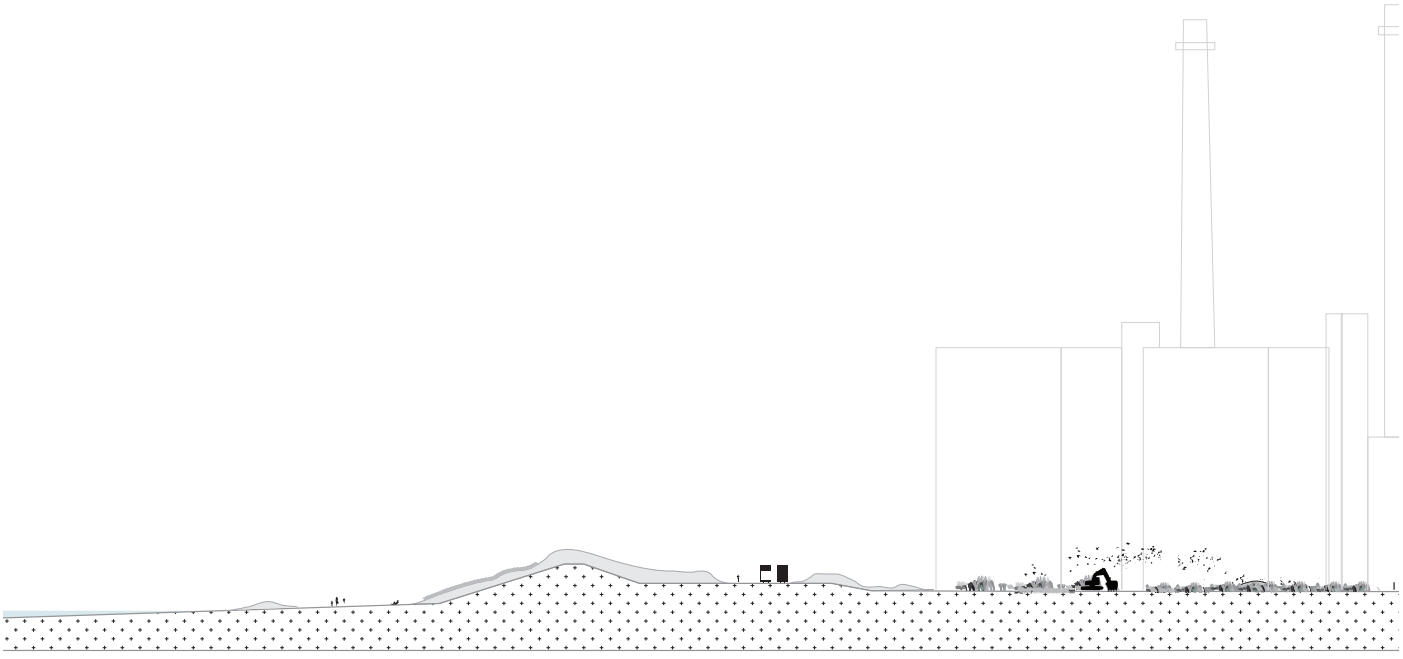
Open space typology

Flora &Fauna

Problem
Certain parts of Port of Rotterdam, lie inside the Natura 2000 area. This means that is part of the wildlife migration corridors and especially in Maasvlakte and Europoort, big numbers of coastal breeding birds can be found. They prefer low grass and shrubs and open fields therefore, Maasvlakte area is perfect spot for them.

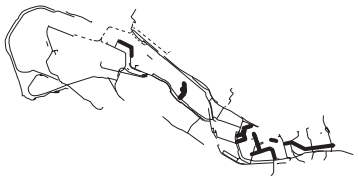
Strategy
In order to avoid the unpleasant meeting of humans and wildlife, hidden pathways look to create movement corridors for humans, while directing their movement. In this way, nature visitors don't disturb the wildlife. The design of these pathways should be done in a natural way, with small slopes that could be done from peat and plantation of low-lying bushes. The corridors in that way, "hide" and protect visitors from wildlife, and vice versa. This strategy works together with the 'Protecting nature' patch strategy.

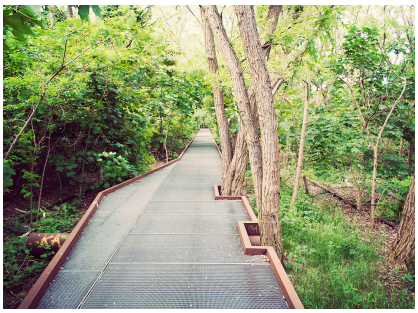




Refference matrix

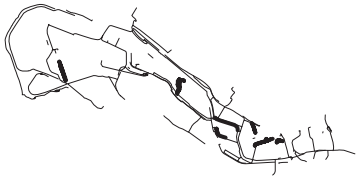
Experience pathways





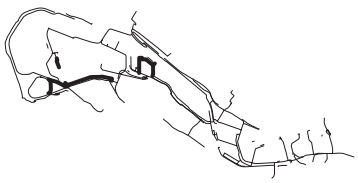
Natur-Park Südgelände, Berlin

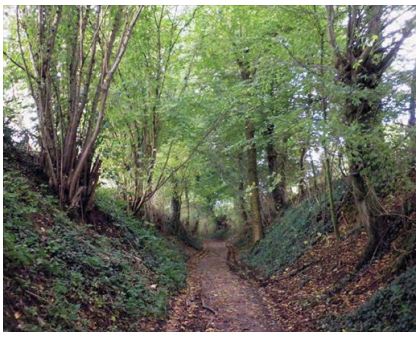
Adapted rail pathways



Natur-Park Südgelände, Berlin

Hidden pathways





De holle Weg - Sunken road, Netherlands

Plitvice lakes, Croatia

Strijp S, Eindhoven by Carve, Deltavormgroep and Piet Oudolf

Marleen Beek

Park am Gleisdreiech Berlin

Turf wall, Netherlands

Landscape syntax node

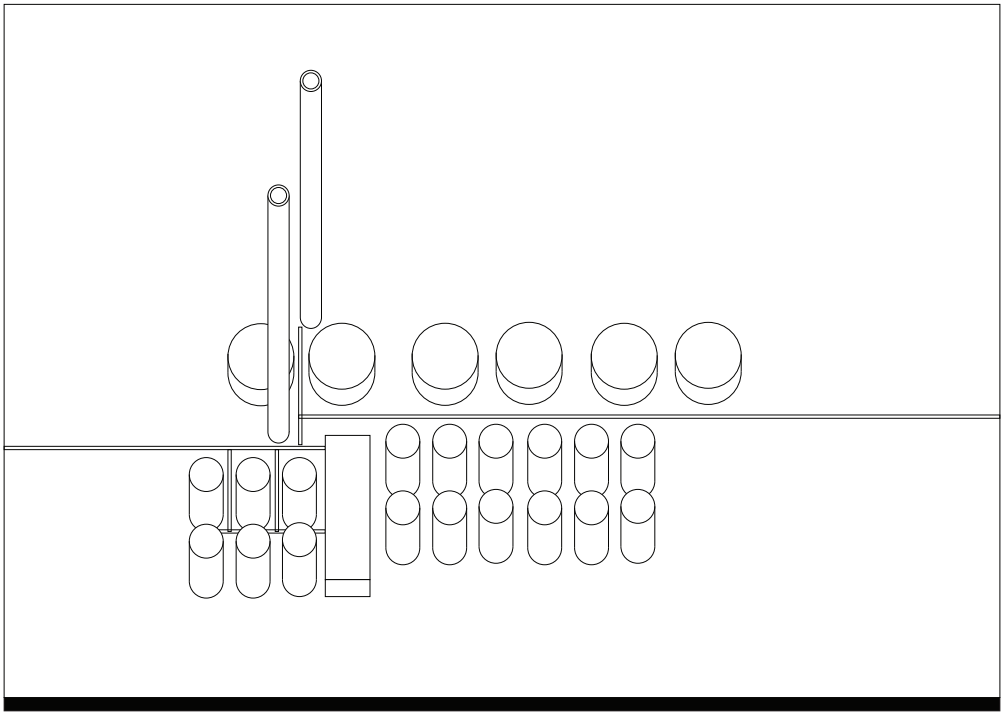
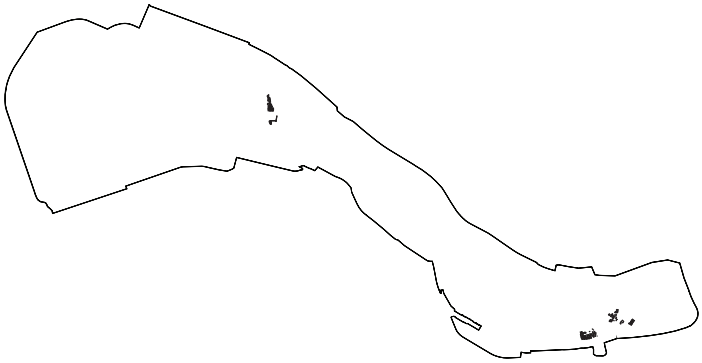
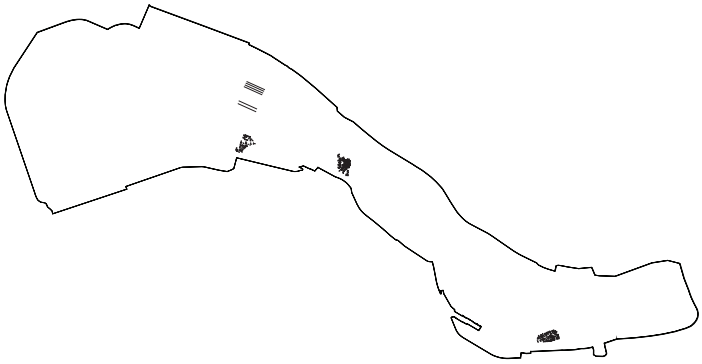


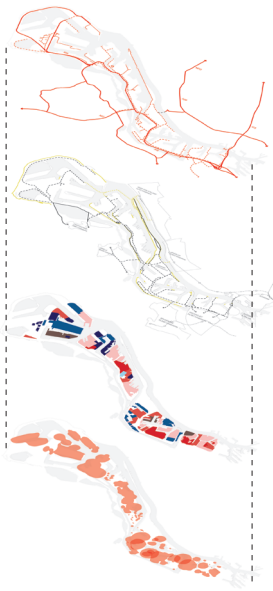
Fig. X.Y.
Figure showing the security perimeters due to dangerous industries. Some of the activities are forbidden or restricted in these areas. This doesent apply for the accessibility.
Source: Veiligsheidcontour; DCMR Milieudienst Rijnmond, 2010





Re-programming

Analytical input



Vehicular accessibility

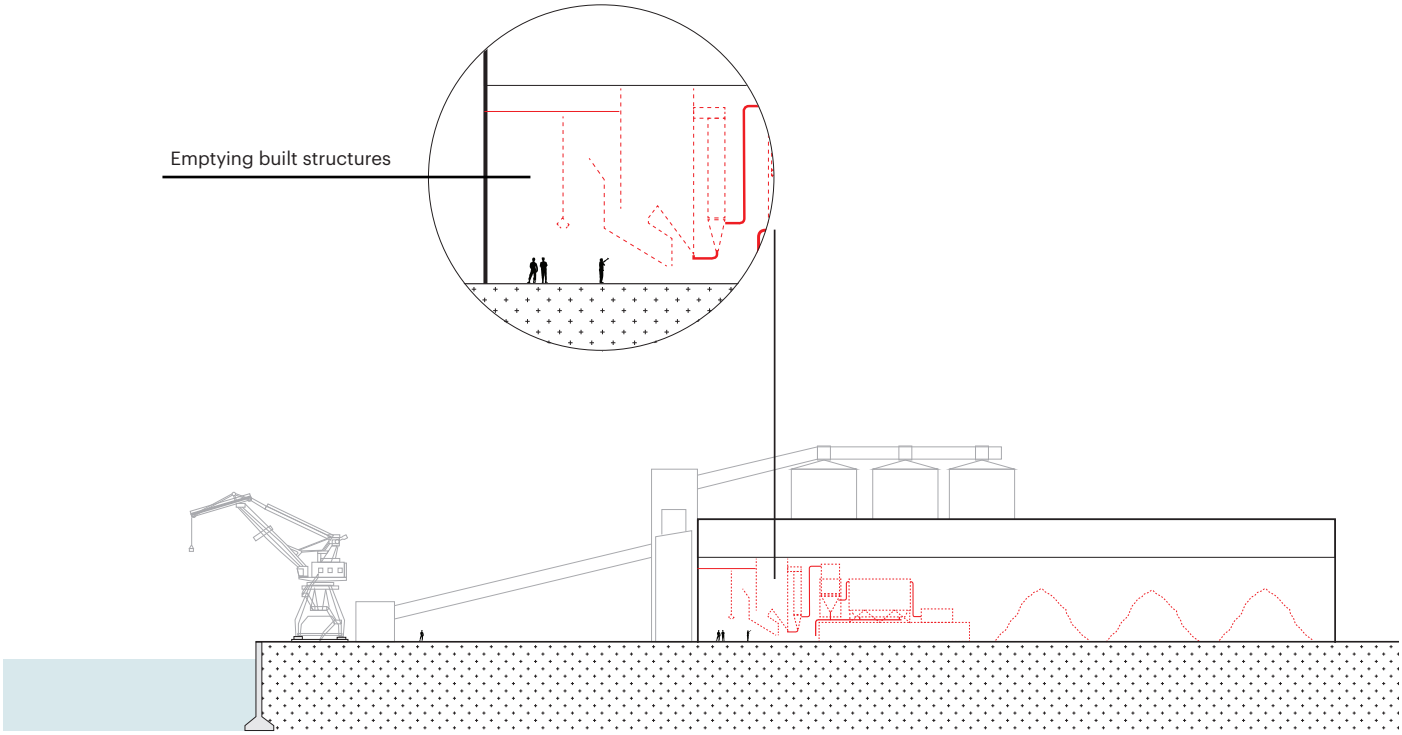
Non-vehicular accessibility

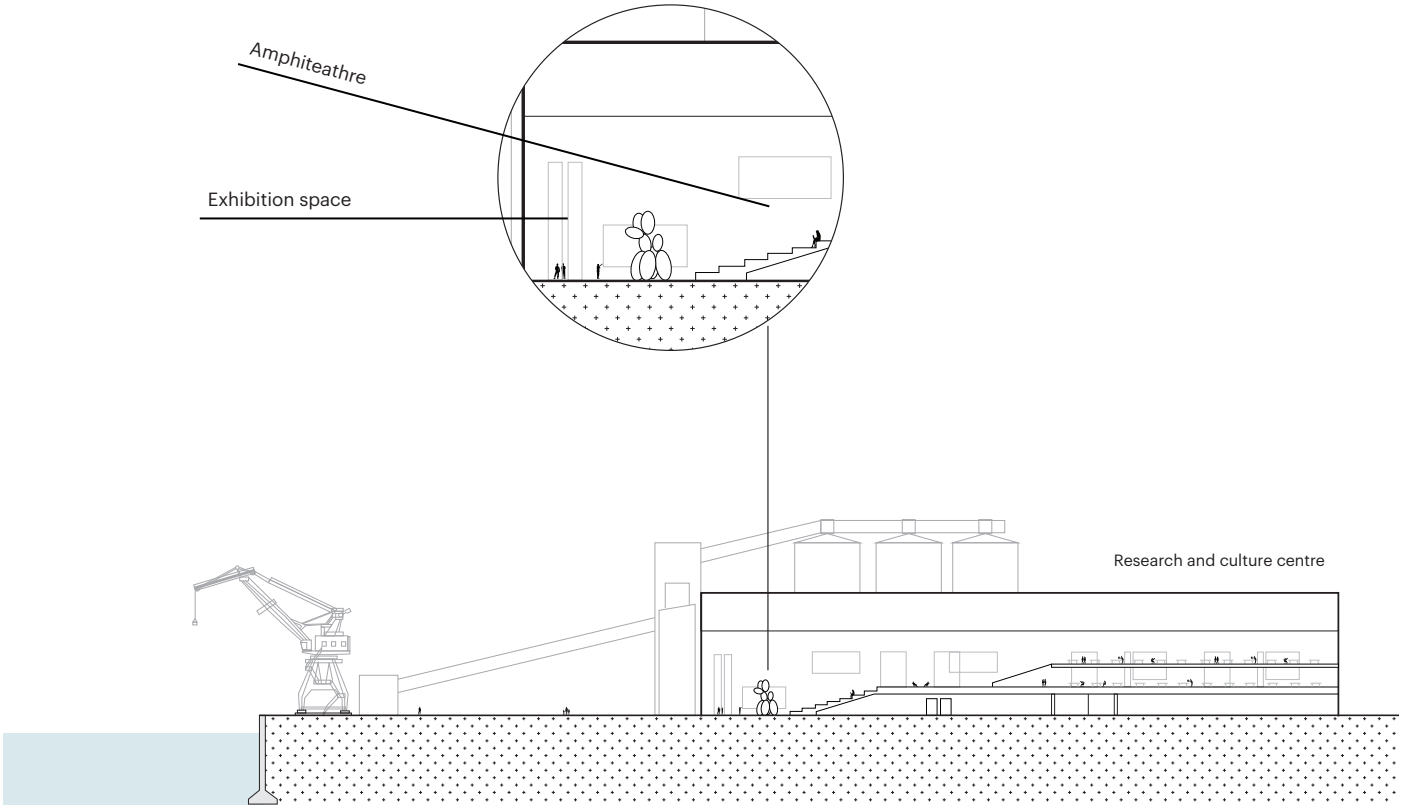
Occupation

Security zone

0 0,5 1 2 5

Fig. X.Y.
Figure showing the security perimeters due to dangerous industries. Some of the activities are forbidden or restricted in these areas. This doesent apply for the accessibility.
Source: Veiligsheidcontour; DCMR Milieudienst Rijnmond, 2010


Emptying built structures


Amphiteathre
Exhibition space
Research and culture centre

Analytical input

0 0,5 1 2 5

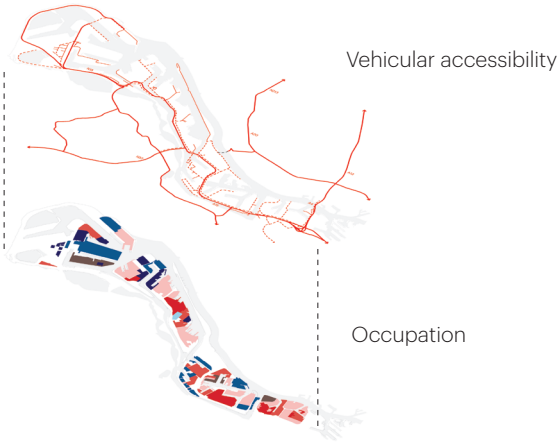


Fig. X.Y.
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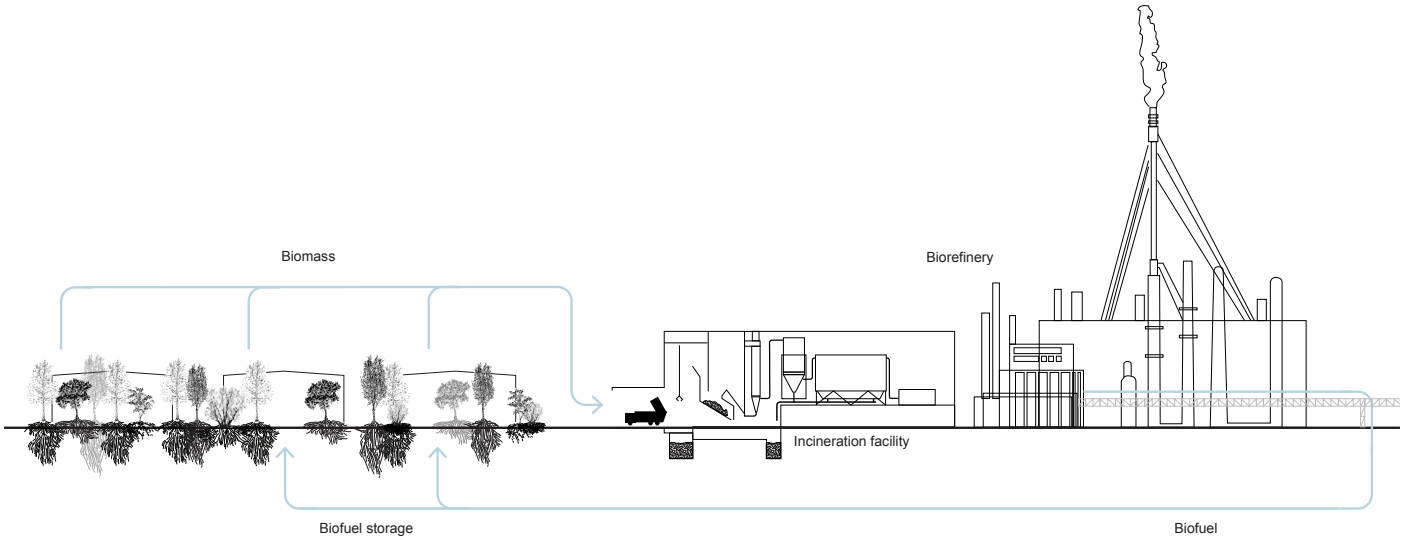
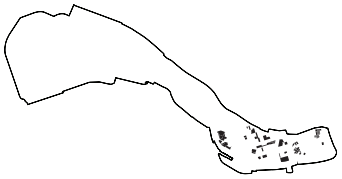
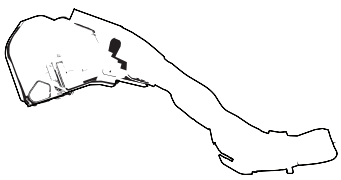
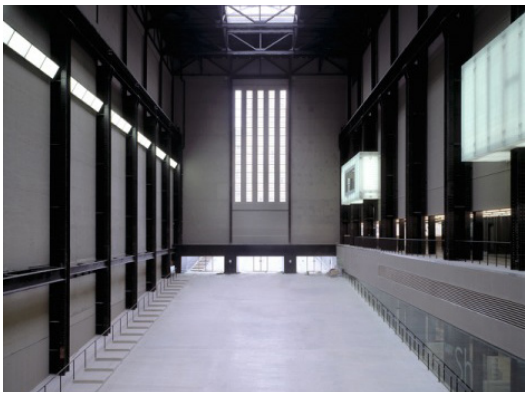

Biomass
Biorefinery
Incineration facility
Biofuel storage
Biofuel

Re-programming

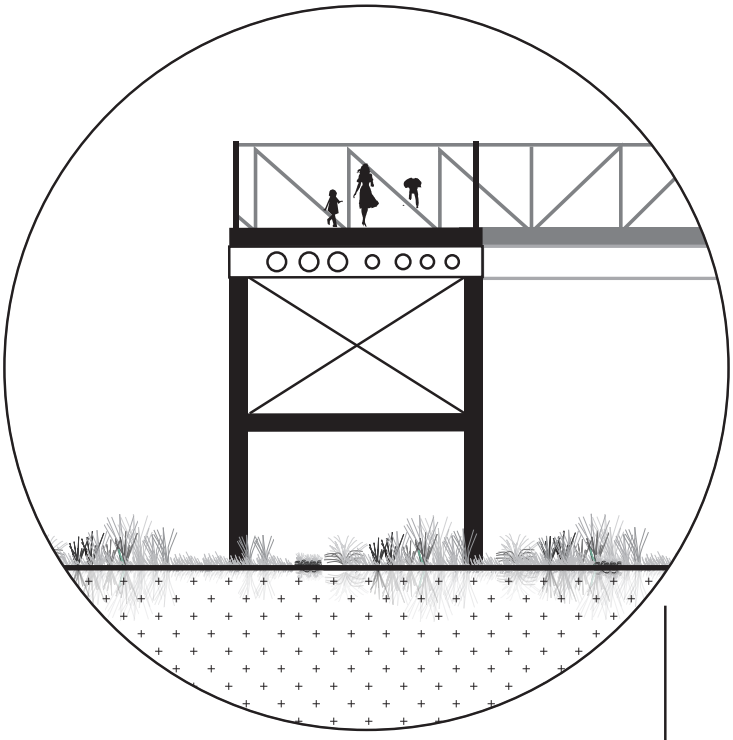


Retrofitting

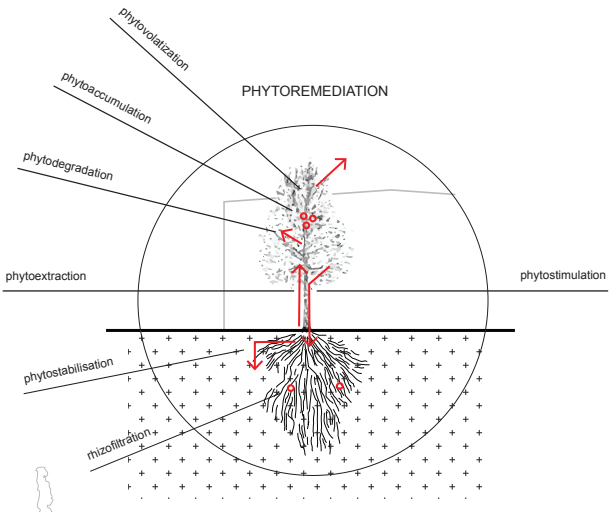




Phasing
Look but dont touch

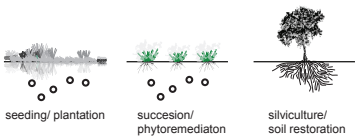


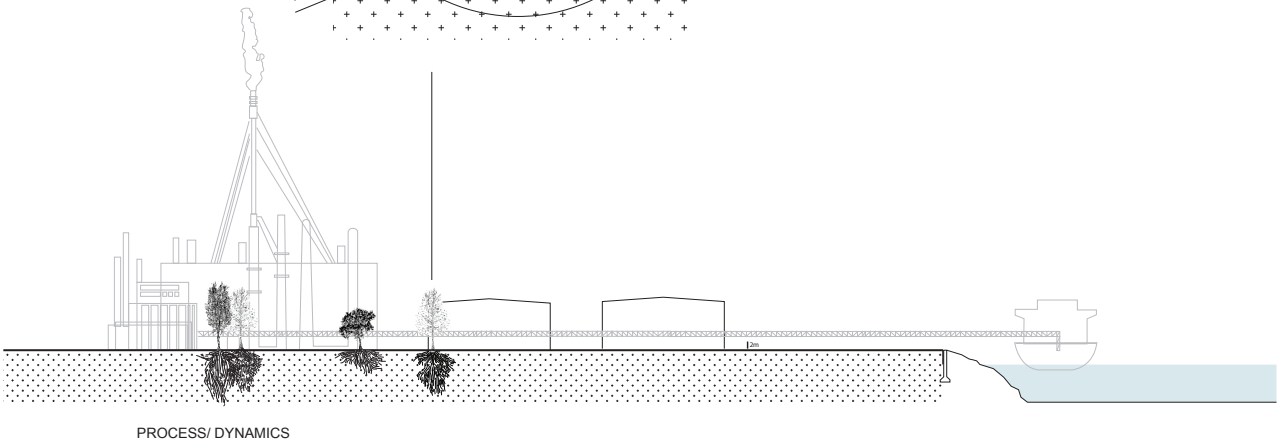
CLEANING



PHYTOREMEDIATION

PROCESS/ DYNAMICS





PROCESS/ DYNAMICS

Ecology

EXISTING

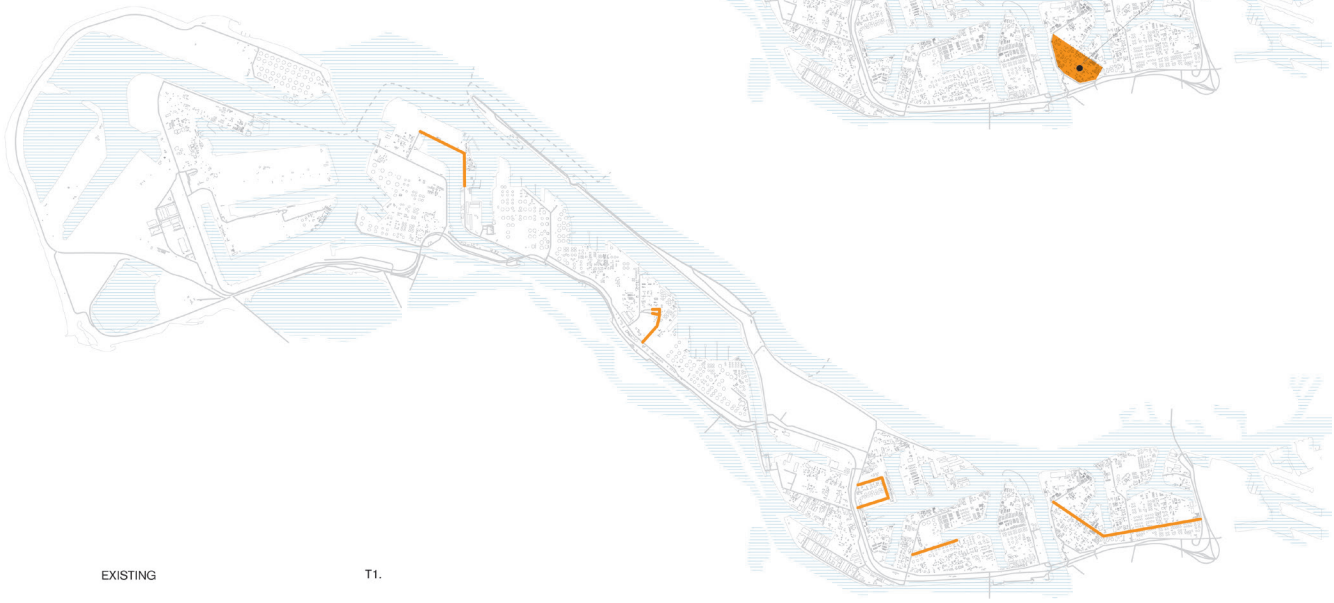
- Woodlands
- Grassland
- Brownfields
- Dune beach
- Dune Valley
- Splillover dikes covered in turf

PROPOSAL

- Flowering remediation fields T1
- Flowering remediation fields T2
- Protected Nature areas T1
- Programatic green T2
- New experience paths T1.

Program

Network and accessibility



EXISTING

- Existing accessibility
- Existing water accessibility

T1.

- New experience paths T1.
- New experience paths T2.
- New experience paths T3.

0 0,5 1 2 5

Clean

Grow

Experience

Re-programming

T.2.

Ecology

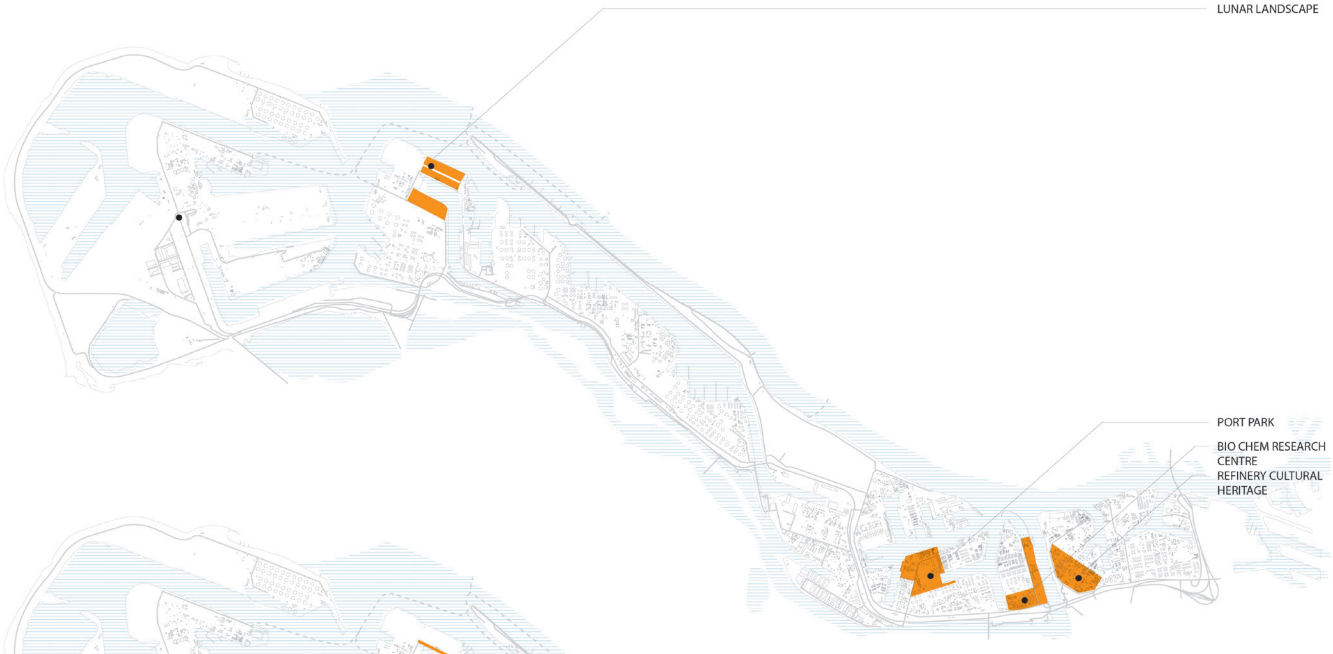
EXISTING

- Woodlands
- Grassland
- Brownfields
- Dune beach
- Dune Valley
- Splillover dikes covered in turf

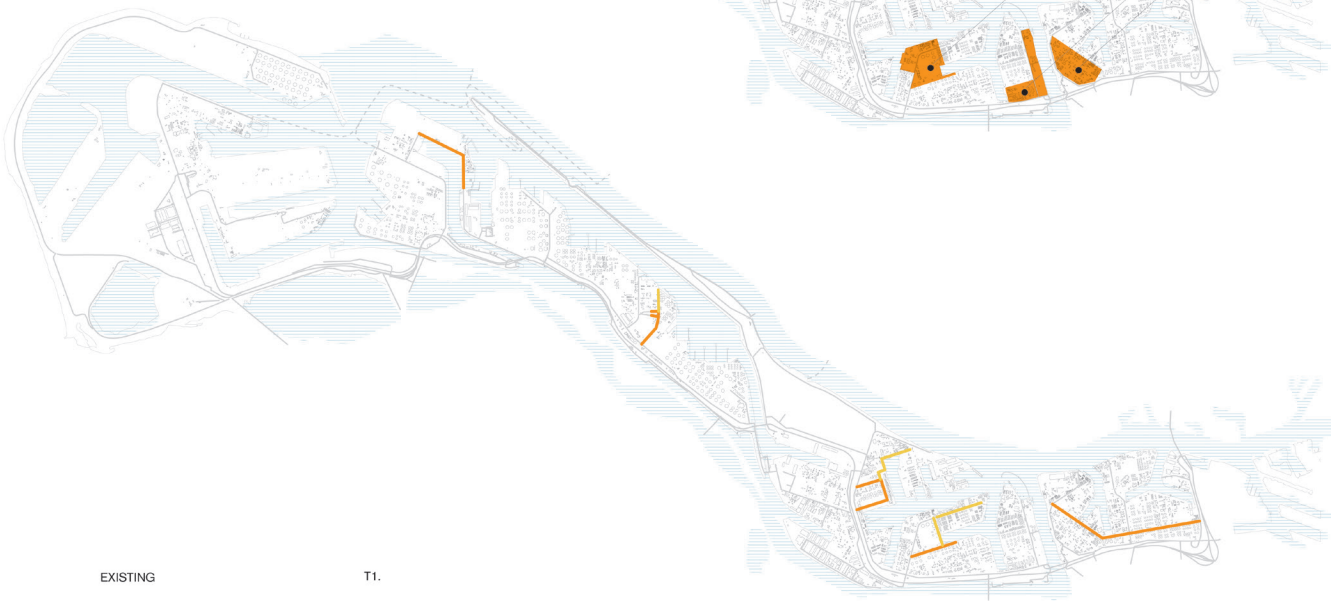
PROPOSAL

- Flowering remediation fields T1
- Flowering remediation fields T2
- Protected Nature areas T1
- Programatic green T2
- New experience paths T1.

Program



Network and accessibility



EXISTING

- Existing accessibility
- Existing water accessibility

T1.

- New experience paths T1.
- New experience paths T2.
- New experience paths T3.

0 0,5 1 2 5

Grow

Experience

Retrofitting

T.3.

Ecology

EXISTING

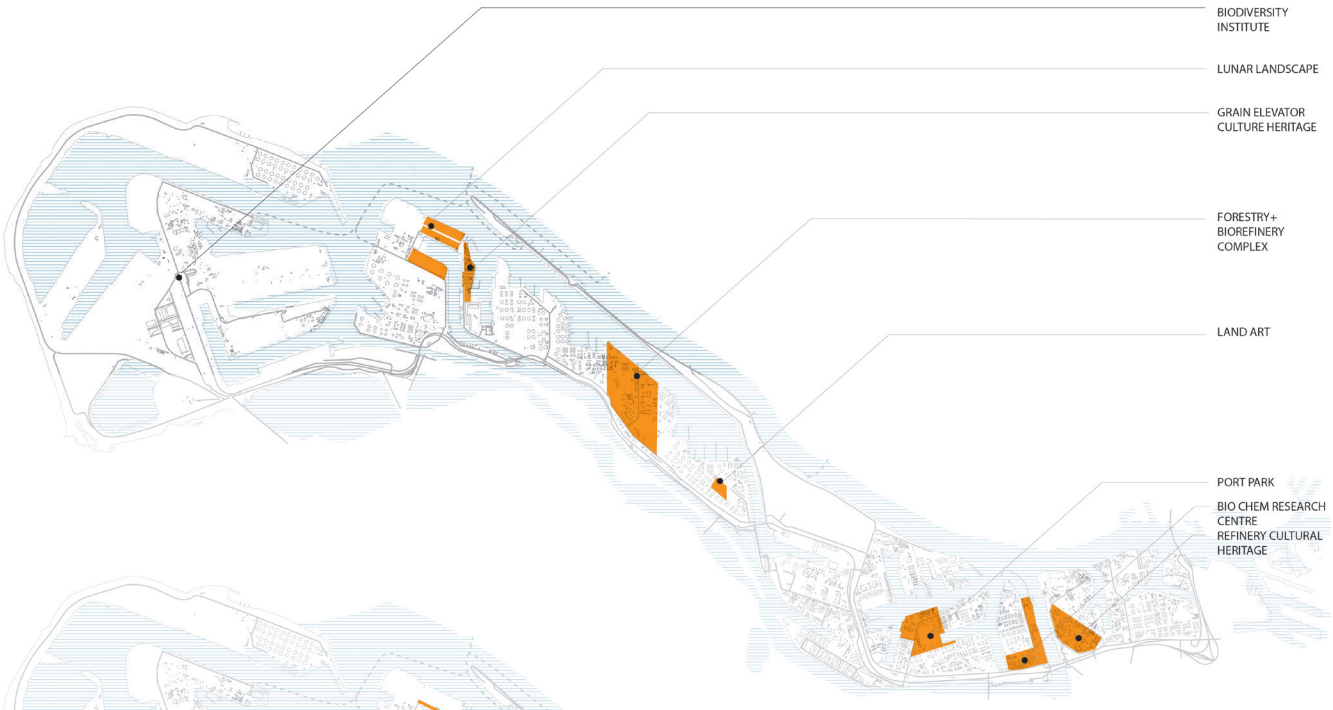
- Woodlands
- Grassland
- Brownfields
- Dune beach
- Dune Valley
- Splillover dikes covered in turf

PROPOSAL

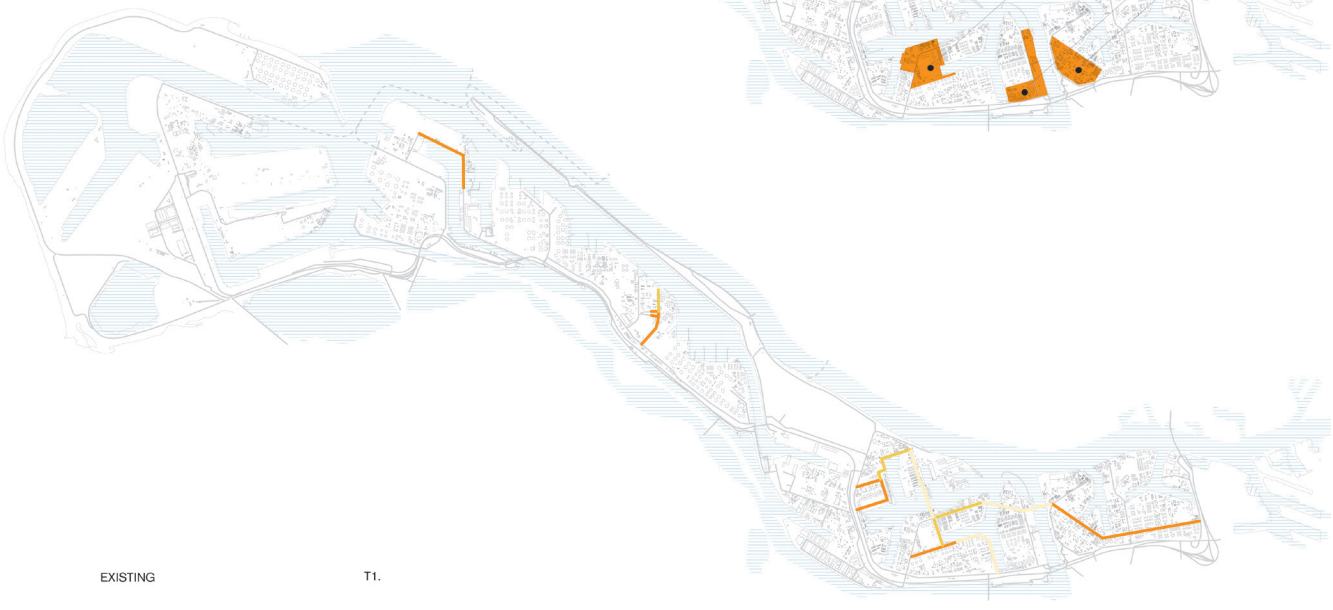
- Flowering remediation fields T1
- Flowering remediation fields T2
- Protected Nature areas T2
- Programatic green T2
- Forest T3
- Something T3

- New experience paths T1.

Program



Network and accessibility



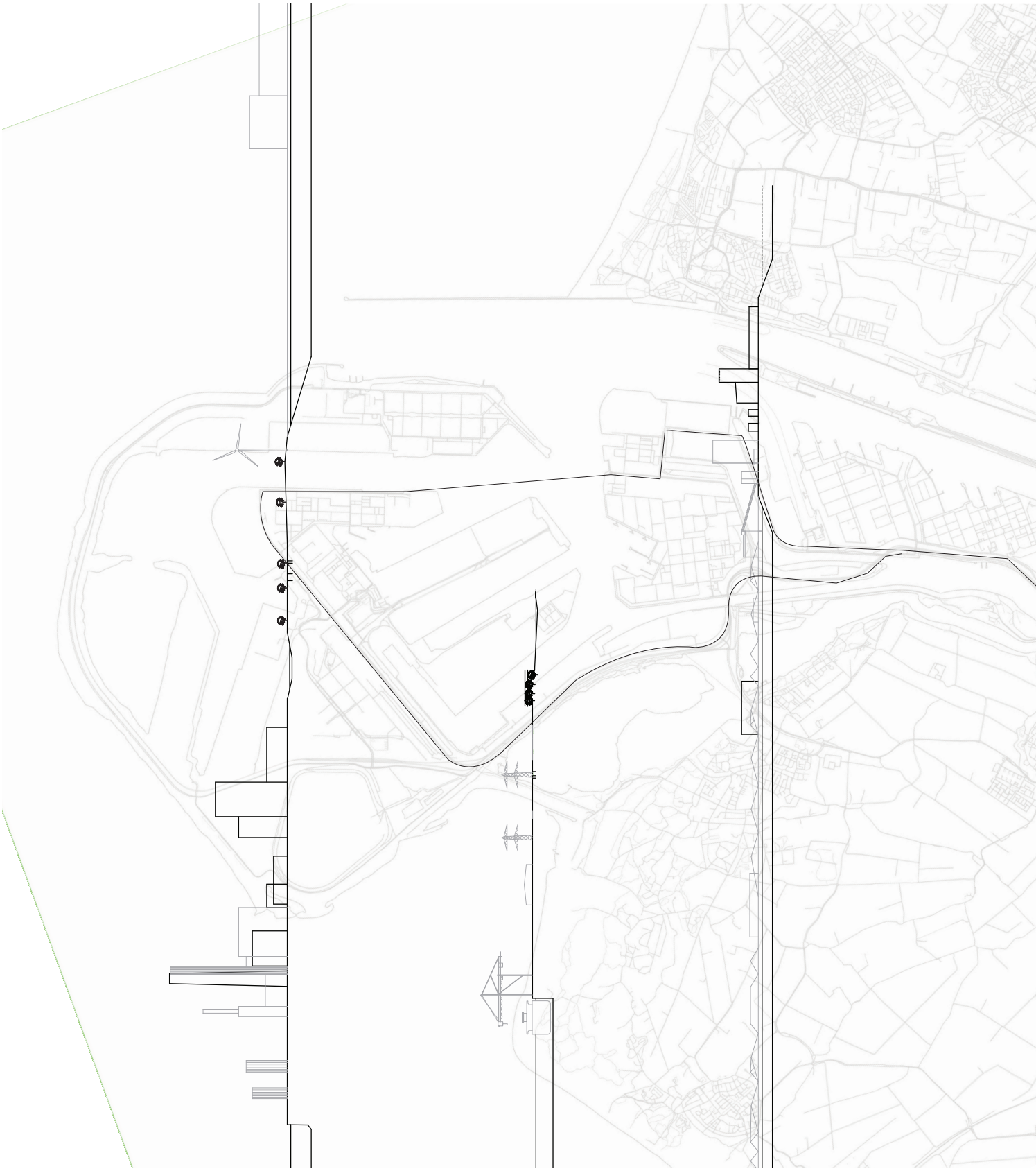
EXISTING

- Existing accessibility
- Existing water accessibility

T1.

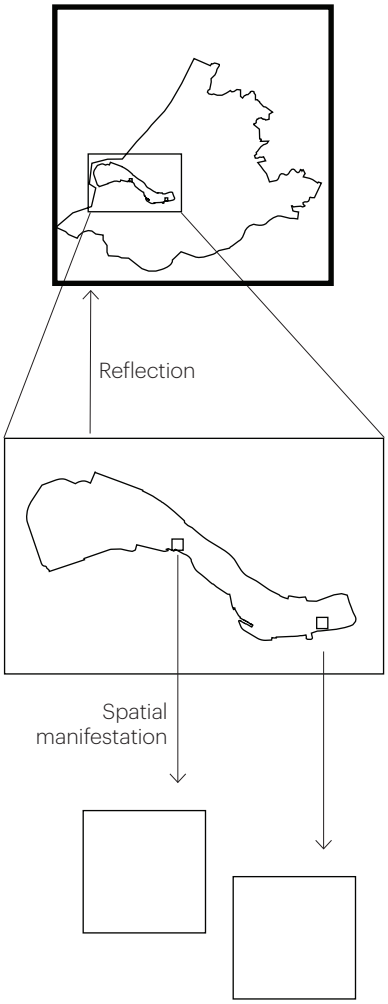
- New experience paths T1.
- New experience paths T2.
- New experience paths T3.

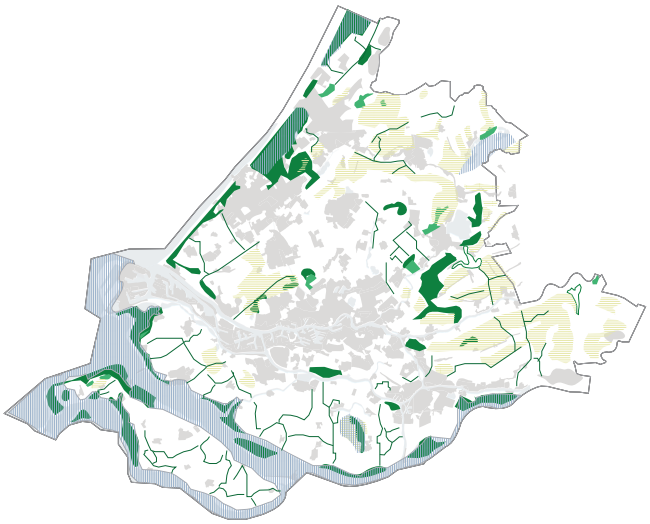
0 0,5 1 2 5



Macro scale

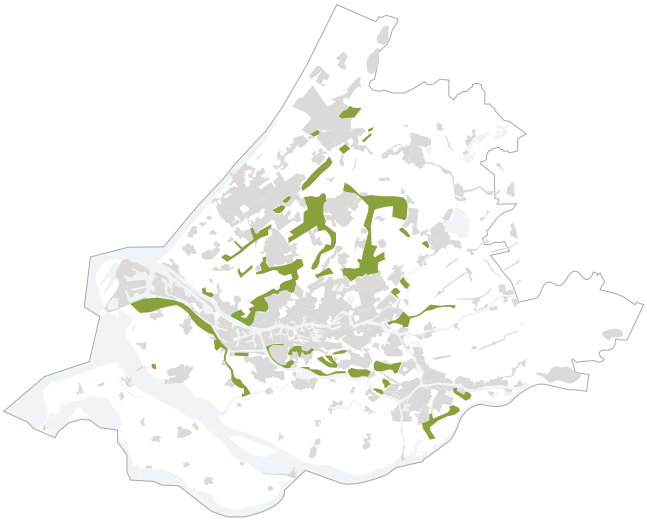
The port of Rotterdam is a 40 km long terminal located at the confluence of two mega-systems, the Holland's North Sea zone and the Rhine Maas Delta. This favorable geographical location allowed the port to be the connection between the faraway locations from the "Russian oilfields to the Suez Canal, to China, to Brazil and the Panama Canal" passing trough the hinterland and the German Ruhr district. (Steenhuis 2015)





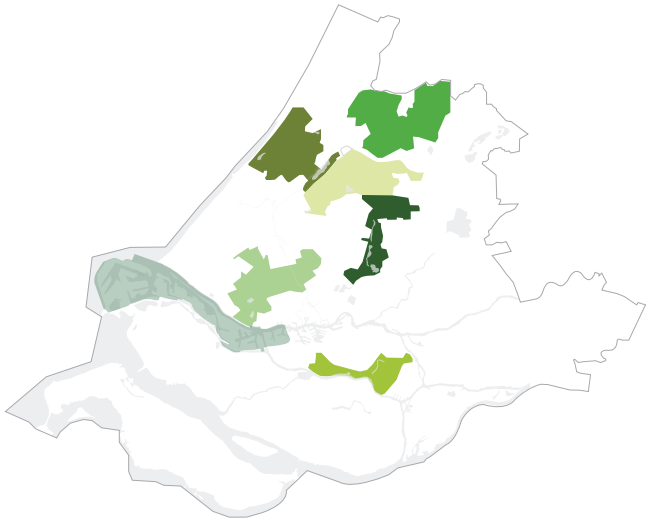
Regional ecological structure

- Natura 2000
- Existing primary new nature
- New nature
- Important bird nesting area
- Ecological corridors



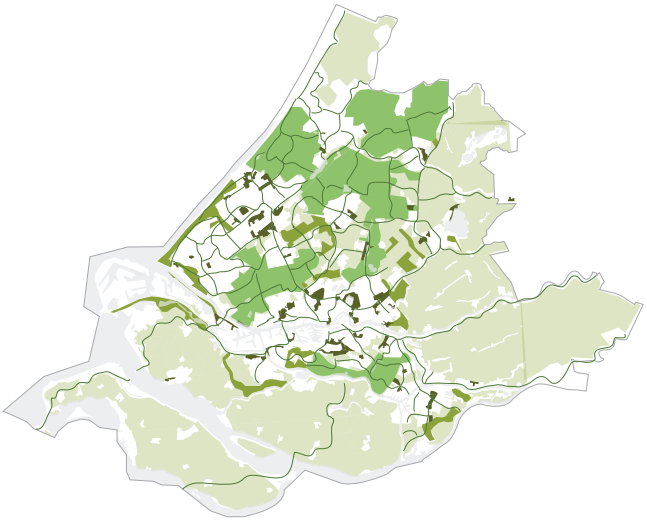
Regional recreation areas

- Regional recreation areas
- Urban areas



Regional landscapes

- Hollandse plassengebied
- Duin, Horst en Weide
- Wijk en Wouden
- Bentwoud/ Rottemeren
- Midden Delfland
- Ijjselmonde



Regional green structure

- Provincial landscape
- Regional landscape
- Urban green
- Agriculture
- Recreation network

Macro scale design - South Holland

Legend

- Productive landscape park
- Protected nature areas
- Agricultural areas
- Urban green areas
- Wildlife and recreation bridge
- Urban recreational link
- Existing recreational corridors
- Proposed park inner accessibility
- Biomass byproduct
- Biorefinery

Anthropogenic dune

The protected nature areas in the Park are acting both as a wildlife and recreation corridor that connects the north and the south part of the region as a coastal nature corridor with the Spanjaards dune and Voornes dunes

Agrarian forest

The growing areas of the park act as silvicultural landscape that can produce biomass and clean the soil and toheth-er with regional agricultural landscape provide input for the biorefineries in the park

Industrial garden

The cleaning areas of the park, have more recreational and urban use, where they act as a recreational corridor to connect better metropoli-tan structure and municipali-ties around the park

Macro scale

Legend

- Productive landscape park
- Protected nature areas
- Wildlife and recreation bridge
- Existing recreational corridors
- Proposed park inner accessibility

Spanjaards Duin

Antropogenic dune

Voornes Duin

Wildlife bridge

Recreation corridor

Macro scale

Legend

- Productive landscape park
- Regional agriculture
- Existing recreational corridors
- Proposed park inner accessibility
- Biomass byproduct
- Biorefinery

Macro scale

Legend

- Productive landscape park
- Urban green parks
- Regional urban recreational connection streghtening
- Existing recreational routes
- Proposed inner accessibility

Massluis

Rotterdam

Rozenburg

Pernis

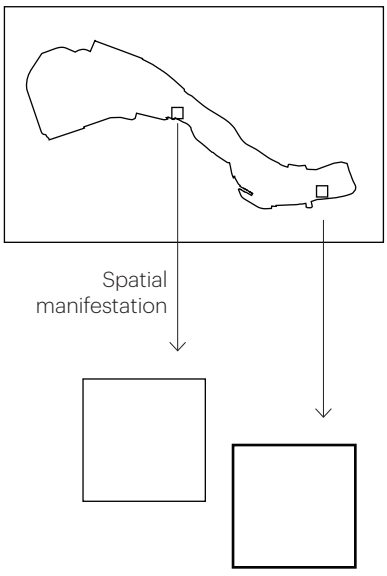
Brielle

Hoogvliet

Spijkenisse

Micro scale
Pernis refinery
Industrial garden

Framework



The Port of Rotterdam is one of the most important junctions for the trade of goods in the world, an international logistics hub and the most important gateway to Europe for more than 500 million consumers. The port's industrial cluster is of global stature: it is the largest industrial cluster in northwest Europe. The port contributes significantly to the national economy with a total added value that represents approximately 3.3% of the Netherlands' gross national product. Directly and indirectly the port provides for 145,000 jobs. (Wurpel, Akker van den et al. 2013)

Fossil fuels provide a constant basis underlying Rotterdam's growth. Therefore, the port continues to create plans for growth in respect with the continuous growth in liquid bulk and containers, especially in the long-term vision, Port Vision 2030. This plan emphasizes the ambition to be Europe's most important port and industrial complex and to be leading in efficiency and sustainability. (Wurpel, Akker van den et al. 2013)

At the same time, the underlying basis for development, fossil fuels, are the reasoning for decades of the environmental degradation to the landscape: in terms of air, water and soil pollution and loss of biodiversity. The current economical shifts towards sustainable forms of energy generation are expected to rapidly gain ground in Europe, as well as throughout the world. It would appear that over the coming decades a transition from a linear, fossil economy to a circular, bio-based economy will unfold in Europe. (Willems, Eijk van der et al. 2016)

What can be expected with regard to pollution, biodiversity loss, industry and non-renewable resources? Can Rotterdam maintain its position with a strategy that is based mainly on fossil fuels? Reflecting on these questions creates an opportunity to rethink and imagine the transition of port of Rotterdam from a nature-based perspective. Along with the initial assumptions and motivations, this process helped in order to produce a research question and sub research questions that will guide the development of the research and design process.


VERWATER

Network and accessibility

Program

Ecology

Turf
Woodlands
Flowering remediation
Silviculture remediation
Experience pathways
Ground pathways
Ⓟ Forest parking lot

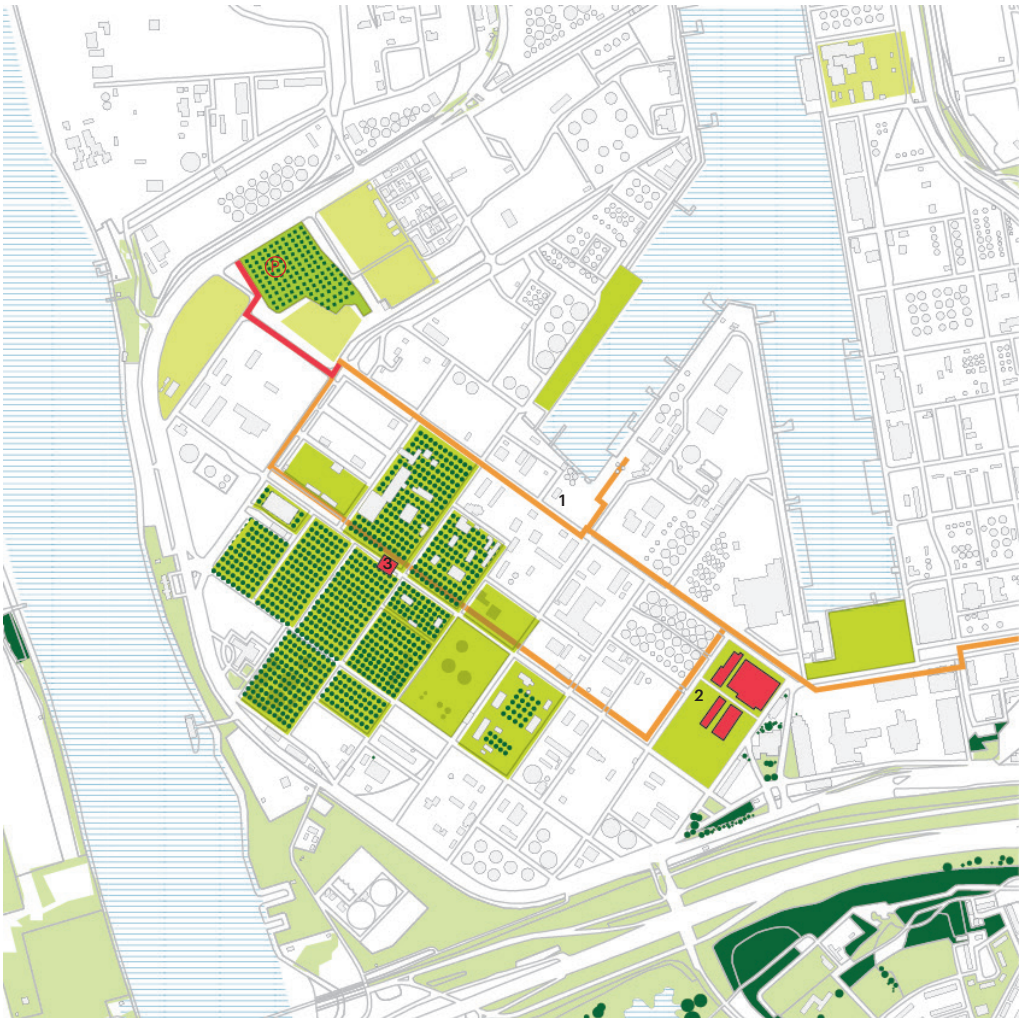
1 Pipeline bridge pathway

0 0.1 0.2 0.5km

Network and accessibility

Program

Ecology



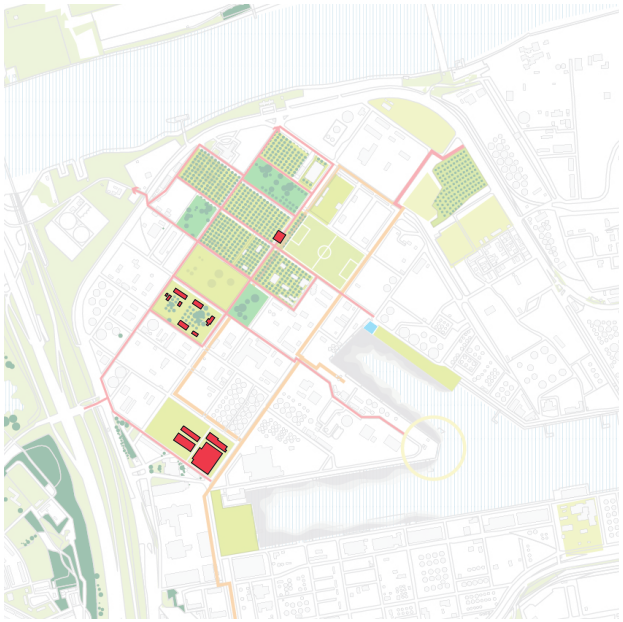
Turf
Woodlands
Flowering remediation
Silviculture remediation
Experience pathways
Ground pathways
Ⓟ Forest parking lot

1 Pipeline bridge pathway
2 Cultural heritage hangars
3 Refinery tower

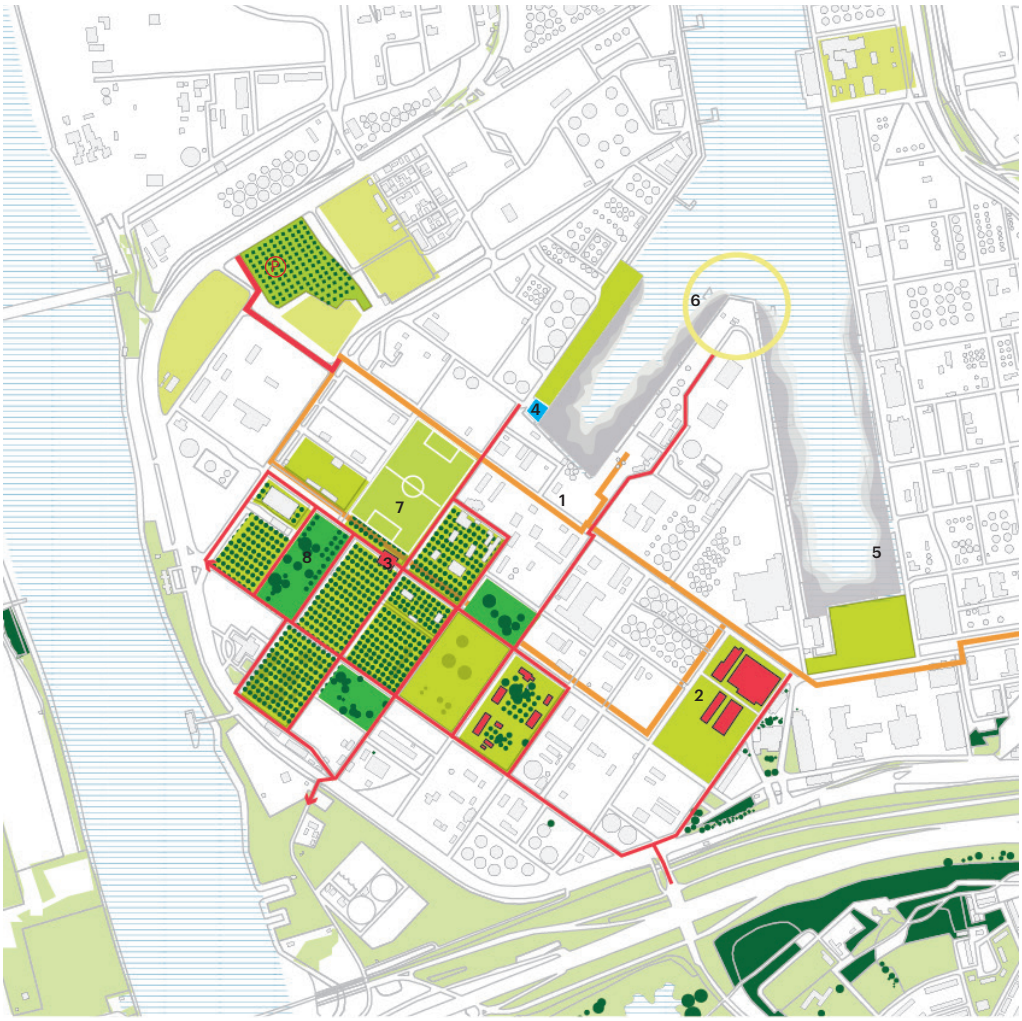
0 0.1 0.2 0.5km

Network and accessibility

Program



Ecology

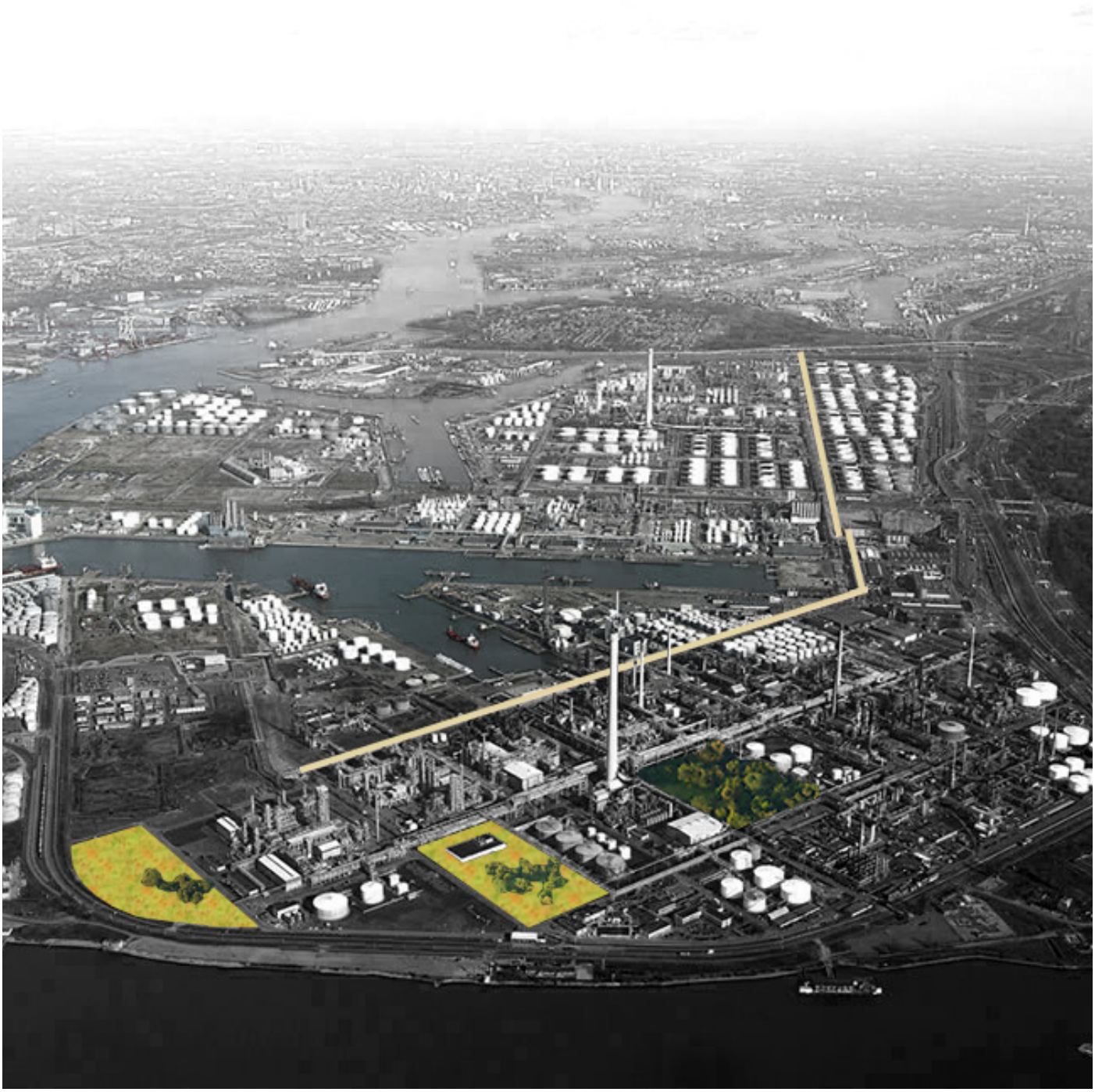


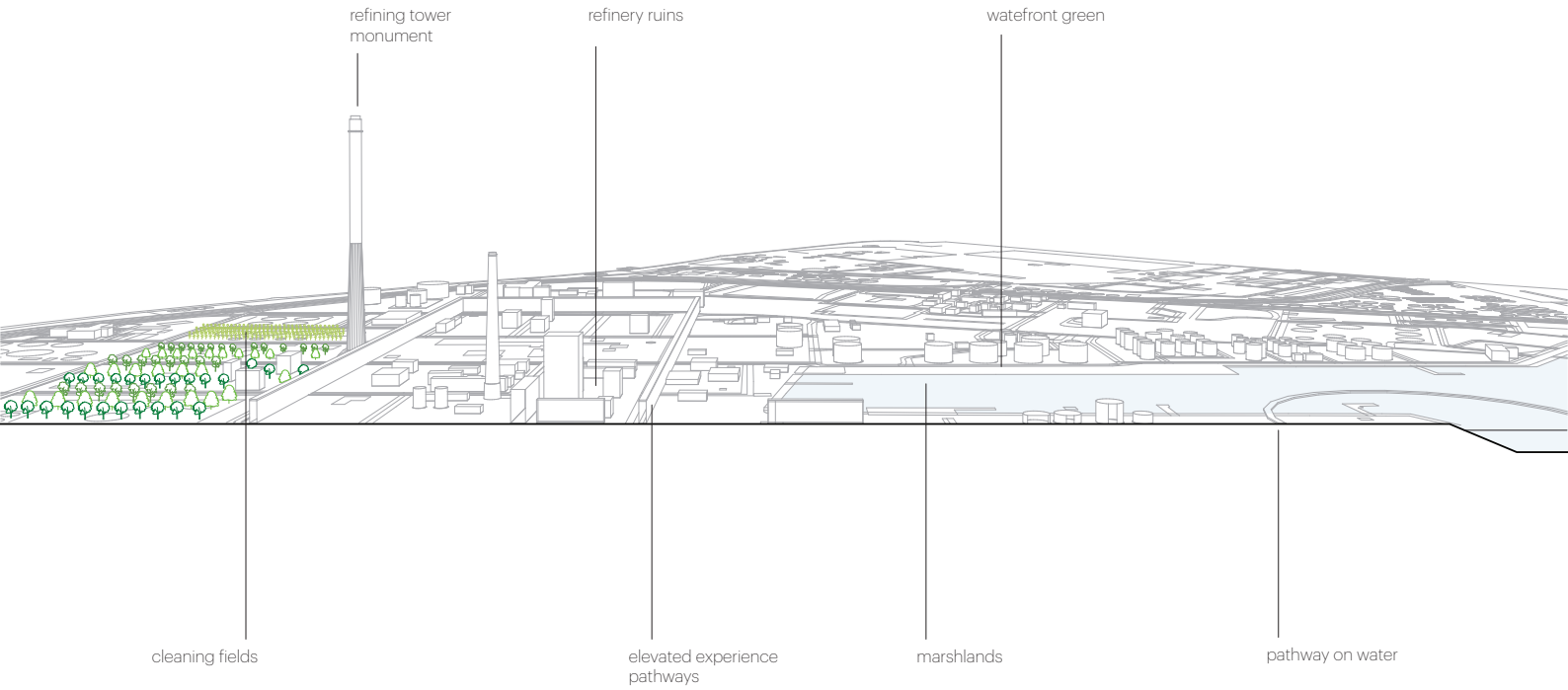
Turf
Woodlands
Flowering remediation
Silviculture remediation
Programatic garden

Experience pathways
Ground pathways
Stilted pathways
Ⓟ Forest parking lot

1 Pipeline bridge pathway
2 Cultural heritage hangars
3 Refinery tower
4 Public pools
5 Constructed wetlands
6 Experience ring overlook
7 Multifunctional recreation fields
8 Industrial garden

0 0.1 0.2 0.5km

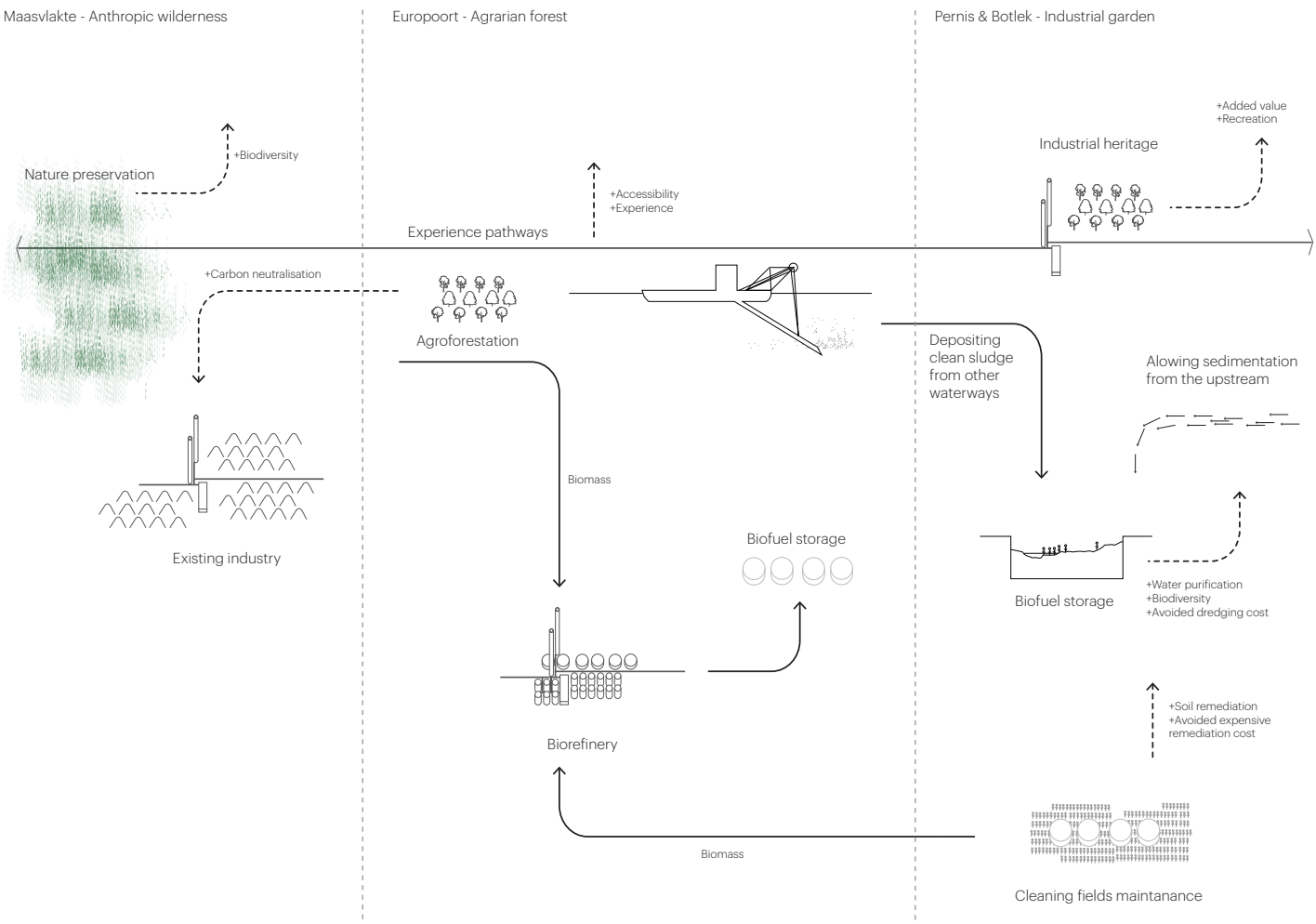



refining tower
monument
refinery ruins
watefront green
cleaning fields
elevated experience
pathways
marshlands
pathway on water

3.

Reflection
Evaluation
Conclusion

Reflection
The productive landscape



Direct benefits

+ Indirect benefits

The diagram shows all the direct (monetary) and indirect (added) benefits of the imagined landscape, where ecology and industry create a synergy to maintain the port main function of an industrial landscape

Governmental

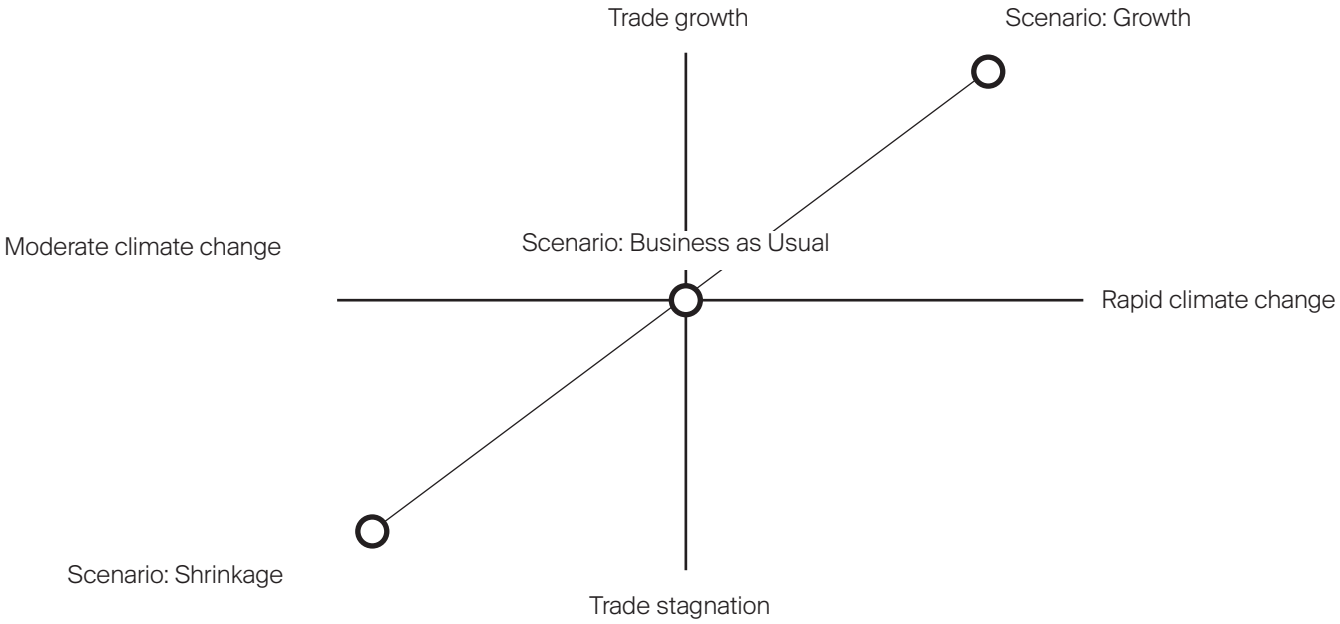
Nature research and presrvation

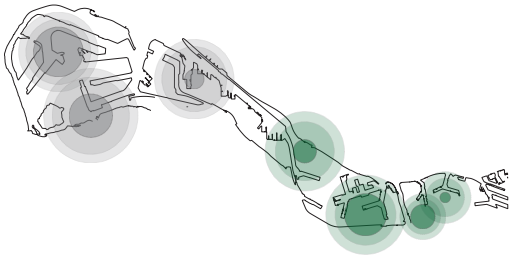
Research & Education

Commercial

Possible future stakeholders

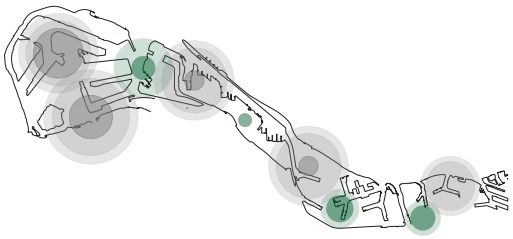
Reflection
On future scenarios





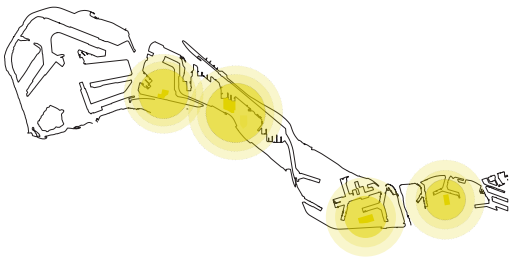
GROWTH – MOVING PORT, EMERGING PARK (harbor would move out and go towards west, there would be free space)
In this scenario, the trade grows, which results in the increase of scales in the container trades and bigger ships that are more automated. At the same time the climate change and sea level rise is happening, resulting major changes in the function of the port.

IMPLICATIONS
- ongoing cargo trade growth
- growth of the scale of trade (only bigger ships that are more efficient and can transfer more cargo)
- 4 degrees celsius global warming (sea level rises 0.5m to 1m)
- in the western part of the city there is more free environmentaly degraded space to develop for recreational, cultural and environmental uses
- infrastructure development up to original plan



BUSINESS AS USUAL - PRODUCTIVE PARK
In this scenario, the trade and climate change stays nearly the same in the future. This results anyhow in moderate shift toward the renewable energy and redevelopment of certain parts of the port, due

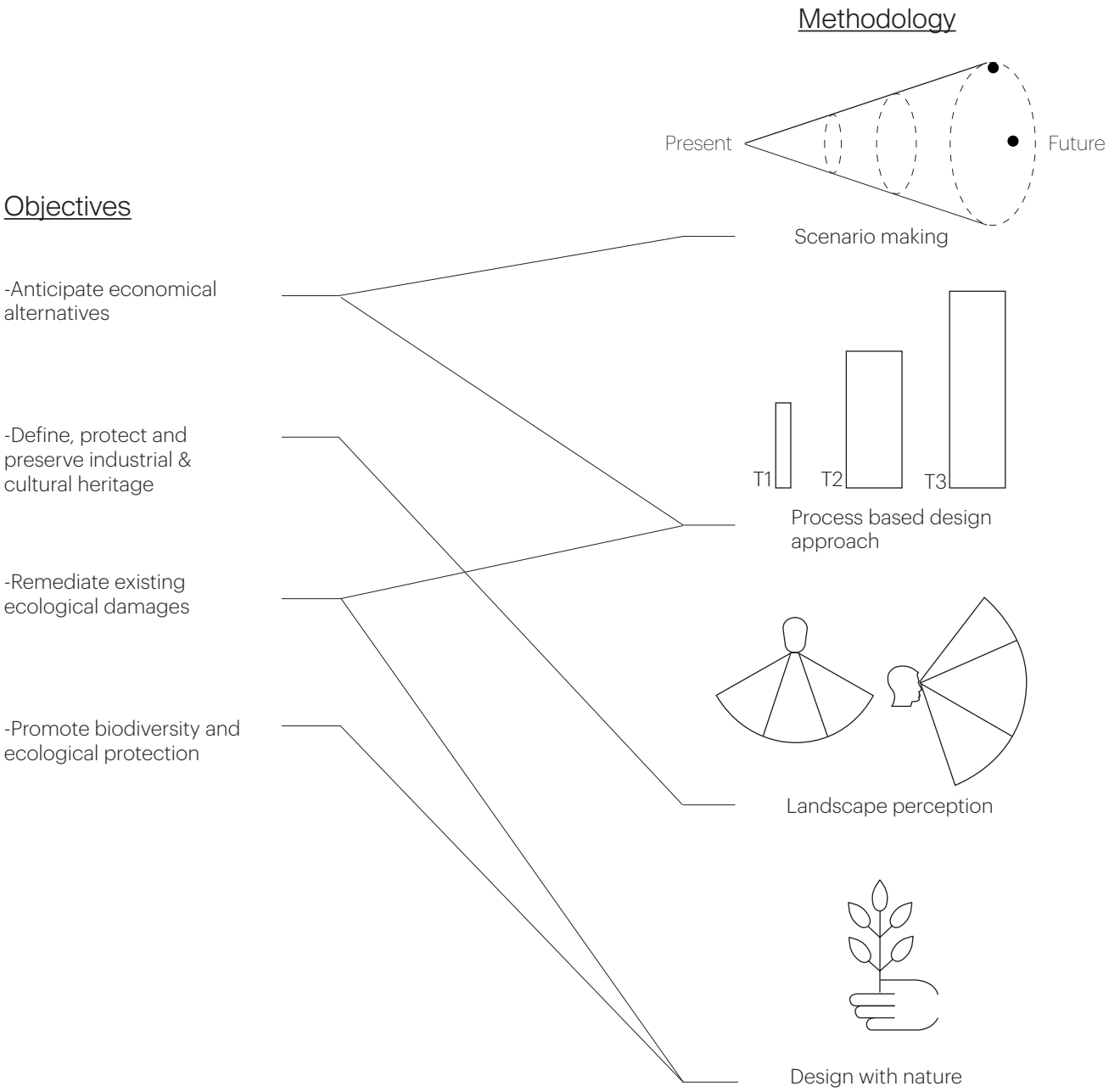
IMPLICATIONS
- around 2 degrees celsius global warming (sea level rises 0.35m)
-interventions in already free areas for development and pollution
-continuous stagnation in petrochemicals, therefore slight shift toward re-newables
-coexistance and mix of public recreational corridors along with ongoing industries in the harbor



SHRINKAGE - BIO BASED ENERGY PORT LANDSCAPE (harbor wouldn't move, but the fossil fuel would shift towards renewables)
In this scenario, the trade stagnates, which results in the need for new economical model and shift towards an energy port. Rotterdam works on becoming major renewable energy and biofuel producer and fuel the region. At the same time, climatic conditions are not changing a lot.

IMPLICATIONS
-international trade stagnates drastically and there is shift towards local renewable energy production, mainly in the bio-based and wind/hydro power storage secto sector
-agro forestation strategies to produce more biomass
-the retrofitting of refienries toward bio refienries occurs, and the whole re-gions of zuid-holland and zeeland are contributing with the biomass

Evaluation & Conclusion



On Methodology

From the beginning of the project, the themes I wanted to address were very broad and the scale and complexity of the project was quite big. This created lot of difficulties in order to cope with all the steps in the project: from objectives, methodology, research and design. What is noted at the end, after a thorough synthesis was done, is that half of the project lies in the 'process' itself. It's not only important what you design, but also how you design, how you came to some conclusions, why you designed certain things.

What I learned is that the importance of design methodology is as important as the design itself, since it explains why certain things are done and in which way. The methods also serve as a guideline and a way to test various options in the design.

The methods I used help me to address better different objectives I stated for myself. It was only possible to anticipate economical alternative by using method of scenario making and looking into the future prospects, and trends as well as the ambitions of the port. Secondly, the process based design allowed me to design in different steps and in that way achieve the co-existence of various programs and uses in time, such as remediation of polluted landscape that is a time based method. Thirdly, the landscape perception method and working with sensory design, that is accumulation of images of the port allowed to design routs and scenery in the 'park' and allocate better different experience pathways. Lastly, design with nature was used in order to promote biodiversity and ecological protection as well as to remediate the landscape.

On imagination

"Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand."

Albert Einstein

Initial hypothesis for the project builds on the imagination of landscape of co-existence, where industry and nature could be seen working complementary rather than working against each other. Initially, it might have seemed as a utopic idea that doesn't fit with reality. The above quote of Albert Einstein depicts the true meaning of the project, where I wanted to go 'out of the box' thinking and test new possibilities for design. And I think it's nice to see that the design outcome turned into something rather palpable, grounded, and maybe in some further future realizable. In the future where interdisciplinary practice is not afraid to collaborate in order to gain better results, where petrochemical corporations work together with phytoremediation specialists and education institutions in order to create cross-disciplinary research and more feasible and sustainable future, both for industry and nature.

SOCIETAL AND SCIENTIFIC RELEVANCE

Contribution

In order to come up with more resilient, and organic urbanism, ecology has become an 'extremely useful lens trough which to analyse and project alternative urban futures' (J.Corner - Terra Fluxus, 2006) while landscape plays a role of a complex medium capable of articulating relations between urban infrastructure, and cultural and natural processes. On the other hand, the economic development has never been so fast and unpredictable. The irreversible patterns of human development and the impact on the environment is a historical fact. Therefore, I would argue that we need to conceive 'remedial landscape that is capable of playing a critical and compensatory role in relation to the ongoing, destructive commodification of man-made world.' (K.Frampton - Towards an urban landscape, 1995). The petrochemical industry is one of the key economic drivers both in the Rotterdam region and on the global level. At the same time, it is No.1 polluter and cause for the climate change. It's impact on our environment in terms of soil, ground water, water, air and the loss of wildlife habitat are evident. As a designer I would like to examine landscape as a medium trough which to generate the renovation and remediation of the ongoing industrial city.

Secondly, design of a park means dealing with complex and diverse systems that respond to processes of economic growth and decay, to their own evolving ecology, to shifts in demographics and social practices, and to changes in aesthetic sensibilities. Due to it's size, their location (often close to urban settlements), and their site histories (former industrial areas that need remediation to make them suitable for recreation), these parks require a process driven design approach that does not intend to provide a definitive plan for the site as much as it seeks to guide its transformation into pubic recreational space. Because the design and construction of parks take years, if not decades, designs are open-minded, incorporating diverse approaches and uneven levels of intervention and management. Berrizbetia, A. (2007)

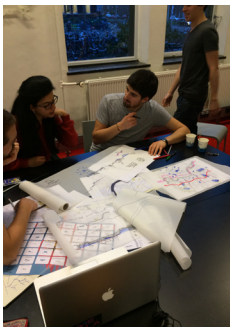
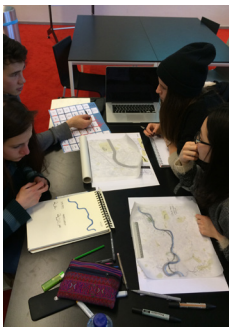
Therefore, the intention of the project is to establish a coexistence of different systems, programs and ecologies, based on theories of process-driven design approach. Parks by nature are already a place of coexistance, not just because they take on the infrastructural and ecological functions already displaced from urban areas, but they also create a place of memorable experience. I would like to raise the consciousness about the changing methodologies, theories and language that are fundamental for the urbanism discipline.

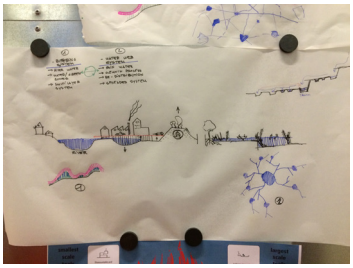
GRADUATION ORIENTATION REPORT

Workshop + Movie screening organisation

Due to the high interest in the ongoing themes of climate change and how can we as designers have impact in it, we decided to organise a workshop + movie screening afterwards. We had a key to stream, still in cinemas, movie 'This changes everything' directed by Avi Lewis, and inspired by Naomi Klein's international bestseller 'This Changes Everything'. The workshop was also organised in parallel to 'The 2015 United Nations Climate Change Conference'. Therefore we took the theme of global warming and the rise in temperature that will influence the water level rise. As a case study we took London, the booming globalisation capital of the world and provided participants with an introduction lecture in which it was suggested how, why and where can we as designers influence design for climate change. We also prepared a small toolbox with the water management operations. There were three interdisciplinary groups (from architects to urbanists) that got three maps in different scale of London with outline where the water will be in the future if we keep warming the planet. The participants were asked to provide three different scale proposals in which they can dress urban and ecological issues. The outcome was surprisingly good, they produced quite nice projects in such a short amount of time that we can maybe use for our own graduation projects. After the presentations and comments there was a very interesting movie screening.





Designing for coexistence

Process based design approach as an alternative to functionalist and deterministic city planning and design

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Urbanism track, Graduation Theory Paper

Abstract

The direct and indirect effects of the industrial society and the modernization had its spatial manifestations on our cities and landscapes. Taking the 'linear way of thinking' and the output of modernist/functionalist city as the outset, this paper tries to emphasize the change in the practice of urbanism and landscape architecture, towards a design for co-existence. This change comes from the fact of theoretical realization that we no longer can separate the natural from man made, but in turn should perceive hybridization of 'urban landscape', i.e. what is urban, becoming more natural, and nature that becomes more urbanized. (Sijmons 2014) Furthermore, the paper aims to highlight 'process based design methodology' as a way to deal with complexity, and the matter of scale and time in the transition of industrial and post-industrial city. More specifically, the paper takes example of Port of Rotterdam, to imagine the possibility of the transition of this industrial landscape. From this outlook, 'design for process' rather than designing 'comprehensive plans'; will form integral part of the discipline of the 21st century.

Key words: modernism, functionalism, comprehensive plans, coexistence, industrial landscape, urban landscape, process based design approach

1.1. Introduction

After the industrial revolution, with the rise of the modernism, we started to build our cities and landscapes in a mono functional way. Modernist planning that was based on segregating functions in the city, outsourcing problems and negative externalities is also the consequence of the enormous linear economy caused by Fordism, as well as the landscape created by the pattern of this production and consumption. (Corner and MacLean, 1996) "Ebenizer Howard's Garden City, Frank Loyd Wright's Broadacre city, Le Corbusier's Ville Radieuse, and the City beautiful movement were all designed under the premise of using the landscape as a respite from urban congestion and the pollution created by the industrialization." (Berger 2006) But in turn, the outcome was decentralization and even more congestion. This industrial city that developed on behalf of extraction of resources, today found itself in decline and with social, environmental and economical issues.(Berger 2006) These historical facts are addressed more in depth, in the second paragraph of this paper, as well as the question the spatial implications of linear ways of production.

However, according to Sijmons "the simplistic arrangement of the past, in which we placed city and nature in opposition to each other so that they excluded each other, is no longer valid." (Sijmons, 2014:15) Therefore, in the following paragraph, the paper will talk about the paradigm change from the outdated 'city making' model and the linear way of thinking that generated the functionalist city. In turn we should project and redesign the balance between the anthropogenic landscape (man-made) and nature and to project a transition from post-industrial, mono-functional and linear landscape

towards a more open, fluid and hybrid type of landscape. According to these statements, some examples are used to illustrate the conditions created by post-industrial cities, and subsequently the port of Rotterdam to point out some recent practice that underpin the theories behind coexistence and complexity.

Finally, in the last paragraph the paper proposes a design methodology to be used to project transition of industrial and post-industrial landscapes, more specifically, by demonstrating possibilities in the case of port of Rotterdam. The methodology of 'Process based design approach', mainly familiar under the notions of landscape architecture and landscape urbanism, "has the ability to reveal a notion of place that is broad and complex", and according to Berrizbeitia, "has an inclusive attitude toward history, ecology, recreation and perception." (Berrizbeitia 2007)

1.2. Relevance on the topic

The relevance of the understanding the consequences and spatial implications of industrial and post-industrial city is today more relevant then ever, especially in the context of industrial transition, from more linear, closed and rigid systems, to more open, flexible, and indeterminate. Since the declaration of the Anthropocene by Crutzen and Stoermer 2000; Crutzen 2002; Williams et al. 2011, as a scientific hypothesis based on the assumption that humanity has become a global earth system factor, we no longer have to maintain the fiction between the division what is natural and what is artificial. (Sijmons, 2014)

More specifically, and in relation to the paradigm change, we observe coexistence as the form of existence in which multiplicity becomes a unity and where the individual has no territorial claim towards the collective. (Russo and Aste 2016) Designing for co-existence, should be our priority, and according to Lister: "it can offer fertile ground for the creation of new, hybridized natural-cultural ecologies and the rehabilitation and rediscovery of others." (Lister 2007)

In the graduation project in which these theories are being applied, I'm building a 'research by design' project for a framework that could guide the transition of port of Rotterdam into a productive landscape park. Hereby, the nature and ecology become industry, while the existing industry gradually becomes a cultural landscape. This comes from the fact that port of Rotterdam is still a working industrial landscape; therefore the time here is seen as tool or technique to orchestrate processes and evolution of landscape from heavy industry towards a more 'synthetic' space, and go beyond "the techno-spatial limits of the twentieth century Fordist engineering to deploy ecology and self-organization as agents of urban renewal and creative innovation." (Bélanger 2015)

2. 'The city as machine' – on spatial manifestation of the industrial city

The Fordism movement and the linear way of production and consumption begins with Henry Ford, the creative force behind the automobile industry in Detroit in the beginning of the 20th century and the application of Taylor's scientific management to the industrial production.

As described by Schumacher and Rogner (2001) 'Fordism as a technical and spatial system' happened in three phases: The first phase happened when Ford applied assembly line to increase the speed and scale of production. Along with the production, the work became observable, controllable and modifiable, which meant that the tasks of the laborers was recorded, analyzed and broken down into elementary movements. This allowed the optimization of efficiency. Albert Kahn provided adequate architecture that by using reinforced concrete offered wide spaces and freedom of movement. According to Schumacher and Rogner (2001) the second phase happened when "the assembly line concept was applied to an overall urban complex" creating a "city as a machine". "Here Ford dispersed the production line flows and assembly points in single-story sheds designed by Kahn across enormous suburban property, creating worlds largest industrial complex."

(Shane 2006) In the third phase production patterns become decentralized. According to (Schumacher and Rogner 2001) the decentralization started happening on regional and national scales. This meant construction of specialized industrial sites dispersed around the U.S. nation and construction of infrastructural networks to connect them.

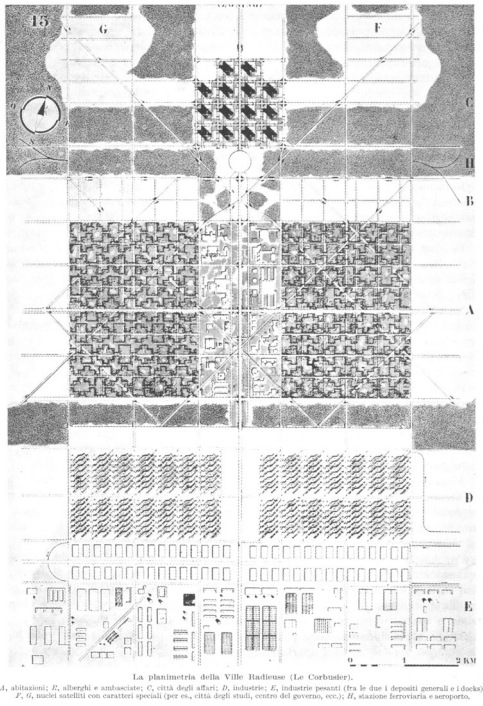

Fig. 1. La Ville Radieuse; Boulogne-sur-Seine, éditions de l'Architecture d'aujourd'hui, Le Corbusier (Pierre Jeanneret, dit) 1935; Paris, BNF, Littérature et Art

The spatial implications of Fordism, became evident in Europe after the First World War, establishing the socio-economic basis for modern architecture. (Schumacher and Rogner 2001) Mass production asked for mass housing, mass produced domestic objects, factories, which were worthy tasks for modern architecture of the time. Peter Behrens, Walter Gropius, Le Corbusier and Mies van der Rohe were some of the architects who "re-invented the discipline" (Schumacher and Rogner 2001:51). In the same way as the Fordism made changes in the production, functionalism implied changes in objectification and analysis of the design process and architectural composition: decomposition, differentiation, repetition and integration. Albert Kahn's General motors Headquarters building (1917-1921) was one of the early examples of functionalist architecture followed by Walter Gropius's Dessau Bauhaus (1926) building which hosted residential, administrative and workshop functions, separately articulated, allowing for differentiation in depth, height and façade according to the need of each function. (Schumacher and Rogner 2001) The separation was continued, as well in the design of cities. The best functionalist example of Fordist logics applied in urbanism is Le corbusier's Ville Radieuse (1933). As stated by Schumacher and Rogner 2001: "it is among the most comprehensive and rigorous expositions of Fordism logics of differentiation (zoning and distinct functionalist articulation of each zone), repetition (homogeneity of each zone), and hierarchical integration (transport system) applied to the city" (see Fig. 1). The culmination of Fordism architecture came with the post-fordism and dispersal of a more open, decentralized, self-organizing and postmodern pattern, still operating today. (Shane 2006) The question what to do with all the industrial and derelict landscapes and cities that were left behind in the wake of Fordism and how to make these landscapes inhabited again, both by people and nature. Is there a way, how to recover these landscapes, and give them new meaning?

3. Hybridisation of 'urban' and 'landscape'

The question facing post-industrial cities and detritus left behind the industrialization is eminent theme within the discourse of architecture and urbanism. This outdated 'city making' model and the linear way of thinking generated the functionalist city, that was based on separating functions and creating segregated mono functional landscapes (housing, industry, leisure, work). As seen from the case of Detroit, once the industry decentralized globally, the city is left with abandoned factories, acres of vacant workers housing and commercial strips. This is also case for some European cities and regions; one of the best examples is the Ruhr-area region and in Germany. The large scale coal and steel industries along the Emscher river created economical backbone of the region, but due to the global shift in

production areas and increase of the service economy, industrial areas “left behind a legacy of high unemployment, scars of environmental contamination, and the haunting shadows of the gigantic steel plants.” (Loures and Burley 2012)

However, as a response to this paradigm, there has been a change in the discourse of urbanism and city planning, and a critical review towards the idea of zoning, i.e. separation of different functions in the city. (Viganò 2013) According to Sijmons (2014): “In the Anthropocene we realize that city and nature overlap spatially and impact each other functionally.” He advises us that the urban question should be viewed from the perspective of landscape architecture, and regards it as appropriate discipline to guide us in the ‘hybridizing world’. “Landscape is by definition an ambiguous and connecting concept, in which natural factors and human factors come together.” (Sijmons 2014) There are numerous possibilities in which we can blend these realities and landscapes that could be beneficial both for urban as well as natural. As also stated by Vigano (2012:), there is a “rise of a different kind of rationality within urban and regional design that aims to cope with the characteristics of ecological problems: complexity, non-reducibility, variability in time and space, and uncertainty; the collective nature of environmental decision making in urban areas; as well as spontaneity, auto-regulation and resilience of ecosystems even beyond human intervention.”

Following the underpinned theories stated before, we can perceive some practical ideas about this paradigm shift in design and construction of large industrial/infrastructural works where productive blending of different social, economical and environmental aspects was achieved. With the construction of Maasvlakte 2, the latest addition to the Port of Rotterdam, the design developed on the theoretical models of ‘building with nature’, delivers a multipurpose infrastructure, and is aligned with natural processes rather than working against them, while dealing with changing conditions of climate change and sea level rise. (De Vriend and Van Koningsveld 2012) The Port of Rotterdam Authority has redeveloped in consultation with H+N+S, landscape architecture firm Maasvlakte’s bird valley (The Vogelvallei), a nature reserve for birds, that comprises various islands and bodies of water as well as open protected spaces, where birds can rest, settle and nest. On the outer areas of Maasvlakte 2, the dune landscape was recreated as compensation to the negative impacts on the Voorne and Kapittel dune areas. This new public space and beach also serves as an infrastructure for water protection against the North Sea. While traditional approaches focused on minimizing the negative impacts of envisaged infrastructure projects (building in nature), building with nature aims to be proactive, utilizing natural processes and providing opportunities for nature as part of the infrastructure development process. (De Vriend and Van Koningsveld 2012)

4. Process based design approach, as a methodology for city making in the 21st century

The theoretical change in the discourse of post-industrial cities in the last 2 decades was also followed within the practice and the design methodologies. There is a more open and interdisciplinary view focused on restoring or reintroducing the natural processes and features of landscapes in cities. In order to project the transition of post-industrial or industrial landscapes, we deal with complexity: multiplicity of urban functions and ecologies, number of stakeholders involved, clients, governments and government agencies, many different communities. Secondly there is a matter of scale: the incapacity of designers in trying to find a working relationship between large scale strategy, and more detailed poetics of design and city making, therefore “the planning mind should be united with the design mind, and different types of scale can be approached.”(Corner 2009) Thirdly, last aspect that asks for different approach is time: when dealing with large and complex urban systems, we have to consider time as a design tool. This comes from the fact that nature development needs time, but also from the fact that city making is part of a long and unpredictable process.

As a response to these three spatial implications of post-industrial city: complexity, scale and time; the design demands 'process based design approach'. This strategy acknowledges complexity, history, and often, contradictory programs that must be accommodated. Used also in the design of large urban parks and coming mainly from the background of landscape architecture and landscape urbanism, the strategy is layering range of dynamic processes on the site, trough various scales and time. (Berrizbeitia 2007) Two projects that are the best exemplary of this design method are James Corner's project for Downsview (together with Stan Alen) and Fresh Kills (see Fig.2). Both design proposals for a post-industrial landscape deal with accommodating human activities and natural systems trough the deployment of a precise series of forms and pathways that will each support the emergence of self-organizing flows and behaviors over time.

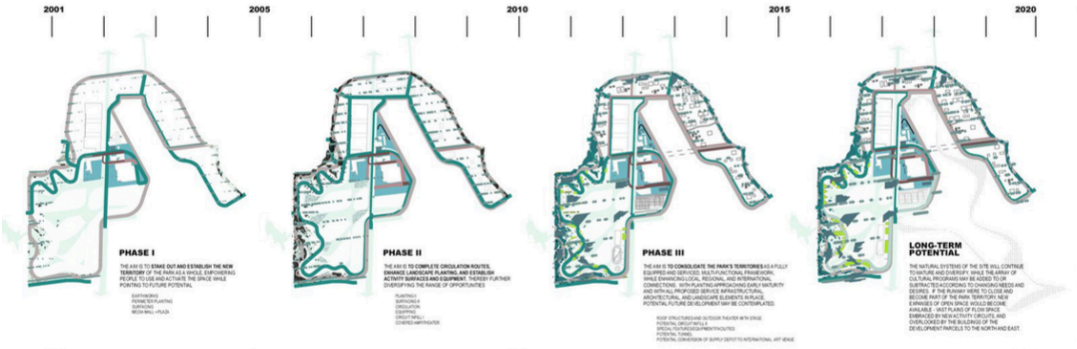

Fig. 2. James Corner Field Operations with Nina-Marie Lister, Emergence through Adaptive Management. Downsview Park, Toronto, Canada, 1999.

In this context, the port of Rotterdam, could be an extremely interesting case to be explored, as a large and complex industrial landscape, that questions the relations between the coexistence of man-made and nature, since it's the biggest port of Europe located at the delta of one of the biggest rivers of Europe, and therefore is a habitat rich in biodiversity. On the other hand, the economic development until now was based on mono-functional fossil economy, brought consequences such as environmental degradation and habitat loss. It is certain that due to the shift toward renewable energy, the technological development and construction of larger and bigger ships, as well as the climate change and sea-level rise, certain areas of this industrial landscape, will loose its functionality.

Therefore, we can imagine the transition as 'succession' in the port of Rotterdam, i.e. making interventions now, that become instrumental in the orchestration of large-scale effects that will grow and develop in the future. More specifically the plantation of special types of plants that have remedial functions for the polluted harbor grounds, that in future could be used more as a part of public landscape as well as for biomass production. In this way, trough 'time as design tool', we explore uncertainties trough spatial options. And in relation to the 'modernist approach' of designing a plan, we rather 'design for a process' and allow for flexibility and indeterminacy.

As we can see in Corner's work, operating on a multitude of scales, the soft, vegetal dimension of design could thus be integrated as emergent organic infrastructure (Belanger, 2015) in contraposition to the hard, fixed and mono functional infrastructures of the past, and provide a framework for the evolution of urban landscape and room for co-existence and multiplicity

5. Conclusion

As previously stated, the linear way of thinking in the 20th century and Fordism logics of differentiation, repetition and hierarchical integration applied on the model of city, created inflexible, closed and rigid planning for the urban development.

Today, there has also been a change in the discourse of urbanism and city planning, due the hybridization of ‘urban’ and ‘natural’ domains, into ‘urban landscape’, consequently we see that the topics of coexistence and multiplicity are becoming more familiar and are being deployed in practice of urbanism and landscape architecture.

Under this lens, ‘design for process’, rather than designing ‘comprehensive plans’ that are static, rigid and fixed; will form integral parts of the discipline for the 21st century, with its capacity to deal with complexity, uncertainty and indeterminacy trough various scales and time.

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Reflection paper

Reflection P3

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The initial interest and keywords were ecology and economy; as well as the physical and environmental impacts of the economy on the landscape; therefore a research by design was conducted to understand the interdependencies of 3 important layers of the port territory: landscape, occupation and accessibility. The problem statement also gives input for the research. In the first place, the mapping of landscape and open space typologies, the biodiversity patterns, as well as the pollution levels and parameters from the environmental assessment documents of the harbor give overview of current problems and opportunities of the landscape. Occupation in other place was coming from another important keyword, the economy. Current spatial manifestations behind economical processes in the harbor were mapped. Lastly high security and low permeability and porosity possibilities lead to interest in analyzing accessibility via mapping of existing routes and differentiation between different modes of transportation, recreation, contact with water and as well as the cognition and perception.

The initial theoretical research coming from the disciplines of landscape urbanism, emphasizes few design methodologies for the design of complex urban systems. One of the main methodologies used in order to design for such a complex system as a port of Rotterdam was *´process based design approach´*. The interest in this design methodology was always central to this project but the complete understanding wasn't. By trial and error, it was succeeded to form a methodology in order to arrive to similar compositional structure. I guess the overall structure of the methodology can be seen in two parts. The first, as already mentioned, a thorough research on different layers of territory in space and time and constitutions of the essential resources to be elaborated into a design. Important addition to the steps described above, was also referring to reference projects, theories and design interventions in order to relate the work to other methodologies that might give a useful feedback on the questions of 'how'? One must take into consideration that the methodology on the other hand is something that itself is a process and changes and adapts during the time and evolution of the project.

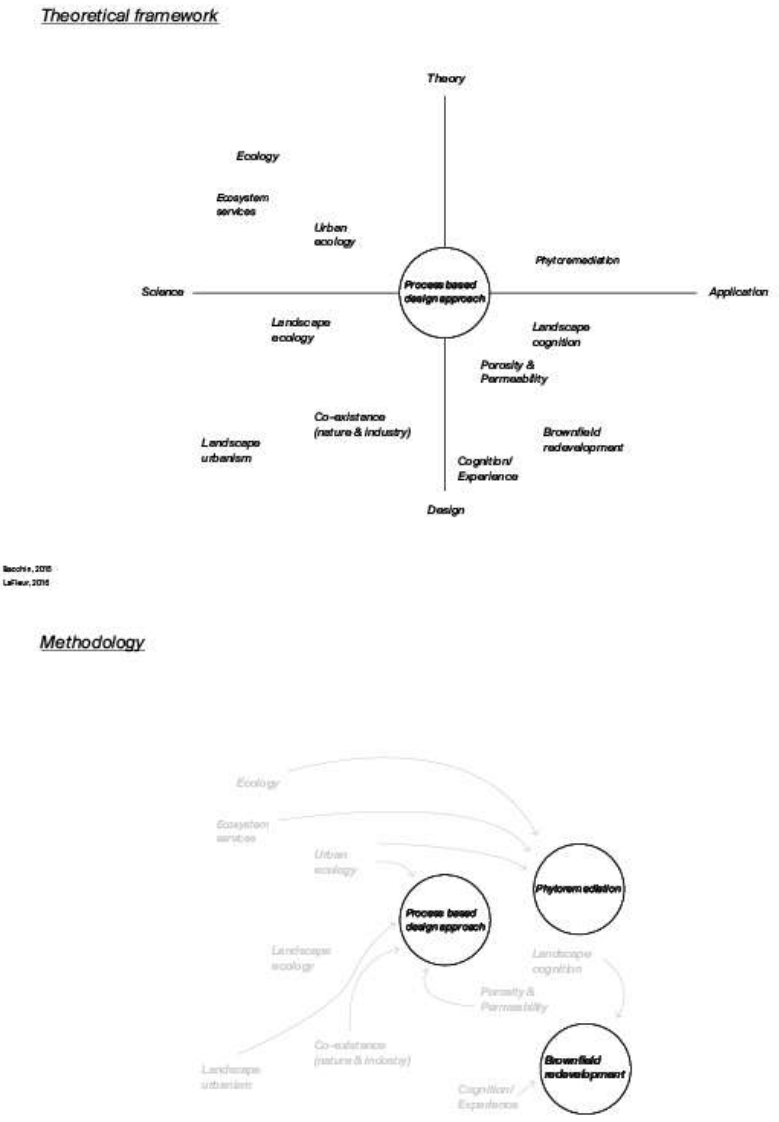

FIG.1.1. From theory to methodology

According to Berrizbeitia, A. (2007), working with process-based approach, rather than purely compositional one demands four significant shifts in design methodology. These four shifts were used in order to reflect on the the design methodology and it´s relation to the research. First there is a shift in design methodology toward dedicating more effort to site research than once was the case in formally focused design approaches. As already mentioned, in the research phase, 3 different layers of landscape were analyzed in order to get best possible input for the design. The soil contamination maps clearly outline lots of the harbor with higher need for environmental interventions. Therefore, using the environmental assessment documents from the harbor indirectly show where the design of the flowering remediation fields will be located, designed in co-existence with the ongoing

industry in the harbor. The accessibility in the harbor is one of the main problems. It is very hard to move around even though by looking at the maps, there is abundance of infrastructure. By mapping these lines, and comparing them to different layers of territory, one gets a clearer idea of the possibilities for the design and eventual design outcomes.

Second, the dynamic nature of the materia itself requires one to design processes rather than landscape's final form. Instead of introducing external forms and transforming the site to accommodate those forms, these are 'found' and evolved out of systems already there. This implies a shift from creating compositions based on notions of balance, regularity, and hierarchy to working with systems, natural or man-made, and the various ways in which they can be organized and distributed as fields, gradients, matrices, corridors, etc. to facilitate connectivity, ecological functions, program and the perception of place. In the project design, three time periods over the course of 50 years were used in order to design with processes. The first design phase accounts actions starting now and going up to first 15 years. This in one hand goes good, in order to apply the slow remediation processes because ecology and environment needs time. On the other hand, you want to start opening up and allowing people to access certain areas in order to use and perceive this landscape. In the second time phase, some of the areas are already clean and allow the change of program, by putting different public or economical use into the place. Third and the last phase is in the far future, and is the possible final outcome of the project as well as the higher successional stage of the project. The harbor landscape can be differently perceived in these 3 different time periods, initially more as an industrial and agricultural landscape where there are different earthworks and soil regeneration processes going on together with industry, while in later stages, the landscape becomes more like a park accessible to the wider public.

Third, the history is understood as a process itself, rather than a visual reference for form, style or type. Process-based practice acknowledge that the site is defined as much by its visible physical qualities as by its accumulated histories. This is especially for the large parks because they occupy sites that have been transformed several times over the course of centuries. The development of the harbor had a big environmental impact. Where once was the estuary of a river and a nature reserve, today one can find biggest clusters of oil storage tanks and oil refineries in the Europe (see Europoort). The design tries to work with the existing elements but also tries to put them in confrontation with its past, by putting forward possible natural and environmental design actions, and ecological networks for the wildlife. It is a common fact that the western world is living in an post-industrial era. The term post-industrial creates more problems than solutions because it narrowly isolates and objectifies the landscape as the byproduct of a very specific process no longer operating upon a given site. (Berger, A. 2013) Therefore, the term post-industrial is avoided in the development of the project. Also because most of the Port of Rotterdam still functions as it did for years. Instead of creating a completely new landscape, the proposed design hypothesis attempts to celebrate the area's industrial heritage by integrating vegetation and industry, promoting sustainable development and maintaining some of the ongoing industry works, and some being dismissed and succeeded with newer and more sustainable forms of industry. But how can this coexistence be designed?. For example this is done by turning the Shell refinery into a cultural and research center for new sustainable energy and biofuel. On the other hand a careful selection of the experience paths is designed where people can visually interact with the industry, for example in the iron ore and coal terminals.

Forth, process based practices anticipate change from the outset, understanding that their intervention is only one of many in the immense evolutionary processes of the landscape. Design in this case is less about permanence and more about anticipating and accommodating growth, evolution and adaptation in the face of unexpected disturbance and new programs and events. Berrizbeitia, A. (2007) Again, I think this is something essential to the project where the actual design is more like a framework that guides a transition of the port. In the later stage of design, scenarios will be speculated in order to reflect on the possibility of project to be resilient and adaptable to different possible futures.

In the ´Delta Interventions´ studio the urgent question is how new balances can be created of different aspects: safety against flooding, the development of livable and attractive urban areas, conditions for economic growth and conditions for nature and ecology. Flood defense interventions, urbanization, port development and nature development are strongly influencing each other. The question is how we can make designs for urbanizing delta areas in way that the different aspects can take profit from each other. Port of Rotterdam as main economic force in the region, is also influenced by the climate change, which implications that are far-reaching and pervasive will affect both ecological and economical systems in the harbour. For this reason, the design of the transition of the port of Rotterdam into a productive landscape park is chosen, where environmental design can work in order to bridge the gaps between economy, ecology and the local inhabitants, while offering better quality of life, economic prosperity and benefits in terms of ecosystem services or wildlife regeneration.

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Landscape imagination:
Ecology as Industry

Designing a transition for the Port of Rotterdam into a productive landscape Park