After the smoke...

Envisioning a healthy regenerative Port of Rotterdam

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Content

Abstract

The current energy transition efforts in the Netherlands are insufficient to achieve a healthy society. The Netherlands Climate Agreement 2030 goal to reduce climate emissions by 50%, is projected to not be met unless more drastic measures are taken (Corder, 2024). In this report, the first step taken to achieve this is the mandated removal of fossil fuels. The removal of this industry in the port of Rotterdam is the catalyst for change that shapes a health-based strategic vision for the port and the surrounding Rijnmond region.

To achieve this vision, research was conducted to determine strategic interventions to be taken related to the necessary energy, climate and societal transition. The research specifically identifies the workers of the region as the transition community that is most negatively impacted by the removal of fossil fuels from the port. The research methods used include fieldwork, a literature review to define “health”, action mapping on a 100 year timeline, and analysis on relevant policy, spatial planning, and stakeholders.

The health framework created focuses on preventative measures, and includes the built, natural, mobility, and social environment. Radical imagination and theory on “degrowth” principles were also used to develop the vision. Ultimately, by dividing the port of Rotterdam into zones that each have their own identity based on our health principles, a 100 year strategy was created for a regenerative port, and in turn, a healthy region, that future generations can enjoy and take pride in. This report defines a “healthy future” vision that can serve as an example for future regional planning efforts and policies. This example is not only applicable in the Netherlands but in all fossil fuel transition landscapes and communities, and not only for workers, but for all living beings.

Keywords

Port of Rotterdam, built environment, health, social identity, climate adaptive, energy transition, regeneration

Without the Port of Rotterdam there is no Rotterdam. Without Rotterdam, there is no port.

Introduction

01

Intro duc tion

The port of Rotterdam is seen as the driving force behind the wealth of the city, region and country. It is hard to envision Rotterdam without its port. The two seem intertwined with each other. The powerful quote ‘Wihout the Port of Rotterdam there is no Rotterdam. Without Rotterdam, there is no port’ has been an inspiration, resulting in this report, *After the smoke*, where a 100-year regenerative vision and strategy for the Port and the Rijnmond region gets presented.

Ports are interesting places, having unique international characters, where globalization is visible. Traditionally a lot of fossil fuels get used, produced, stored and transfered in these ports. Ports worldwide have to deal with the reality that fossil fuels are not infinite. Ports will even have to reinvent themselves, being capable to contribute to a sustainable future. This report examines how the energy transition will influence the Port of Rotterdam.

The energy transition creates a lot of problems and opportunities to all communities involved. The workers of the port were often seen as a vulnerable community in times of transition. This reports examines, throughout the perspective of the workers of the port, how the current energy transition can be fulfilled in a socially just way.

An example of a worker in the port is our persona, Linda. Linda is 40 years old, working in the sector of oil refinery as an engineer and lives close to the port, with her husband and two children. Throughout the report she represents all workers of the port. *After the smoke* envisions a future for Linda and her future descendants.

Figure 1.1
Vision Collage

Context

02

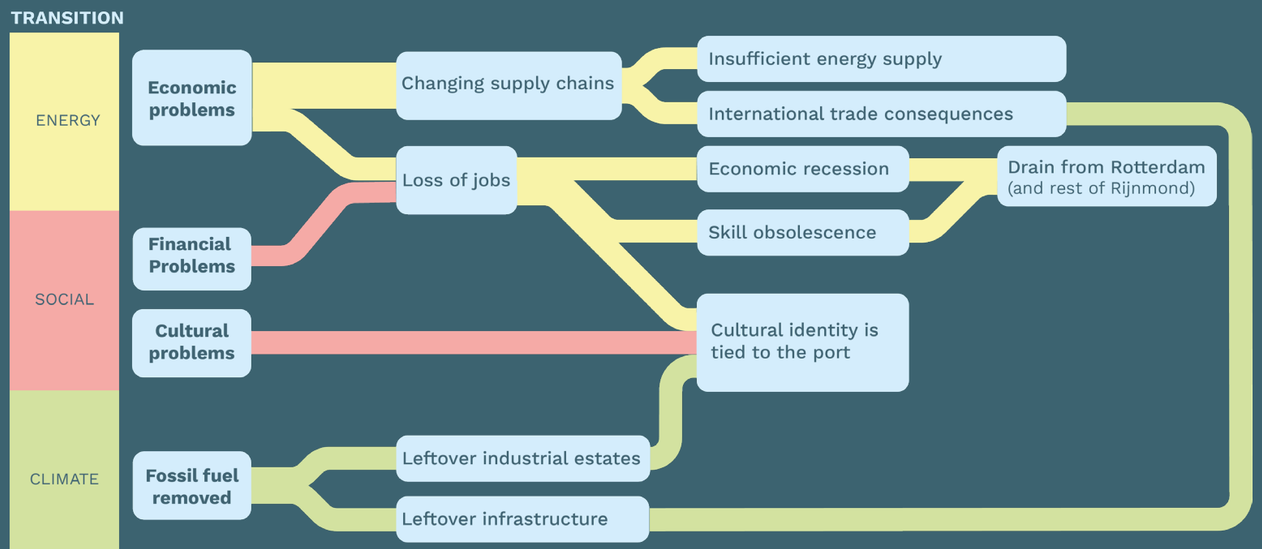


Figure 2.1
Flowchart of the problem statement

Problem statement

Problem Statement: Considered the gateway to Europe, the Port of Rotterdam connects to over 1,000 ports worldwide and generates €63 billion in economic value, accounting for approximately 8.2% of the Netherlands' GDP (cbre, 2022). However, this economic prosperity comes at the cost of the region's health. The Port of Rotterdam's activities resulted in 22.4 million tons of CO_2 emissions in 2020, accounting for nearly 17% of the Netherlands' total CO_2 emissions (Engelke & Webster, 2023). This is due to the port's continued dependence on fossil fuels to fuel its economic activity, which directly contributes to Rotterdam being the least healthy city in the Netherlands (Gezonde Stad Index, Arcadis, 2024). While some efforts are being made in the current energy transition to reduce carbon emissions, the Netherlands Climate Agreement to reduce emissions by half in 2030 is projected to not be met unless more extreme measures are taken to stop these planet-harming emissions (Corder, 2024).

According to the World Health Organization (2018), climate change is the single biggest health threat facing humanity, with environmental pollution directly harming health through "air pollution, disease, extreme weather events, forced displacement, food insecurity and pressures on mental health." It is for these reasons that we reject the fossil fuel industry entirely in our vision, and focus on what remains after industry leaves. It is important to note that the port provides employment for about 150,000 people, almost 20% of employment for the entire Rotterdam-Rijnmond region (Port of Rotterdam, 2023).

Though necessary to restore the health of the planet, an immediate departure from fossil fuel would cause structural unemployment in the region and a major cultural shift. Therefore, the interventions taken regarding the shift away from fossil fuel must focus on uplifting the workers of the region.

Urgency

CO_2 emissions from businesses in 2020

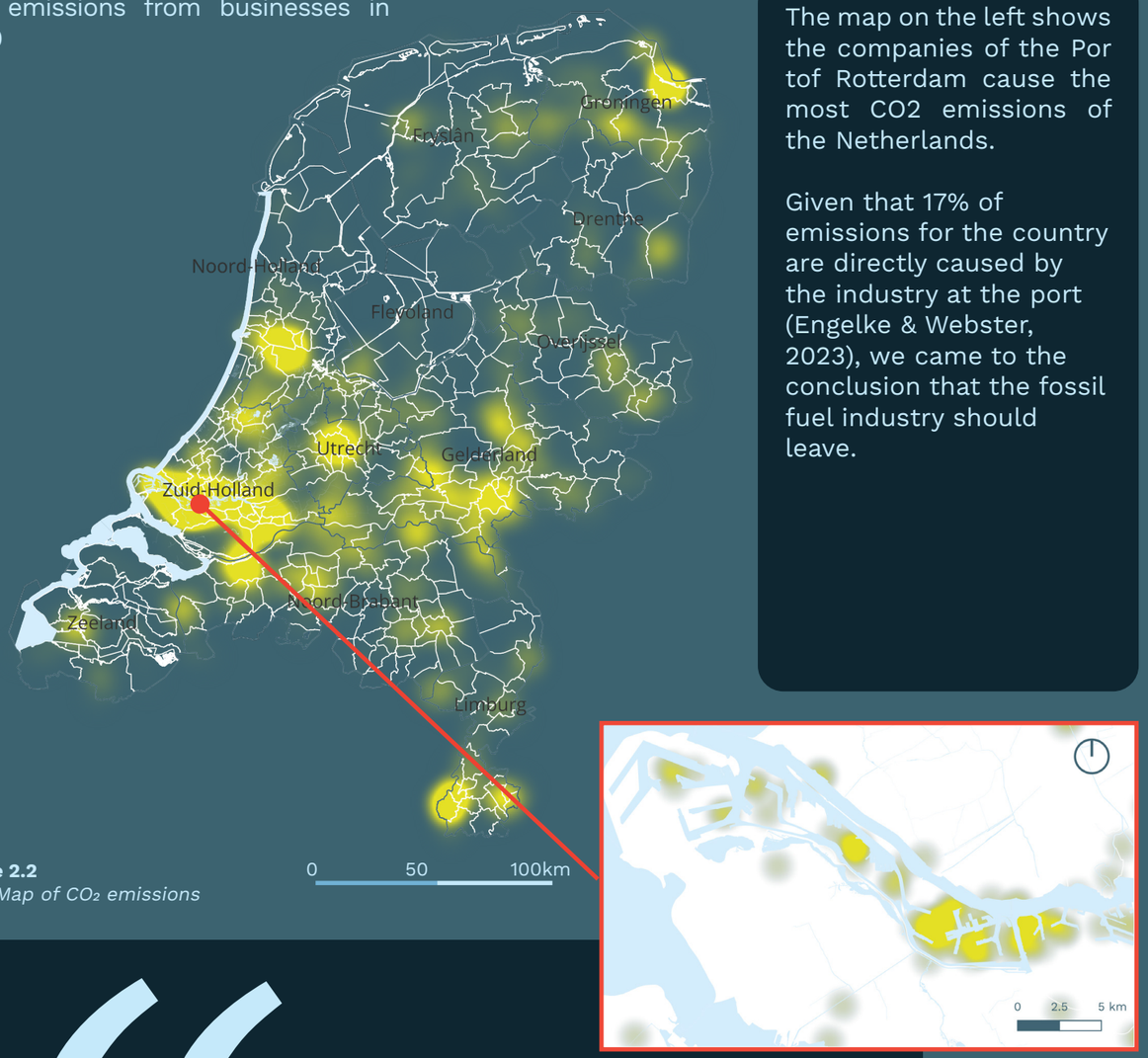


Figure 2.2
Heat Map of CO_2 emissions

The map on the left shows the companies of the Por tof Rotterdam cause the most CO2 emissions of the Netherlands.

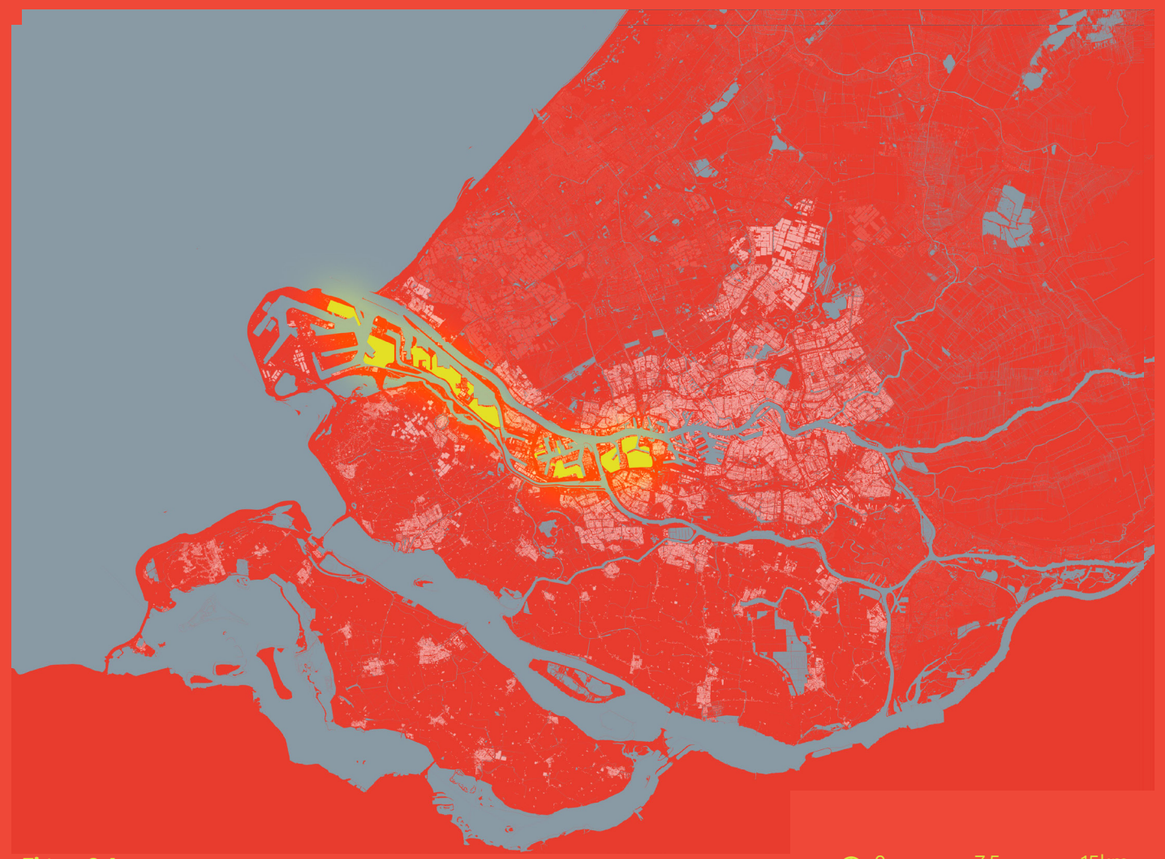
Given that 17% of emissions for the country are directly caused by the industry at the port (Engelke & Webster, 2023), we came to the conclusion that the fossil fuel industry should leave.

Figure 2.3
The 25 studied cities, Gezonde Stad Index, Arcadis, 2024

The Gezonde stad index (2024) (Healthy city index) did a research on 25 cities in the Netherlands with the highest populations. They tested the cities on a framework of health, containing the categories: healthy environment, healthy community, healthy built environment, healthy mobility and healthy outdoor space.

Rotterdam is in this research the **least healthy city of the Netherlands**, which is problematic. They especially scored bad on ‘safety’, ‘cleanliness’, and ‘nitrogen’.

> **“In 2020, the Port of Rotterdam’s activities resulted in 22.4 million tons of CO_2 emissions accounting for nearly 17% of the Netherlands’ total CO_2 emissions.”**
>
> *Engelke & Webster, 2023*



0 7,5 15km

N

Figure 2.4
Space taken up by fossil fuel companies.

“Behind the city’s symbol of growth, prosperity, and open gate to the world is a thick smokescreen hiding a bleak reality: the harbour is widely dependent on fossil fuels, relies on polluting industries, harms our collective health & prosperity and is driven by profits over people.”

Extinction Rebellion, Netherlands, 2024

The fossil fuel industry will leave the port of Rotterdam

Focus Region

> **“The Port of Rotterdam generates about 500.000 jobs.**
>
> **The port provides almost 20% of environment for the entire Rotterdam-Rijnmond region.”**
>
> *Port of Rotterdam, 2023*

The Port of Rotterdam has not only impact on the citizens of the Port and the city of Rotterdam, but also on the whole RIjnmond Region.

Figure 2.5
Port of Rotterdam in South Holland

Figure 2.6
Rijnmond Region in The Netherlands

Transition community

Who will be left behind when the fossil fuel moves away?

The workers of the Port of Rotterdam

Concluding from the assumption that the fossil fuel industry will leave and the fact that a big amount of people from the RIjnmond region are currently working in the Port, the transition community for our project are the workers and their families of the Port of Rotterdam. In our project is Linda the representative of the transition community.

Fieldwork

Figure 2.7
Route of excursion trip, Google Earth

Rozenburg

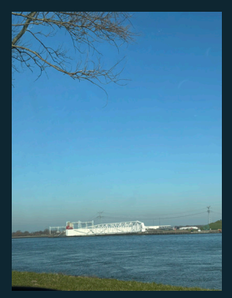
Small village surrouded by the Port.



Landtong

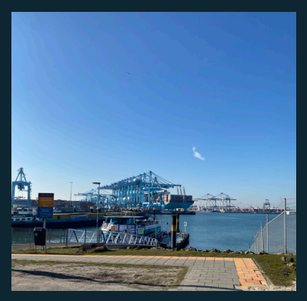
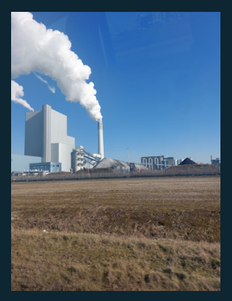
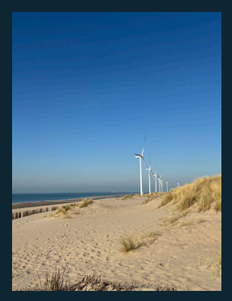
Extended nature reserve with the Maeslant storm surge barrier at the end and Watch towers on the way.





Maasvlakte

The last build part of the port, with a lot of industry. However, there is also the Maasvlaktebeach for recreation.

Pictures taken by authors

Heijplaat

Small village that used to be part of the Port of Rotterdam, where the workers lived in this villages. Nowadays is still charateristics of the port visible in this village.




Interviews in Rozenburg

"I do not feel a connection with harbor."

"The most beautiful place to visit in Rozenburg it the waterside"

"There is a bad traffic connection with Rotterdam'

- Two people working in the libraby about 40 years old

"Some people work in the habor, mostly in Europoort anfd Botlek."

"Some workers come to Rozenburg to buy their products"

"I can not say if the people are proud of the Port."

- Girl about 20 years old, works at Hema

"I do not feel a connection with harbor and I do not work there."

"I can hear the ships and harbor acitivites, but it does not feel like noise pollution, because I chose to live in Rozenburg"

- Two parents with a child, about 30 years old

Key findings

Large scale infrastructure without the human scale

Disconnection between the city, Port, and villages

Already recreation options in the port

Subtle smell of chemicals and sound

Nature existing in Landtong, but not in the Port

Dystopian vision

What would happen to the port area and the rest of the Rijnmond region?

This is our imagined future if no interventions are taken after the removal of fossil fuel.

Firstly, this will be felt in an economic sense. The fossil fuel industry employs many citizens, and their supply chains also employ many more in the Rijnmond region. Leaving the port will cause tremendous unemployment, leaving behind empty and unused infrastructure. Due to the decrease of human activity nature finally has a chance to take over, while creating a new landscape of deserted industrial estates. Nature will not only take over on land, but the water will take on a prominent role as well and occasionally flood the area.
This deserted area, with a lack of human activity, comes with side-effects.
Having become devoid of human presence, the former port area is often overlooked and even with the deserted infrastructure is a great way for crime to carry out their illegal activities without being bothered by others. Shipments of illegal substances would increase, yet regular cargo would choose to go somewhere else.

Figure 2.8
Dystopian future, Open AI, 2025

Figure 2.9
Dystopian vision map

With a lack of human, economic, activity the port area starts to become a firm barrier, harshly dividing the regions north and south of it. The citizens, who now face unemployment and no glimpse of a better future, decide the grass is actually greener elsewhere and leave the region. Cities, towns and villages will shrink which in turn puts pressure on services that become unsustainable with a low population. The towns and villages on the southern islands see their connections fade away, a new barrier put in place, less services and an exodus of people. It will leave them more isolated and left behind.

Theory and methodology

03

Research question

This research aims to discover in what ways the energy transition can take place in such a way that the communities negatively impacted by it, such as workers in the fossil fuel industry, will benefit from the large economic and cultural shifts that affect them.

In this case, we assume that the fossil fuel leaving the Port of Rotterdam is inevitable. Considering the large amount of people employed at the port, the impact of this event will affect a great number of citizens. If nothing is done to deal with this transition impact, we foresee a drain from Rotterdam which will cause all sorts of issues due to the population leaving. The workers in the port, especially those currently working in the fossil fuel industry, will be affected the most. That is why the workers at the port of Rotterdam form our focus community. With these possible problems and the focus community in mind, the following research question was formulated.

How can we transition away from fossil fuels in a way that promotes clean energy, is climate adaptive and addresses relevant social issues, specifically for the workers at the port of Rotterdam and their families?

In order to be able to answer this research question, which is one that encompasses many different topics at once, several sub questions are necessary. The research question addresses three main transitions: energy transition, climate transition and social transition. These are the three lenses through which the problem is looked at. The sub questions are also assigned to each of these lenses.

ENERGY TRANSITION
What are the spatial implications of the transition away from fossil fuels towards a renewable energy system in the port of Rotterdam?

SOCIAL TRANSITION
How can the social identity of the port evolve in a way that the workers of the region can still be proud of?

CLIMATE TRANSITION
What interventions are needed to address climate resilience for the region?

Conceptual framework

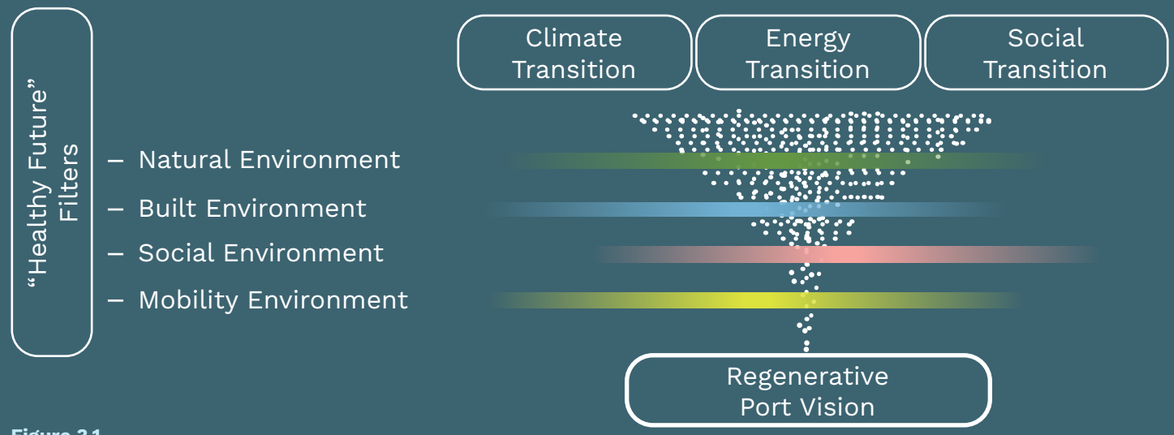


Figure 3.1
Conceptual framework

Conceptual Framework
The conceptual framework in Figure 3.1 shows how the three lenses of transition, the different fields impacted by the transition away from fossil fuel, come together to form a vision for a regenerative port. Mixing these three lenses allows us to create a future vision which addresses the problems of our focus community, the workers, and accomplishes the transition away from fossil fuels.

We have concluded that the solution to the problems mentioned in the research question is health. That means that in order to create a vision for a regenerative port of Rotterdam, the answers of the sub questions need to be filtered through a 'healthy future' filter. It is therefore necessary to define what 'Healthy' means to us.

Methodology

In order to be able to spatialize this 'healh' definition and show how it affects and/or manifests itself in space, the definition has been divided into four sub categories, each of whom is an aspect of healthy future: built environment, social environment, natural environment, mobility environment. These four environments are also how the analysis and the spatial strategies in the visions are sorted, allowing for specific analysis conclusions and to develop spatial strategies which address the found issues or opportunities.

Data collection
The data used in this research is mostly secondary data. In most cases, we had to find this secondary data ourselves. This is the case for all the literature and for a large part of the spatial data. In some cases however certain datasets were provided for us, like the spatial QGIS dataset provided as part of this quarter's QGIS assignments.

- Data from PDOK, Nationaal Georegister, Atlas Leefomgeving, Provincie Zuid-Holland, NWB, Rijkswaterstaat was used to do spatial analyses in QGIS
- Academic articles and other non-academic articles where used to support the analyses, build the frameworks, analyse policies, and to serve as design input for the spatial actions

We also conducted a little amount of fieldwork, which provided us with a lot of pictures and a spatial understanding of our site.

Data analysis
For the spatial analysis we defined certain categories in the theoretical framework, our 'healthy future' filter. These four categories of Built Environment, Social Environment, Natural Environment, and Mobility Environment guided and structured our analysis. Spatial analysis was used to map the existing conditions, which in some cases meant that certain layers of a dataset had to be used. Overlaying layers of spatial data in order to show phenomena not initially visible was one of the commonly used methods. In some cases the spatial dataset was modified, but this generally remained limited to recoloring of the output.

It depended on the category to which degree both spatial analysis and literature review were present, in some cases such as Social Environment spatial analysis was absent and only literature review was used for analysis. To analyse this environment in a structured manner, another small framework was developed.

The definition of 'health' is based on literature, just as the stakeholders and policy analysis further in the report. The decisions made to arrive at the vision and the spatial strategies were supported by the findings in the spatial analyses, sometimes with extra support from literature sources. That way both the spatial implications as well as the underlying reasons could lead to strategies which resulted in a plan that answered our main research question.

Health Definition

To develop our theoretical framework on healthy living, we had to research our holistic definition of the term. We completed a literature review on existing research and publications related to health policies and frameworks. According to the WHO (World Health Organization), "health is not only just about avoiding disease. It is also about physical, mental and social wellbeing." (World Health Organization, 1999). We focus mainly on preventative care lifestyle health policies regarding non-communicable diseases in our framework, rather than on reactive healthcare policies to diseases and illnesses. see Figure 3.2 .

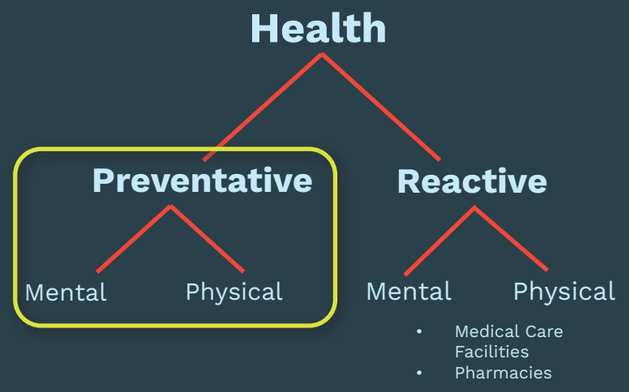


Figure 3.2
Health definition graphic

In order to be able to spatialize this definition and show how it affects and/or manifests itself in space, the definition has been divided into four sub categories, each of whom is an aspect of healthy future: built environment, social environment, natural environment, mobility environment. These four environments are also how the analysis and the spatial strategies in the visions are sorted, allowing for specific analysis conclusions and to develop spatial strategies which address the found issues or opportunities.

Literature Review
on healthy urban planning principles

World Health Organization

UN-HABITAT

Figure 3.3
SDG Goals. United Nations, 2024.

Our vision for a healthy future takes inspiration from the UN Sustainable Development goals, as well as the UN Habitat new urban agenda policies. While the sustainable development goals serve as a basis for our own framework, we take a more radical stance to prioritize health in all aspects of life. (see conceptual framework, p. 27)

Healthy Urban Cities & Theory

Urban areas such as the Rotterdam-Rijnmond region face unique spatial challenges that are excaberated by modern societal issues and the negative impacts of climate change. According to the UN Habitat (2024), a healthy city is one that "continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential."This is reflected in the policies and action planning taken in our report. The theory of "the governance of the commons" (Eleanor Ostrom) is a principle that guides our vision.
Based on this and "degrowth" theory principles, our vision rejects the idea of "sustainable economic growth" policies and actions outlined by the Sustainable Development Goals.

We believe that goal eight of decent work and economic growth is a contradiction to our goals to achieve a truly healthy region. This is reflected as part of our strategic vision, we believe that global shipping will continue from the port, but that it should be reduced gradually over 100 years as regionalization improves, and the localization of circular product manufacturing increases and will take its place.

Spatial Outlook Strategy Analysis

Our regional vision also takes inspiration from the "Spatial Outlook 2023" research by the PBL Netherlands Environmental Assessment Agency. Two of the scenarios influenced our definition of health. The first is the "Green State" spatial scenario, where natural solutions are the focus, as sustainability challenges are considered a collective public mission. Humans respect the role of the natural environment in their lives and work together with nature" (PBL, 2023). Due to compact urbanisation and nature-inclusive agriculture, there is plenty of space for nature and recreation." This principle contributes to our definition of "healthy living" and guides many of our design strategies in our own regional vision. The second spatial scenario that we take inspiration from is the "Regional Roots" vision, where local and regional communities have high decision making power. In this scenario, "profits must not come at the expense of community spirit and ecology" which is a core principle for our vision that emphasizes degrowth and local production. (PBL, 2023).

In order to regenerate a healthy Port of Rotterdam, and in turn a healthy Rijnmond region, we need to expand upon the spatial strategy scenarios presented in this report, and combine aspects of the different scenarios.

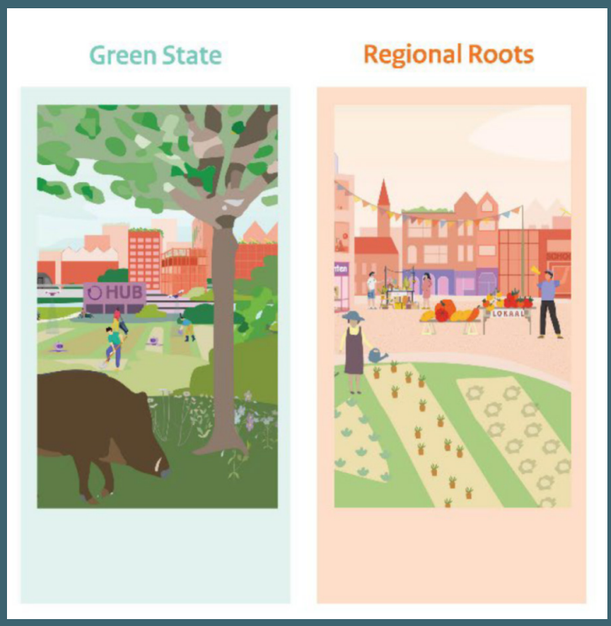


Figure 3.4
Spatial Outlook 2023. PBL, 2023.

Framework social environment

To be able to understand what makes healthy social environment, a theoretical framework was created.

Figure 3.5
Social environment framework

Affordances
According to the Cambridge Dictionary affordances means ‘a use or purpose that a thing can have’ (“affordance,” 2025). In this case the focus is on people, so it would mean the use of a person. This may sound harsh, but it means the possibilities, resources and resources a person can have. This can be about financial situations of people, but also about access to education for example.

Safety
Safety is about being at risk or danger. One can imagine when being in physical danger, this will influence your health. But feeling unsafe also impacts mental health (Corney et al., 2024).

Inclusivity
Who can and can not participate? Is a (social) space accessible? The importance of inclusivity in a healthy social environment, is that everybody has access and the right to being healthy.

Engagement
Engagement can mean several things. In this framework it is about interaction and at what level this is done. Interaction is import for all social animals. For humans in the built environment this can be done in many ways, between humans or between humans and government, but it is essential for human health (Bloomberg et al., 1994).

Analysis

04

Energy Transition

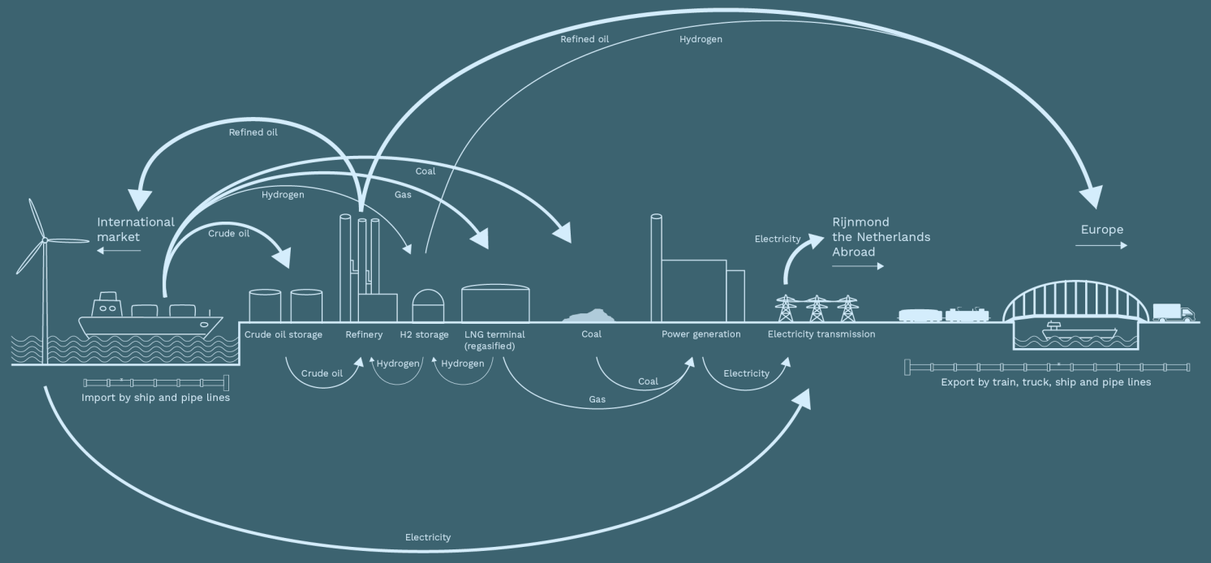


Figure 4.1
Existing Energy Systems Section

Currently, the port of Rotterdam supplies about 25% of the energy demand for the Netherlands alone, and to the rest of Europe as well through important pipelines that travel hinterland from the port. According to the Port of Rotterdam Authority, the amount of energy, a majority of which is oil, that is transported via Rotterdam is three times as much as is consumed in all of the Netherlands. As seen in our energy systems diagram, it is an extremely linear energy system, related to the shipping flows of the port. Most of the energy flows are from offshore via power lines and oil-and gas pipelines. A majority of this energy from the wind farms and bore holes on the North Sea.(cite? Efforts are currently being made at the Port to transition towards more renewable energy sources. These include green and blue hydrogen, as well as biofuels, in efforts to reduce carbon emissions to be climate neutral by 2050 in accordance with the Netherlands Climate Agreement. Currently, half of all hydrogen projects in the Netherlands are taking place in Rotterdam (Port of Rotterdam, 2025), such as the installation of a hydrogen pipe from Pernis to Maasvlakte. It is clear that the current global and linear energy system is not sustainable, and the efforts made by the Port that are based solely on technological measures of success, is not sufficient to reduce negative health impacts of the energy system.

Figure 4.2 *The Visible Industry at the Port, 2025*

Almost half of the import to the Port is wet bulk (oil and gas).

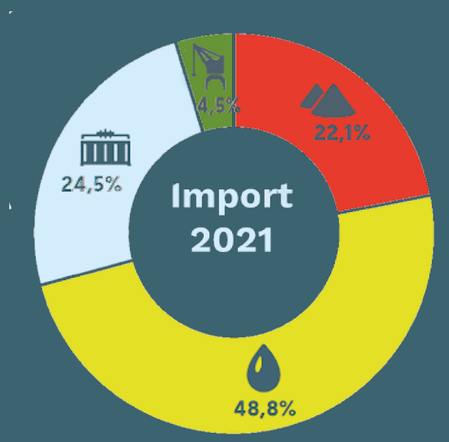


Figure 4.3
Import 2021 Percentage Graphic, Own Work, 2025. Data from Port of Rotterdam.

Social transition

The city of Rotterdam was founded in 1250. For many centuries, Rotterdam remained a not very significant city in influence and size. In the 19th century things change. There are several factors, but the port of Rotterdam starts growing. First focussing on coal, then on oil, fossil fuels have been present for a long time in the port of Rotterdam. The port keeps growing, bigger infrastructure gets built and more land gets transformed into port.

In order for the port to expand, farmers were bought out against low prices. According to the Port Authority, this was necesarry for the great good: bringing wealth to the country. The Port Authority was very powerful in these times. Even without having an official permit of the municipality, the Port would expand and industrilize land. The expansion of the port seemed unstoppable and it seemed the focus of the municipality was not on the city and it's citizens, but on the port and creating wealth.

Besides farmland and villages also a big and unique nature reserve had to make place for the port. Nature reserve 'de Beer', a marshland, was located in today's Europoort and Maasvlakte and was renowned for the ecological values and biodiversity. In the 60s de Beer was burned down burried under 6 meters of sand, in order to make way for the port.

Figure 4.4
Nature reserve 'de Beer' being burned down with oil, 1964. Photo by Wabe Korfmaker, supervisor of de Beer. Courtesy of Mrs. A. den Bakker-Korfmaker. Ed Buijsman Collection.

The workers of the port made a reputation throughout history as hard workers. This is true, they worked long days and before any mechanization, workers had to carry up to 80 kilograms. Interestingly, the unions were often against mechanizations, thinking it could take away jobs.
After carrying heavy goods in the coal industry, the workers had to deal with poisonous air from the oil industry. Accidents happened and even people living around the port were unsure how safe such a port is.
Nowadays a worker in the port can mean a variety of carreers. They stay the driving force of everything that happens in the port.

The transition of the port of Rotterdam towards it's current form, was mostly due to innovations in technology. This mentality brought us wealth. It makes sense that we hope that technology will solve the issues of today, for example climate change. We can ask ourselves if this mindset will the right thing, since this mindset also gave us today's issues and problems.

Figure 4.5
Portraits of port workers, 1993. Fotografie Frank Hanswijk

Documentary 'Een Kano Naar Zee' (2024) and NPOkennis: 'Hoe kreeg Rotterdam de grootste haven van Europa?' (2023)

Climate Transition

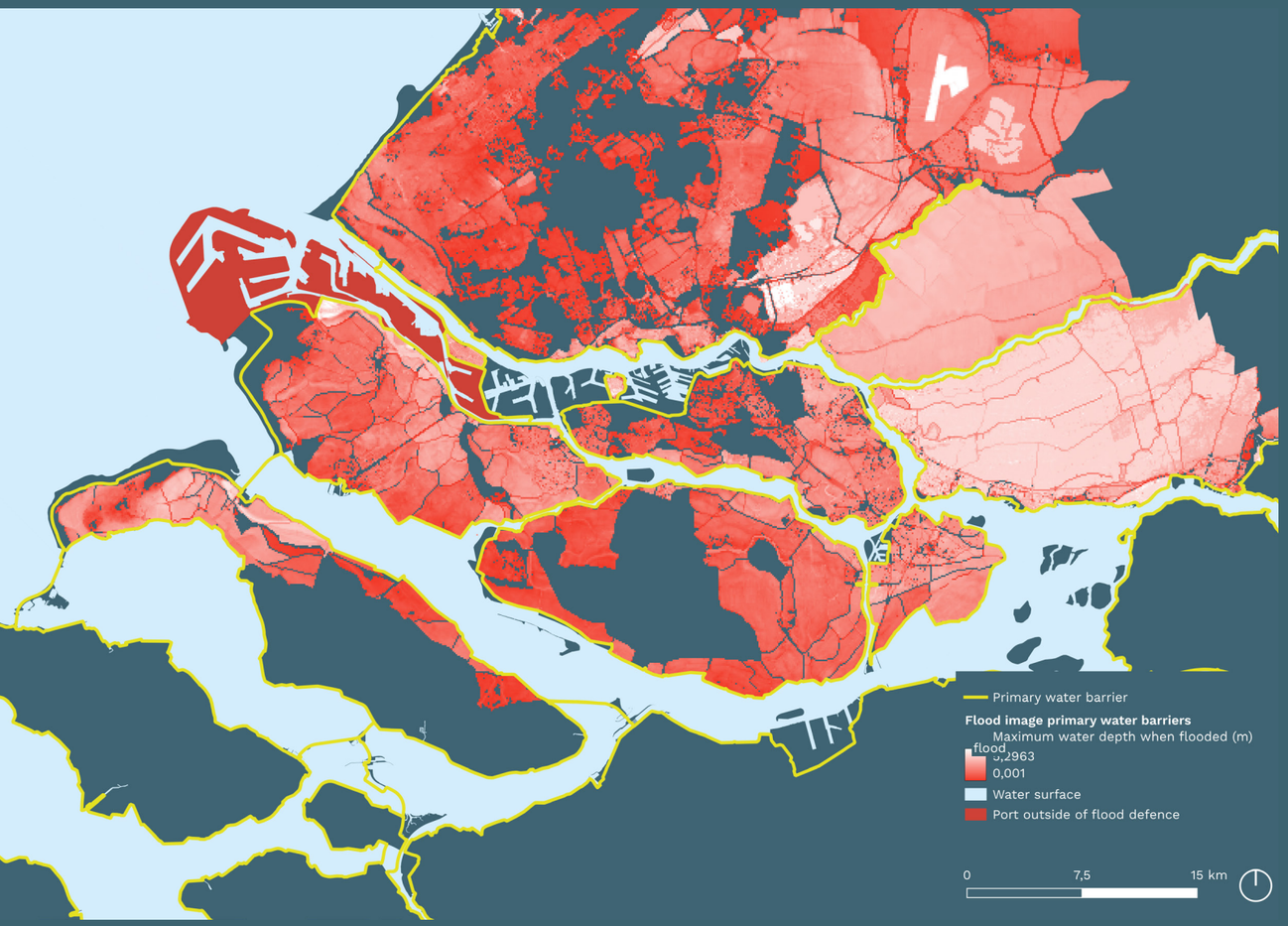


Figure 4.6
Flood risk map

Climate disruption is the greatest threat to our health in this century.
-The World Health Organization

The low-lying geography of the Netherlands makes it susceptible to the effects of climate change, particularly sea level rise and increased flooding risk. The port of Rotterdam is especially vulnerable, as much of it is not protected by the Maeslantkerin the existing flood barrier (as shown in Figure 4.6). The Port of Rotterdam has future strategies to address this that rely mainly on technological strategies to track flood risk. (“Flood Risk Management”, Port of Rotterdam, 2021)

According to the World Health Organization, to protect health and avoid widening health inequities, countries must build climate-resilient health systems” (World Health Organization, 2024). This includes climate adaptation measures that protect communities from flood risk.

Given that the effects of climate change are excaberated by the industry tied to the port of Rotterdam, as well as the surrounding industries in the region, it is necessary to take this into account when planning for the future flood resilience of the region.

Current life of Linda

Health analysis

Mobility environment

Regional mobility

Public transport in the region is organized with concessions. Local authorities, such as the Province of South Holland and the Metropoolregio Rotterdam Den Haag, grant public transport companies permission to provide public transport. The Metropoolregio Rotterdam Den Haag,. MRDH in short, is a collaboration between 21 municipalities (Metropoolregio Rotterdam Den Haag [MRDH], n.d.). In the Rijnmond region, which consists of three concessions, three different public transport companies are active: EBS, RET and Connexxion/Transdev (CROW, 2024). They provide the different forms of public transport in the region, as seen in Figure 4.7. Railways further connect the region, mainly Rotterdam, to the rest of the country. In Figure 4.8 the coverage by stops is visualized as well, the port of Rotterdam stands out here negatively: it lacks public transport connections.

Figure 4.7
Public transport in Rijnmond

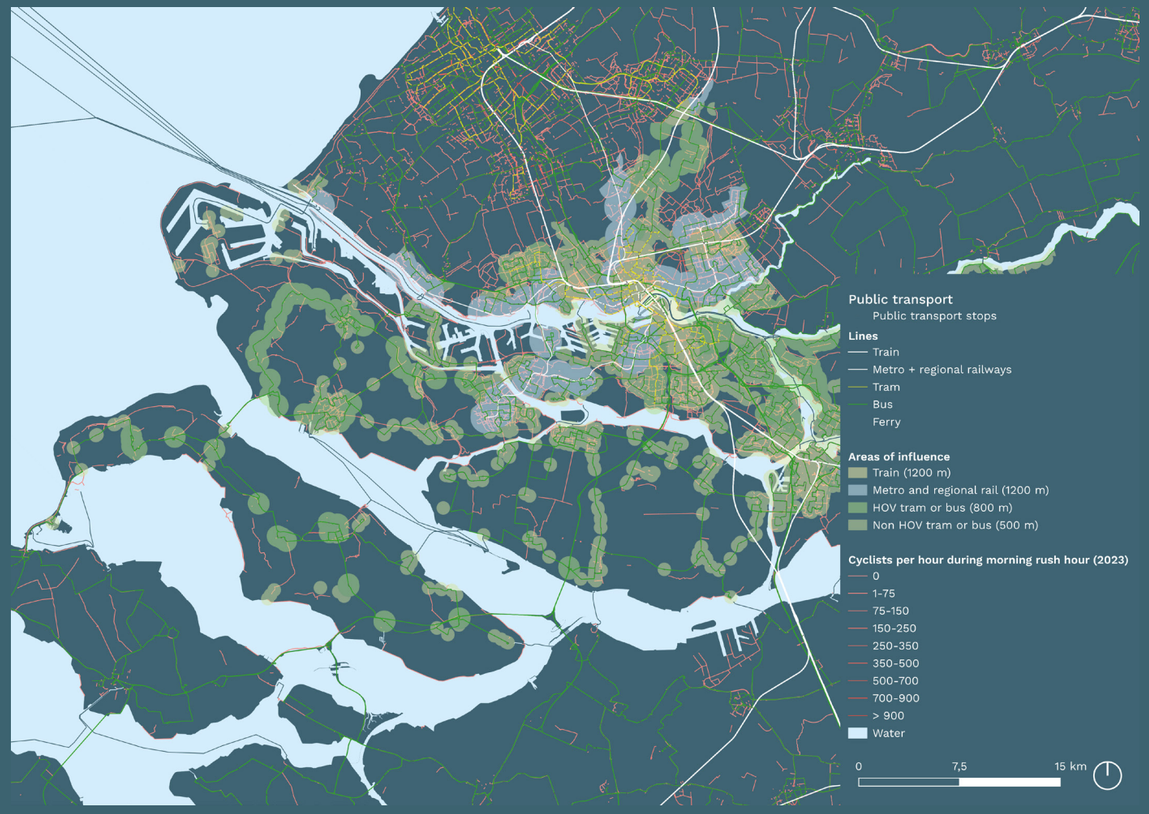


Figure 4.8
Regional mobility

Larger scale mobility

In a larger scale, most connections are aimed at either the port of Rotterdam, or the city of Rotterdam. As seen in Figure 4.10, the main highways and freeways which are owned and maintained by the national government, are connections focused on Rotterdam. The port of Rotterdam is situated at the end of the east-west connections, such as the A15/ N15 highway that stretches from the port to the east of The Netherlands

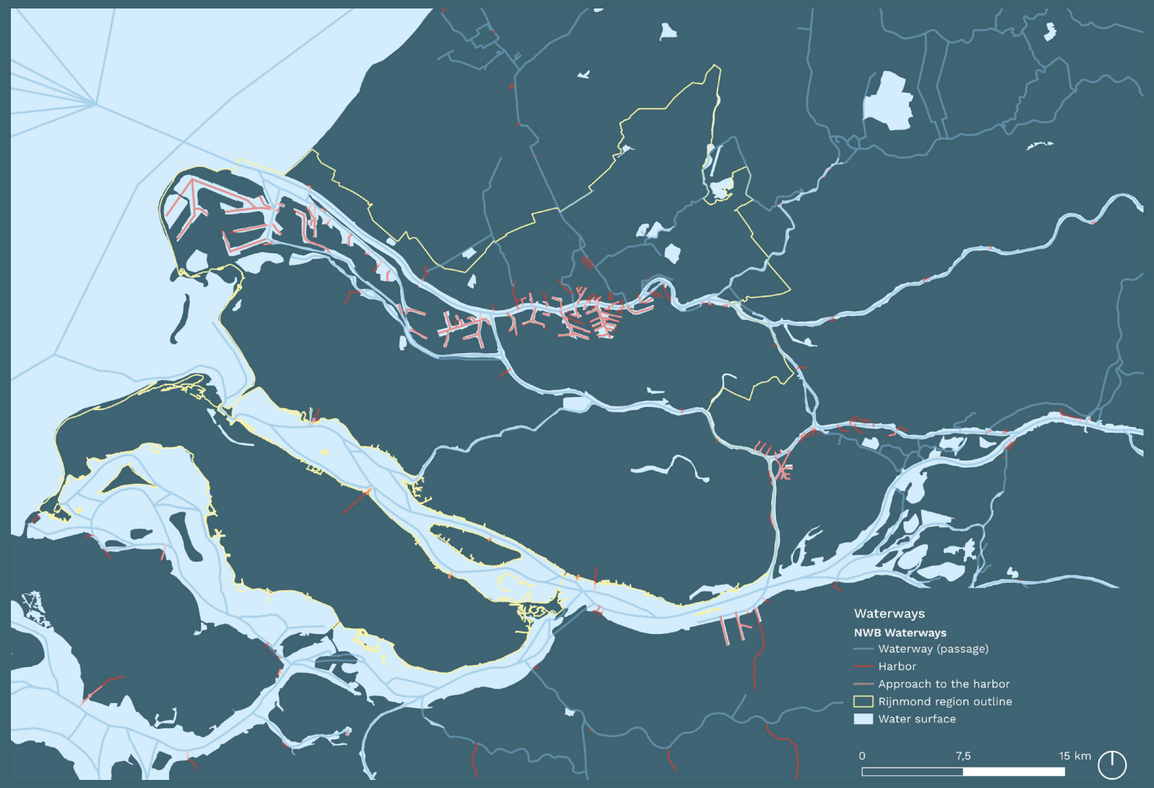


Figure 4.9
Waterways

One of the advantages of the Port of Rotterdam is the intermodal connectivity. The port is connected with many other European destinations. 90 inland ports can be reached by inland shipping and the port is also connected to 400 European destinations via railways. Pipelines are too connecting the port with locations further inland. Internationally, Rotterdam is connected to over 1000 ports by deep sea shipping connections. (Port of Rotterdam, n.d.).

The rail transport towards continental Europe shrank in 2024 due to the decrease in coal transport, but despite that 120 freight trains went to or from the port of Rotterdam on a working day. A large portion of these trains went via the Betuweroute to destinations in the direction of Germany (Demmers et al.).

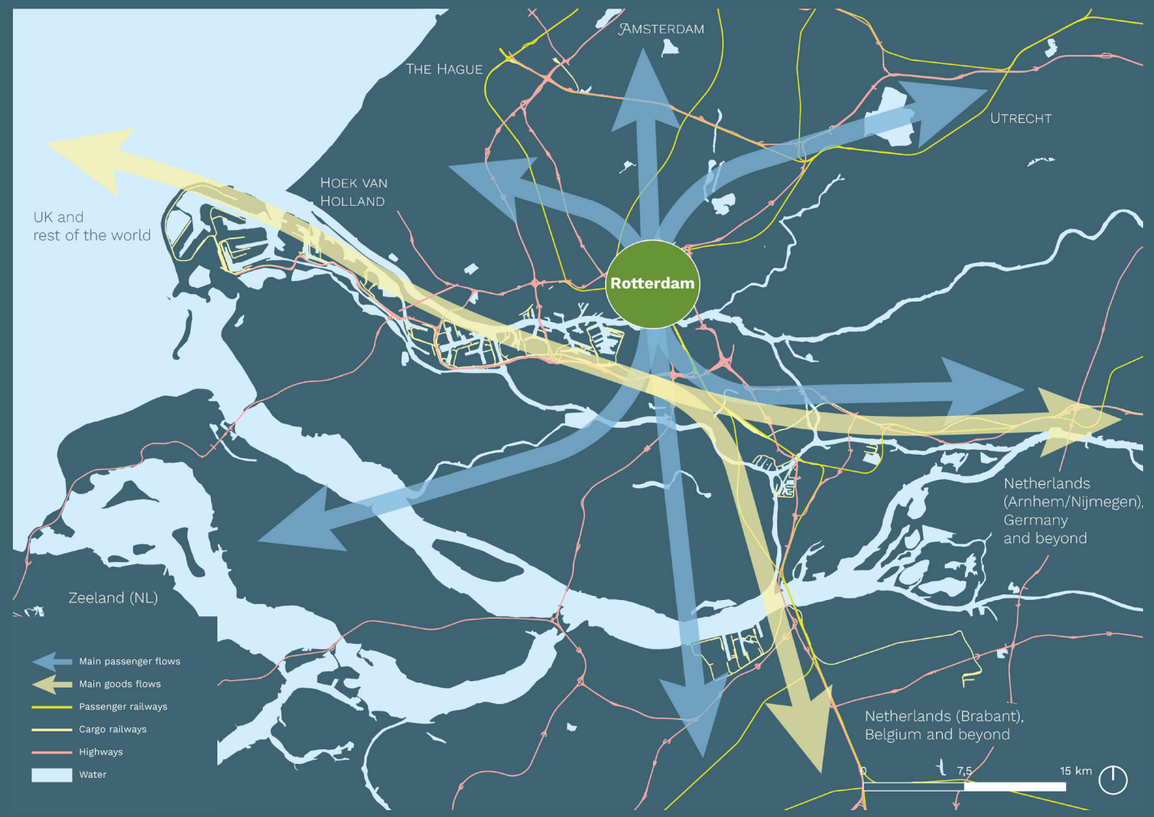
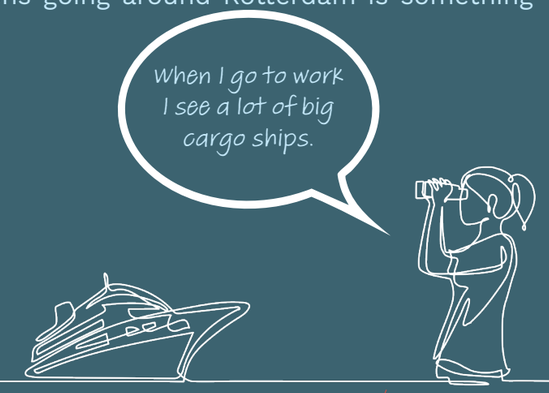


Figure 4.10
Global mobility flows

On the larger, more global scale, the goods flows tend to go more in an east-west direction before heading towards Belgium or Germany. On the contrary, flows by car or by public transport always pass through the city of Rotterdam to reach destinations north or south of Rotterdam. Despite being connected by different modes of transportation, the port of Rotterdam and the Rijnond region are affected by pollution caused by mobility. The pollution, together with the poor connectivity of the port by public transport and the lack of connections going around Rotterdam is something that needs to be addressed



Built environment

The built environment provides facilitiesthat help citizens with their physical and mental health. By creating a region with good facilities, the preventitive health is better.

Figure 4.11 shows the hotspots of health facilities, categorized into mental health, physical health, and reactive health. Mental and physical health facilities are grouped under preventive health on this map. Education is considered a part of mental health, but due to its big scope, it is seperated. Rotterdam and the Hague are clearly visible as large health hotspots, while the port has almost no facilities.

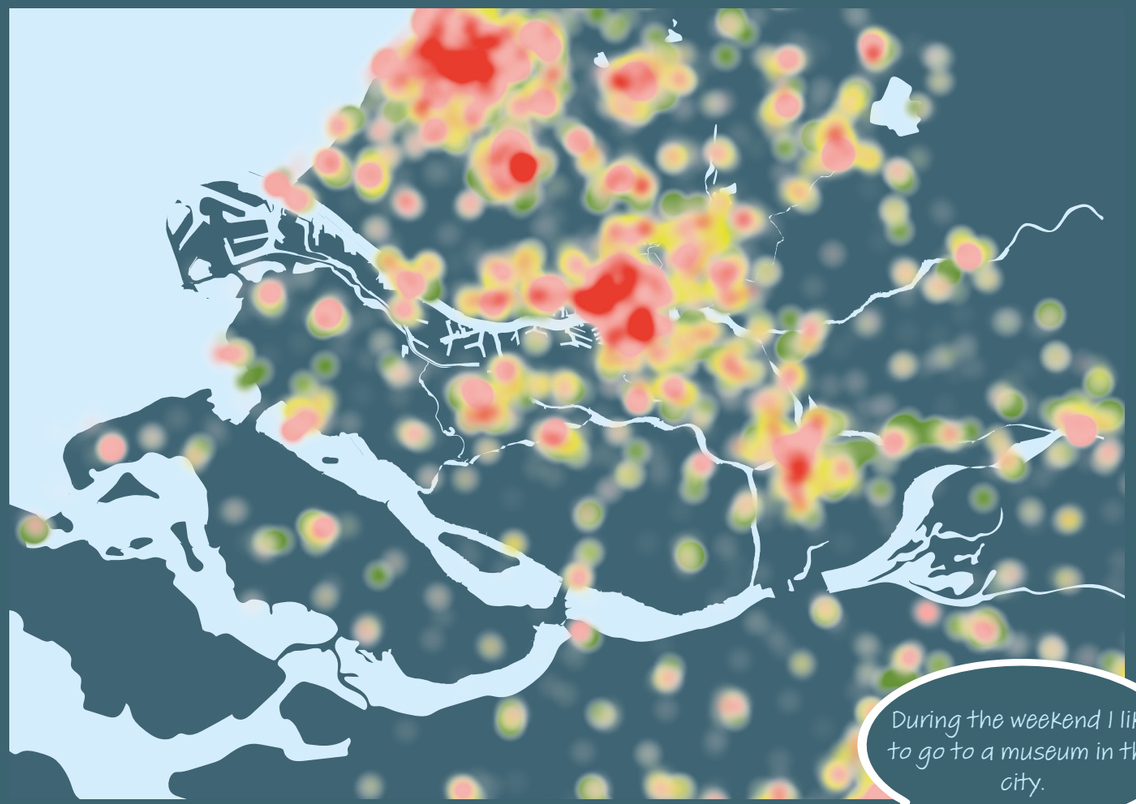


Figure 4.11
Health facilities

Figure 4.12
Places for physical health and metal heath

Parks and sport facilities fulfill the function to help with both mental and physical health.

Figure 4.12 shows that around Rotterdam there are quite some recreational areas, just like the shore is. The rural areas below the port do not have that many facilities for the combination of physical and mental health.

Social environment

Humans are social animals and social animals need connection. The social environment even influences the lifespan of humans (Snyder-Mackler et al., 2020). Cities are filled with people, forming a lot of opportunities and problems in making social connections. By focusing focusing on the principles of affordances, safety, inclusivity, and engagement the current situation of the social environment of the Rijnmond region is made visible.

Affordances
In the report ‘Gezondheidsaanpak Rotterdam 2024+’, written by Gemeente Rotterdam, it is stated that 20% of young adults in Rijnmond is in debts. Being debts has an overal bad influences on health (Sweet, 2020). In Rotterdam was 70,5% of the residents economically independent. This is several percent lower than the national average of 76,2% (CBS, 2022).

Safety
From the 4 biggest cities, Rotterdam is the city where people experienced most social nuisances (CBS, 2023). One can imagine this is an influences on how people feel. Maybe not directly linked, but in the same research was revealed that 28% of Rotterdam residents sometimes feel unsafe in their own neigborhood.

Inclusivity
In the city of Rottedam, 23% of the people has felt discriminated (Gemeente Rotterdam, 2024). The half of these people felt discriminated because of their race or skincolor.

Engagement
loneliness is very present in the Rijnmond region. 54% of the people describes themselves as lonely (RIVM, 2022). Even 14% describes themselves as severely lonely. Another research describes Rotterdam as the city (from the biggest 4 cities) with the lowest social cohesion per neighborhood (CBS, 2021).

Natural environment

Air pollution

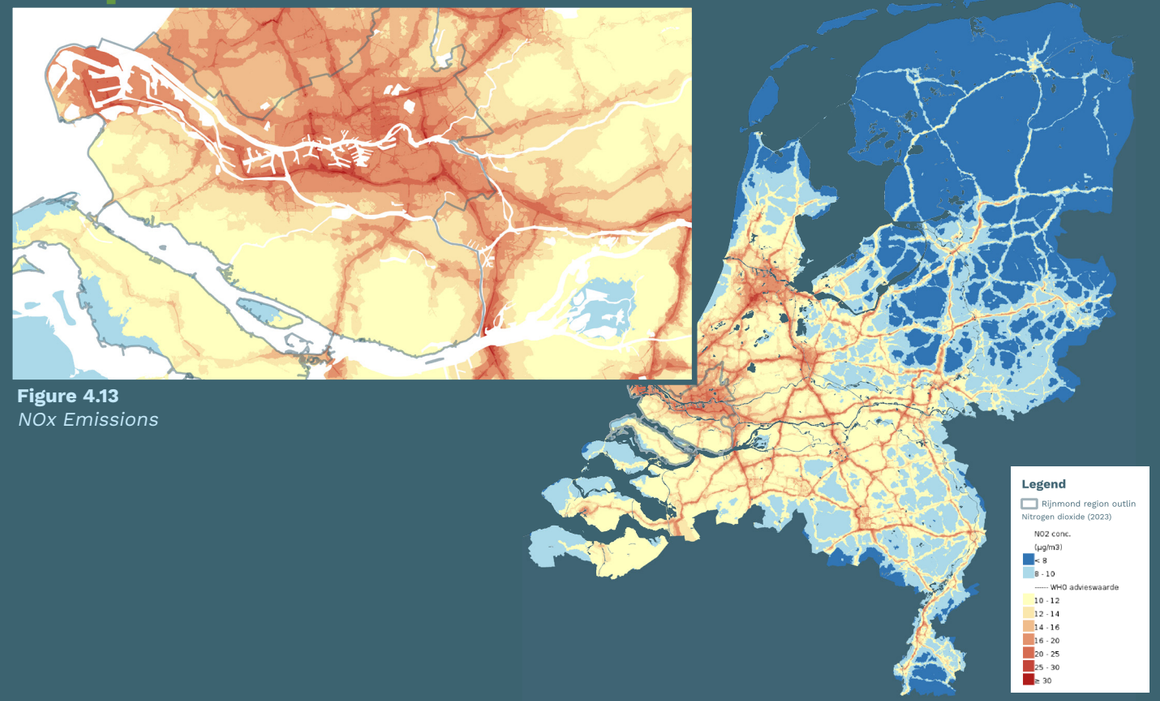


Figure 4.13
NOx Emissions

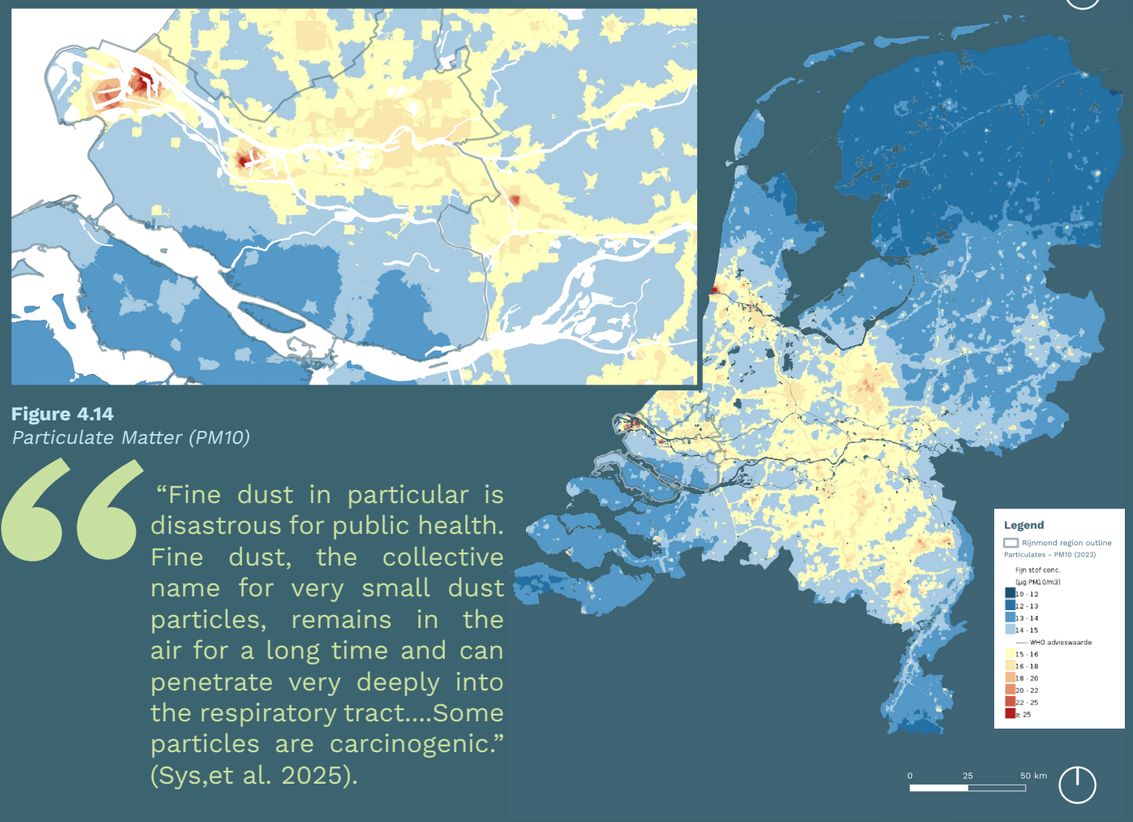


Figure 4.14
Particulate Matter (PM10)

> “Fine dust in particular is disastrous for public health. Fine dust, the collective name for very small dust particles, remains in the air for a long time and can penetrate very deeply into the respiratory tract....Some particles are carcinogenic.” (Sys,et al. 2025).

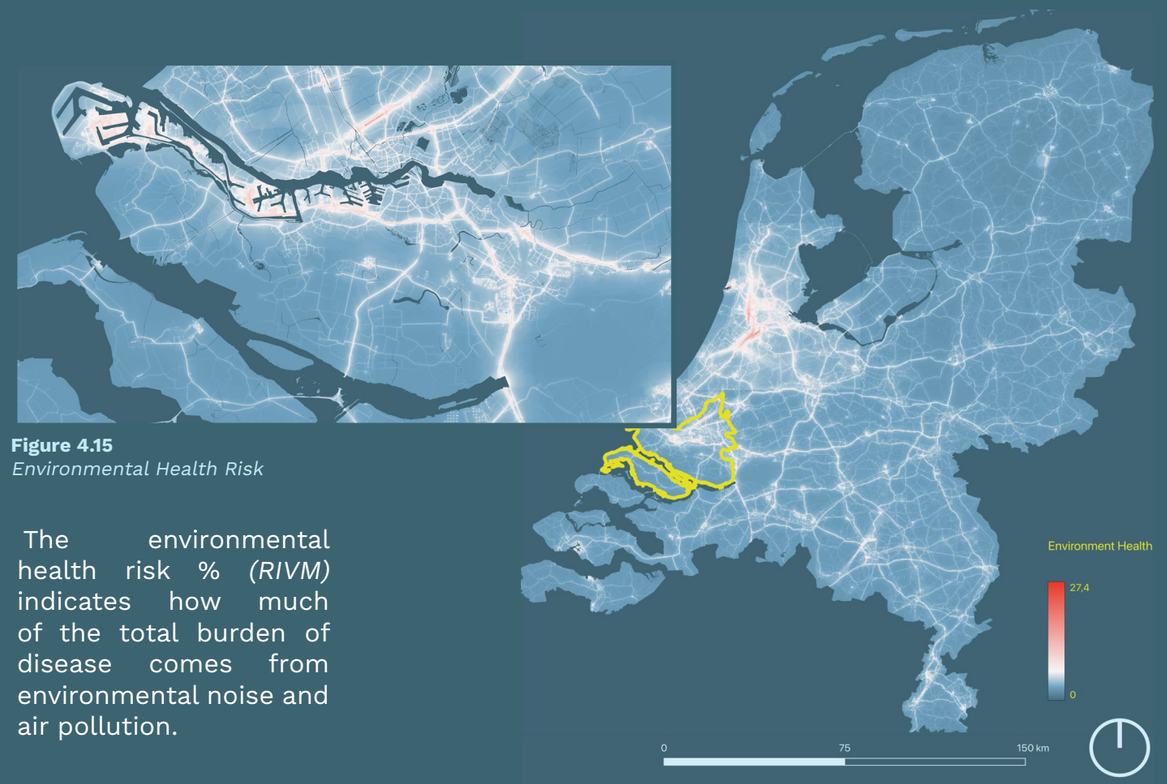


Figure 4.15
Environmental Health Risk

The environmental health risk % *(RIVM)* indicates how much of the total burden of disease comes from environmental noise and air pollution.

The petrochemical industry at the port of Rotterdam has harmful impacts due to the air pollutants released during the production of oil, plastic, and other chemicals. “The substances that play the greatest role in air pollution are particulate matter (PM2.5 and PM10), sulphur dioxide (SO2), nitrogen oxide (NOx), volatile organic compounds (VOCs) and ozone(O3)” (Sys, Daalder, & Claessens, 2025). While a lot of this discharge is breathed in by people, some also ends up in the soil and water (Sys,et al. 2025). As shown by the maps related to air pollution (Figures 4.13 and 4.14), these are all concentrated at higher levels at and around the Port of Rotterdam, which directly correlates to the high environmental health risk (Figure 4.15). The noise from industrial activity is also a major contributor to health, as loud noises are very disruptive for mental and physical health.

Water quality

“The Netherlands has the worst water quality of all EU member states.”

EU Water Framework Directive (2022)

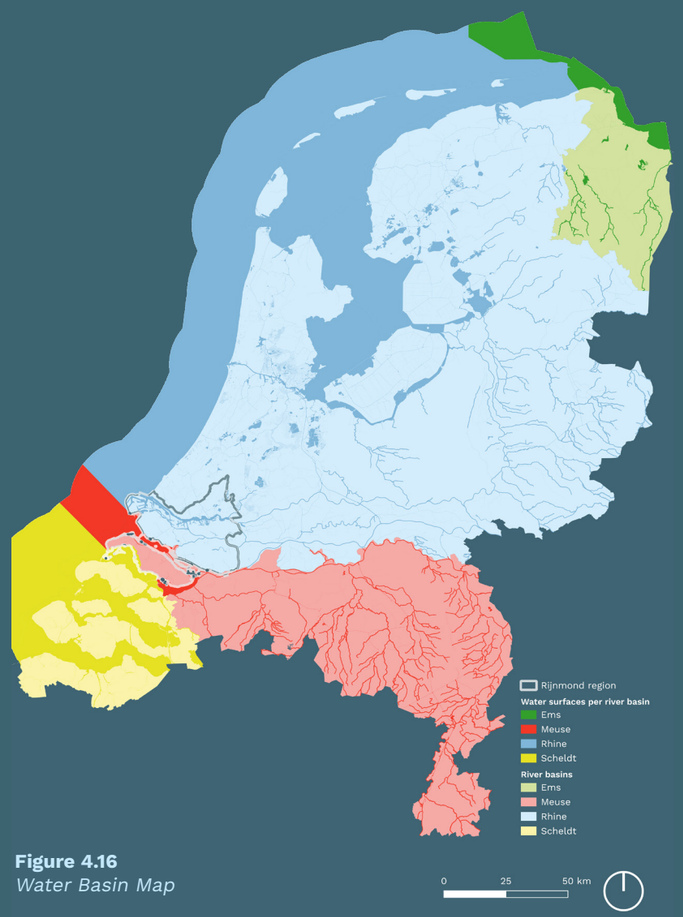


Figure 4.16
Water Basin Map

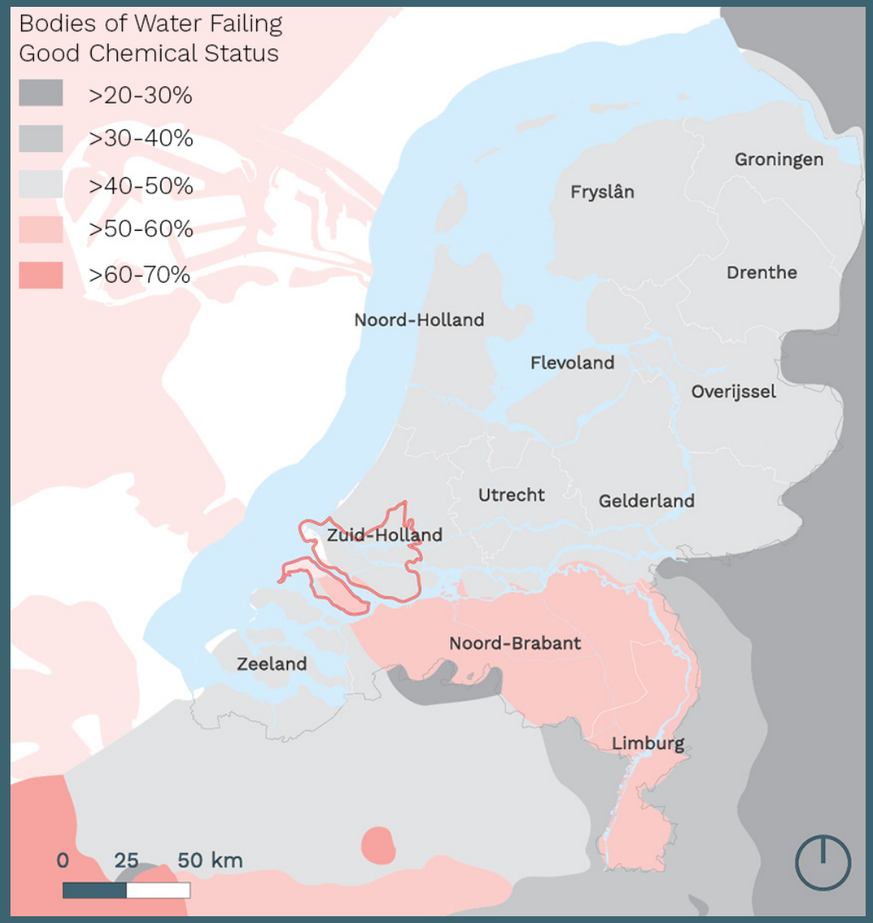
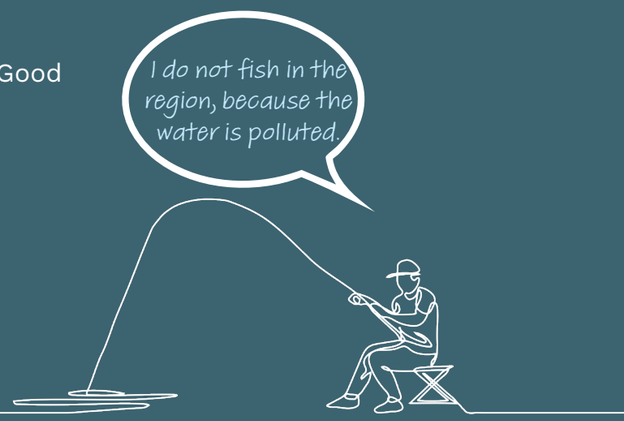


Figure 4.17
Water Quality Map

There are many reasons why the Netherlands has the worst water quality for all EU Member States, much of it due to the industry acitvity and geographic location of the Netherlands. The port in particular contributes greatly to water pollution. The Port of Rotterdam is situated at the mouth of the Rhine-Meuse-Scheldt delta, where several major European rivers flow into the North Sea, as seen in the water basin map. The pollution upstream from the Rhine and Muese gets carried downstream into the port, and ultimately into the North Sea. The tidal waves of the sea also bring in saltwater into the freshwater areas, and the mix spreads pollutants across both coastal environments of the Netherlands and into the open sea. The energy and shipping industries at the port further increase the water pollution in the region. In 2024, “the number of spills/leaks reported this year rose to 218. Normally, around 180 spills are reported each year. Around 20 percent of the reported water pollution comes from the coast.” (“Nautical Annual Figures 2023”,Port of Rotterdam, 2024).

It is crucial to consider that water does not have boundaries, so the role of the Port in the health of the global sea system should not be overlooked.

Figure 4.18
Surface Water Chemical Status



Urban heat island effect

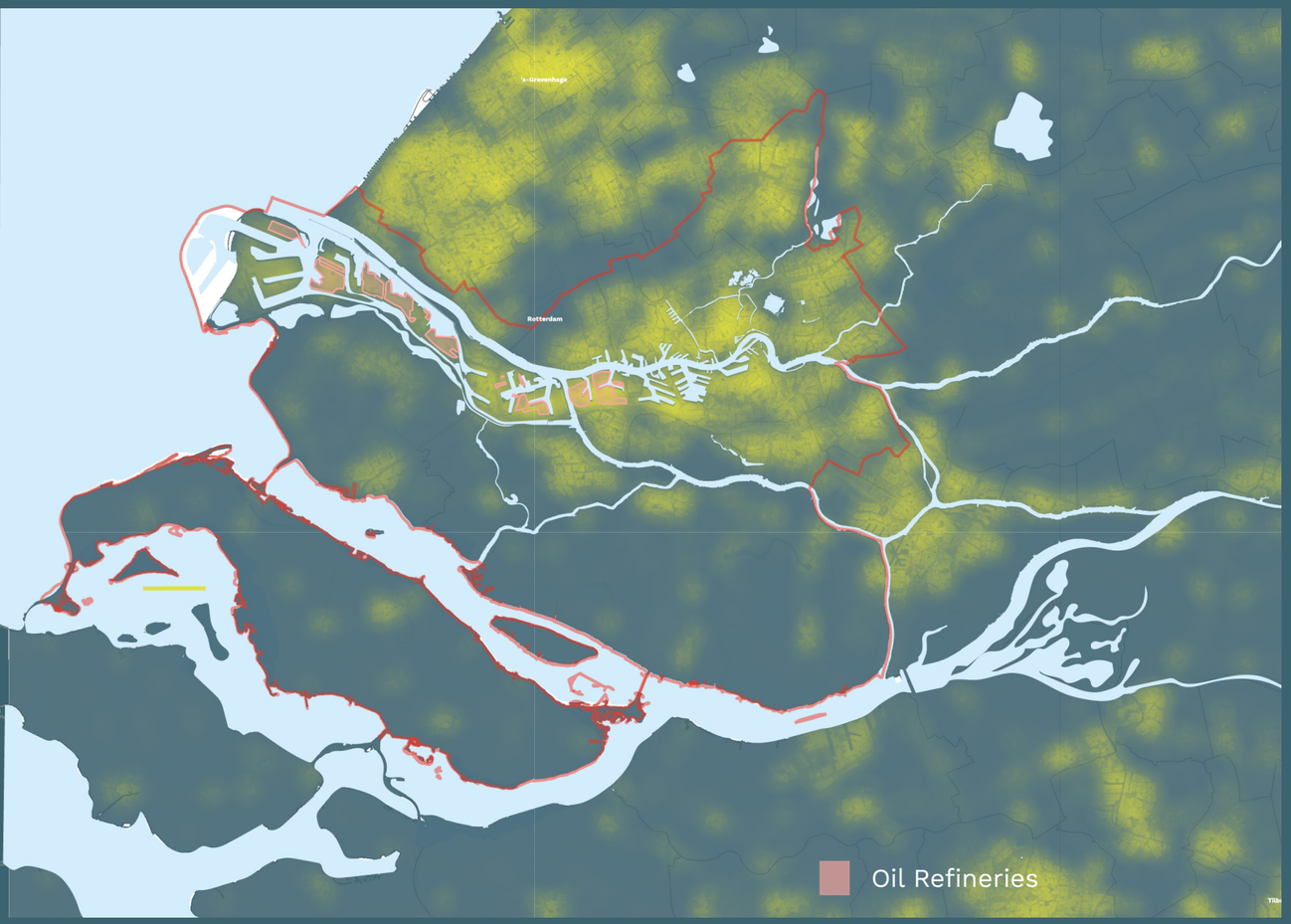


Figure 4.19
Urban Heat Island Effect

“Heat waves will occur in Rotterdam with greater frequency in the future.”
- Wandl & van der Hoeven, 2015

Due to the highly built environment that is common in industrial zones, the Port of Rotterdam experiences significantly high urban heat island effect. It is one of Rotterdam’s urgent climate challenges. This also includes the surrounding densely built regions in Rijnmond that have a lot of industry. The ‘urban heat island effect’ is increasing in Rotterdam, especially in the center and the old city districts. As seen in Figure 4.19, the conditions at the oil refineries in the port create unsafe outdoor condition, especially for vulnerable communites such as young children and the elderly.

Vision

05

Vision statement

In 100 years, Rijnmond will be a healthy region. To achieve this, Rijnmond needs a regenerative port that promotes clean energy, is climate adaptive, and preserves the social identity of the region, specifically for the workers at the Port of Rotterdam and their families.

We recognize that fossil fuels are limited in supply and cause irreparable damage to the environment; they will disappear. Change is therefore inevitable: the spaces formerly occupied by fossil fuels will become places to create a new identity for a sustainable and healthy port. Through this evolution, the port will become a leader in clean energy for the Rijnmond region, the Netherlands, and Europe, becoming a hub for renewable production and consumption. Unfortunately, the future rising sea levels due to climate change leave the Rijnmond region in a vulnerable position. Especially the port, since that is directly affected by the tide. The port itself is also essential to the region's identity and should evolve, not disappear. A well-planned transition ensures job security and stability for the workers and their families. By prioritizing health in mobility, and in the built, natural, and social environment, in 100 years Rotterdam and the surrounding Rijnmond region will be a global example of a thriving, green harbor city where the workers' needs coexist with the energy demands of the future. The worker of today is a driving force in the transition of the port, ensuring a steady and healthy environment for the future worker and the future generations.

Zoning

Figure 5.1
Vision zoning

Vision

= Water
= Building
= Rotterdam centre
= New city
= Education centre
= Park
= Grassland
= Healthy working landscape
= Energy production
= Circulair energy system
= Mobility network
= Connecting bridge

Figure 5.2
Vision synergy map
1:200.000
N

Future life of Linda

Vision explained

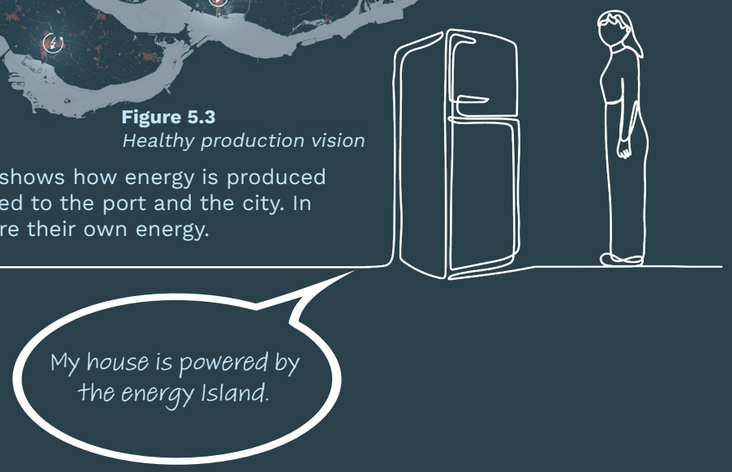
Vision

The vision of the regenerative port of the future shows a port that is a diverse space. Different zones form a combination of functions and space. Each zone has a main function, but it is important to note everything is mixed in function. The zones spread into green and infrastructure networks. Above the port, a bridge connects the zones.

Healthy production

Figure 5.3
Healthy production vision

The vision on healthy production shows how energy is produced at the energy island and distributed to the port and the city. In the region, town produce and store their own energy.



Healthy education

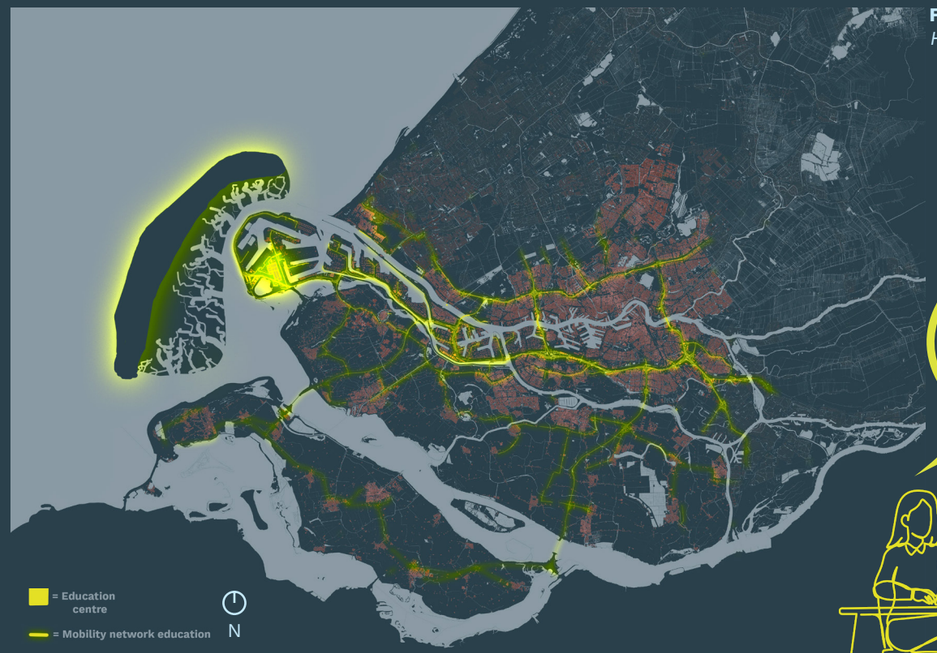
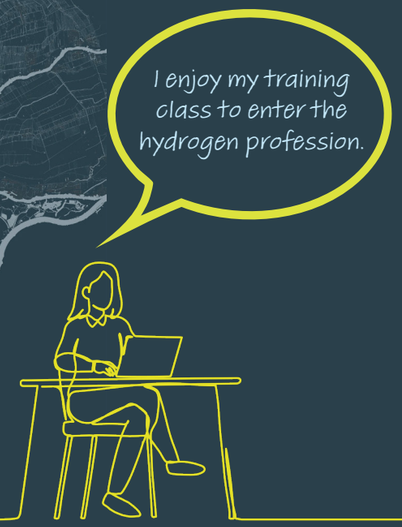


Figure 5.4
Healthy education vision

The vision on healthy education shows a education and research centre. It is well connected with the port, city and region.



Healthy working

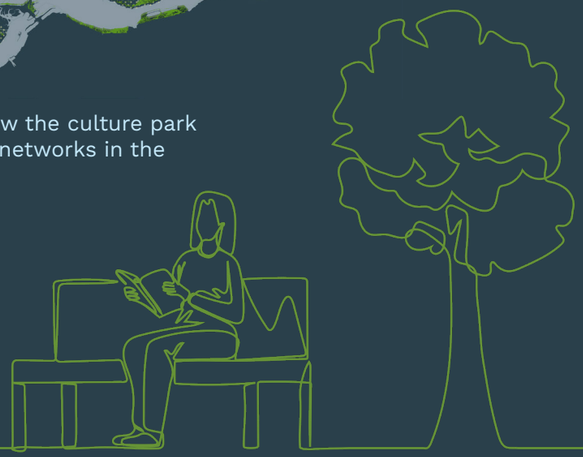
Figure 5.5
Healthy working vision

The vision on healthy working shows where in the port renewable industries and regenerative farming will take place, connecting with rural areas.

Healthy culture park

Figure 5.6
Healthy culture park vision

The vision on the healthy culture park shows how the culture park plays a role in connecting green structures and networks in the region.



I enjoy going to the culture park with my family to relax.

Healthy living

Figure 5.6
Healthy living vision

The vision on healthy living shows where new living areas will be built. This consists of town in the healthy working area and a ‘new city’, which connects Vlaardingen and Hoogvliet.

I like to go to the new cinema near my house.

Healthy evolution

Figure 5.7
Healthy evolution vision

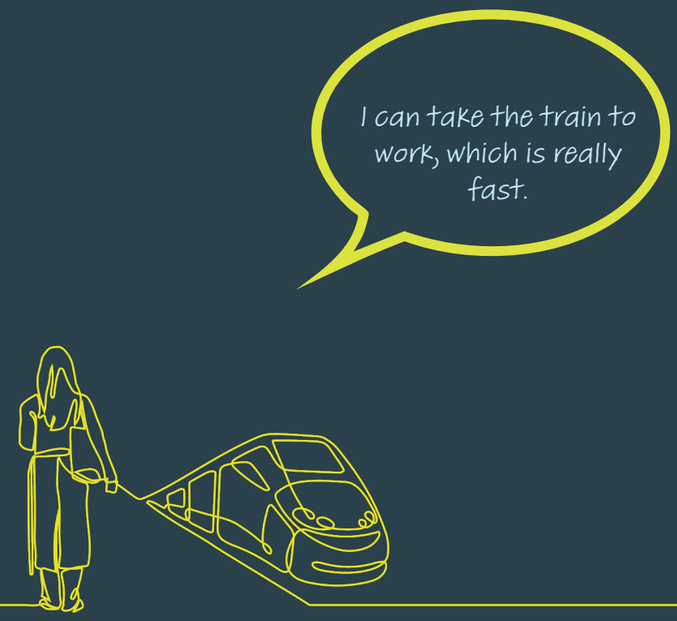
The vision on healthy evolution shows how the Rotterdam centre is located and remains its character.

The improvement of the city helped me make new friends.

Mobility

Figure 5.8
Healthy mobility vision

The idea of radical connectivity is more than just the 15-minute city. Besides being able to reach other places quickly, it means that spaces and people are connected in other ways as well. Different networks connect them, in terms of mobility, ecology, energy, culture, communication, economy, research and education.



Strategy

06

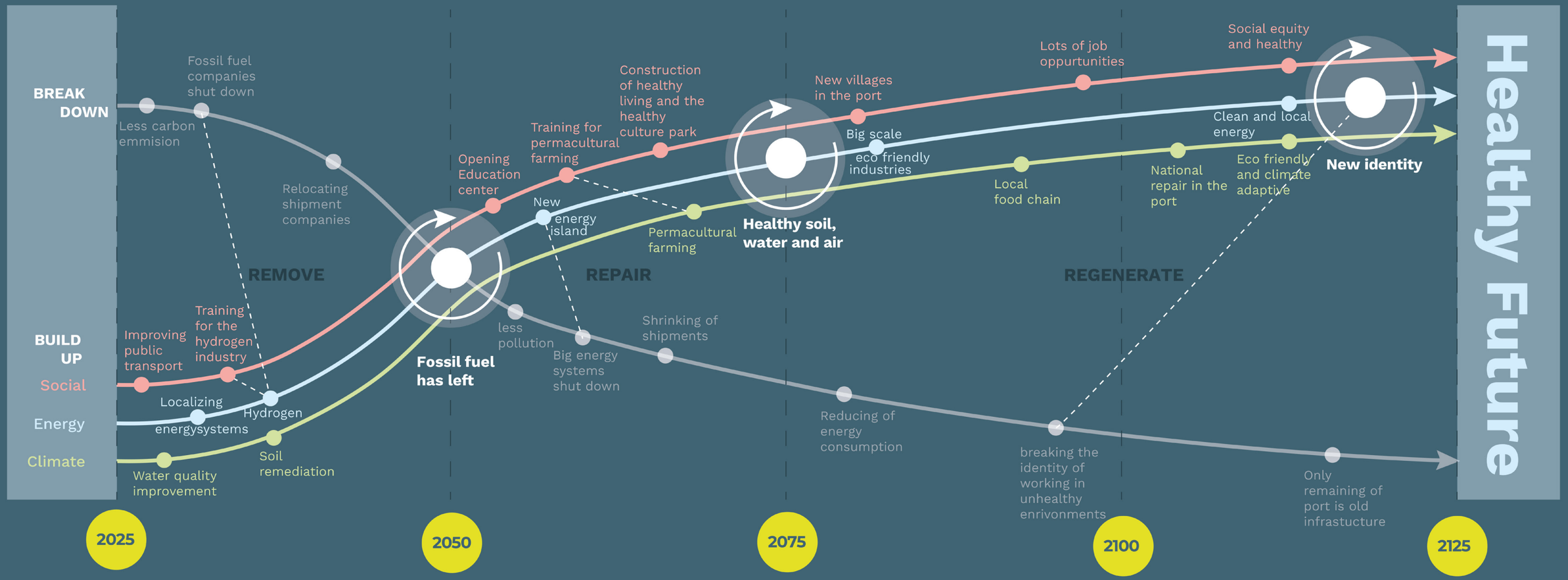


Figure 6.1
Regeneration drawing

Figure 6.2
Strategy zoning

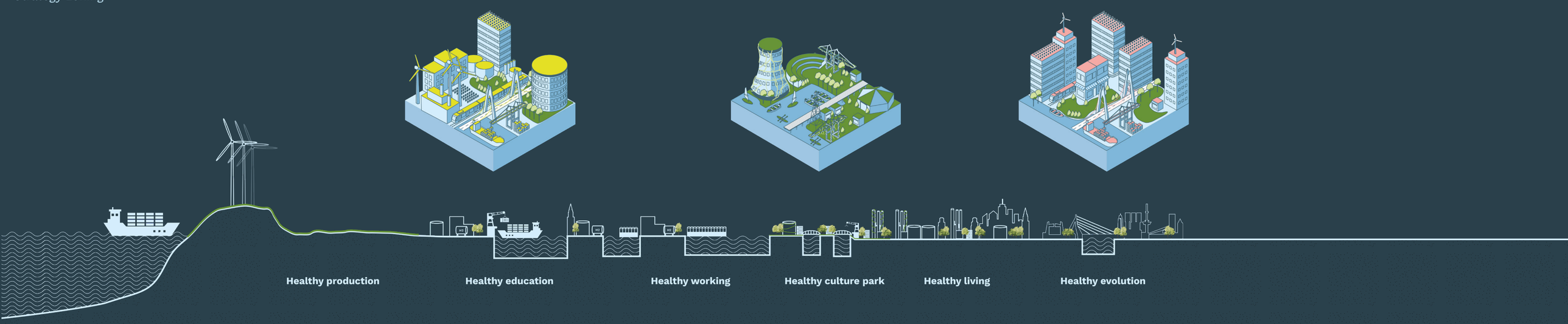


Figure 6.3
Section of the strategy zones

Stakeholder analysis

The vision for a regenerative port of Rotterdam influences and/or affects many stakeholders. Who are they and how do we need to deal with them?

All stakeholders affected by our vision are sorted in the 3 sectors: public, private and civic.

A characteristic of the Rijnmond region and the port of Rotterdam especially, is the large amount of public sector actors. These are mostly different layers of government, however the Province of Zuid-Holland has been left out on purpose. The Province, while a relevant part of government, does not seem to be affected by or influence our vision, nor involved in the major decision-making regarding the implementation.

Our choice for a focus community of 'workers in the port of Rotterdam' also causes a large number of civic stakeholders. Due to the long duration of our vision, the coming century, both the current and future generations of citizens are included.

	Stakeholder	Objective	Power amount	Resources
Pu.1	EU	Economic, social wellbeing, environmental	● ● ○	Money, some legal powers
Pu.2	National government	Economic policies, sustainable	● ● ●	Legal powers, money
Pu.3	Water board(s)	Water access, availability and quality, safety.	● ● ●	Legal powers, money
Pu.4	Municipality (mainly Rotterdam)	Health, employment opportunities	● ● ●	Legal powers, money
Pu.5	Education institutions	Knowledge, employment opportunities	● ◐ ○	Knowledge, influencing others
PuPr.1	Port of Rotterdam	Economic growth, retaining employment	● ● ●	Ownership, finance, legal
PuPr.2	Public transport companies	Transport, growth	● ● ○	Mobility, influencing
Pr.1	Container shipment companies	Economic growth,	● ○ ○	Employment, ownership, influencing
Pr.2	Developers	Economic growth	● ● ◐	Money
Pr.3	Farmers	Employment (stability)	● ○ ○	Land, influencing
Pr.4	Local businesses & Start-ups	Growth, (new) opportunities	● ○ ○	Money, knowledge
C.1	Activist groups	Good environment, rights, fairness	● ◐ ○	Protest, influencing
C.2	Citizens of Rijnmond	Accessibility, livelihood, health	● ○ ○	Voting, counsel groups, protest
C.3	Current workers of the port	Employment, healthy conditions	● ○ ○	Labor, knowledge, influencing
C.4	Future generations	Healthy conditions, opportunities, wellbeing, fairness	○ ○ ○	None
C.5	Labor unions (FNV etc.)	Healthy and safe working conditions, opportunities, employment	● ● ○	Legal powers, some money
CPu.	Wildlife	Good environment, biodiversity	○ ○ ○	Beauty, biodiversity, health
C.6	Tourists	Entertainment, health	◐ ○ ○	Money, influencing

Table 1
Stakeholder inventarisation

Little power ◐ ○ ○
A lot of power ● ● ●

Stakeholder relations

In Figure 6.4, all stakeholders affected by our vision aresorted in the 3 sectors: public, private and civic.

Public sector
The public sector contists mostly of several forms of government, depending on the scale. The EU is active on the largest scale and does not have a lot of direct influence. However, with its environmental regulations and funding capabilities it could have an impact on our vision and this region. By far the most influential actor here is the national government, who decides the funding and steers the local governments like water boards and municipalities towards a certain goal.

Private sector
The private sector is made up of, indeed, private companies. These are the ‘users’ of the port of Rotterdam and the Rijnmond region: container shipment companies, farmers, local businesses and start-ups. These three have multiple relations with actors from the public as well as from the civic sector. Another private stakeholder is developers. Developers might not have as many relationships with other stakeholders, but they can be a driving force behind change.

Civic sector
The civic sector encompasses a vast amount of stakeholders. Activist groups and labor unions are the more organized stakeholders, who have many relationships with the public and private sector. Citizens of the Rijnmond region, as well as our focus community current workers of the port of Rotterdam are the stakeholders who will experience the changes proposed by our vision, whereas the future generations will experience the final result of the vision. Wildlife has been put on the brink of the civic and public sectors, because that was the place it felt the least out of place.

In this relational diagram, each stakeholder's attitude towards our vision is visualized as well, ranging from 'proponent' to 'opponent'. This classification is based on the current situation: the fossil fuel will leave and our vision is the new plan for the future. Hence why the stakeholders mostly affected by these changes, the workers and the containter shipment companies, will most likely be an opponent of our vision. They will lose their employment and need to go to work somewhere else.

The, perhaps missing, relations between stakeholders have been identified and shown as well. This classification of the relationships between stakeholders has been based on the stakeholder's objectives shown in Table 1.

Many stakeholders do have a synergetic relationship, but some do not. Most notably the activist groups, whose desires and objectives are often at odds with those of many other stakeholders.

Interesting to see is that many stakeholders operate on the larger scales, regional or national and therefore influence or affect a lot of citizens. An interesting exception when it comes to this, is wildlife. Wildlife is put into the national scale, however that decision was influenced by visual reasons in order to keep the onion diagram legible. In reality, wildlife is active across all scales, from the neighborhood to international scale.

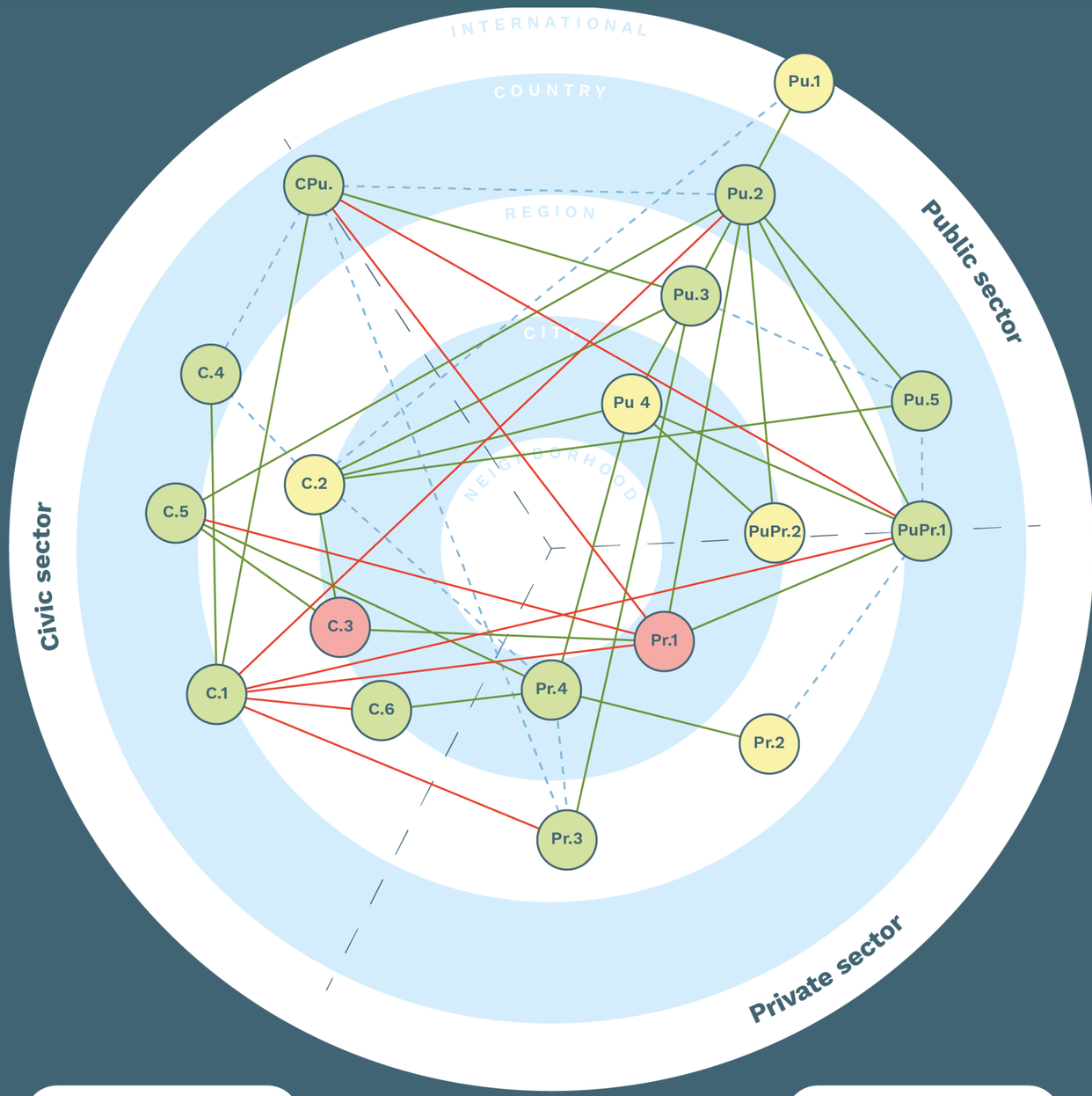


Figure 6.4
Relational diagram of stakeholders

Stakeholders

Pu.1	EU	Pr.1	Container shipment comp.	C.1	Activist groups
Pu.2	National government	Pr.2	Developers	C.2	Citizens of Rijnmond
Pu.3	Water board(s)	Pr.3	Farmers	C.3	Current workers of the port
Pu.4	Municipality	Pr.4	Local businesses & start-ups	C.4	Future generations
Pu.5	Education institutions			C.5	Labour unions (FNV etc)
PuPr.1	Port of Rotterdam			C.6	Tourists
PuPr.2	Public transport comp.			CPu.	Wildlife

Power-interest matrix

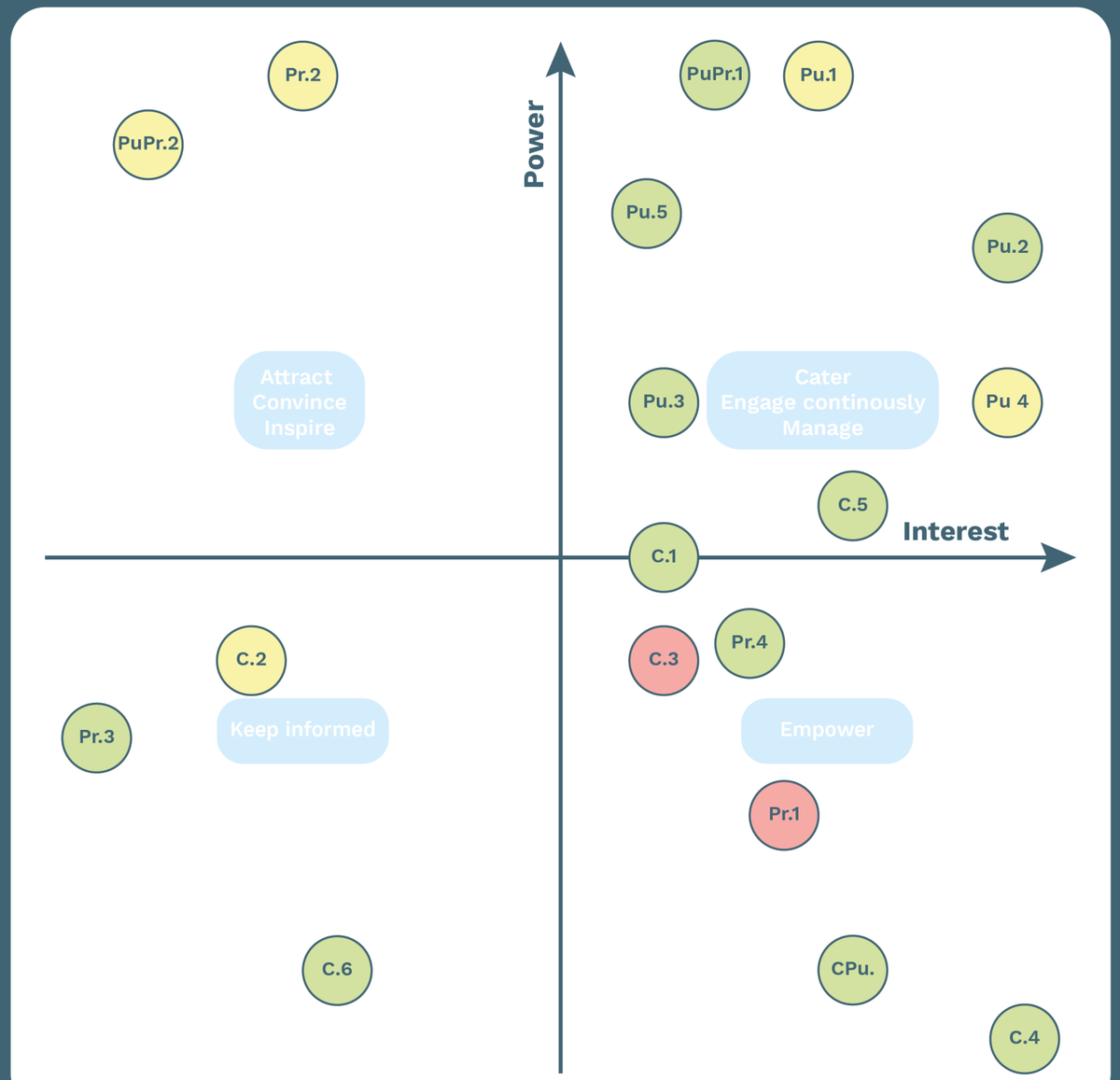


Figure 6.5
Current power-matrix diagram

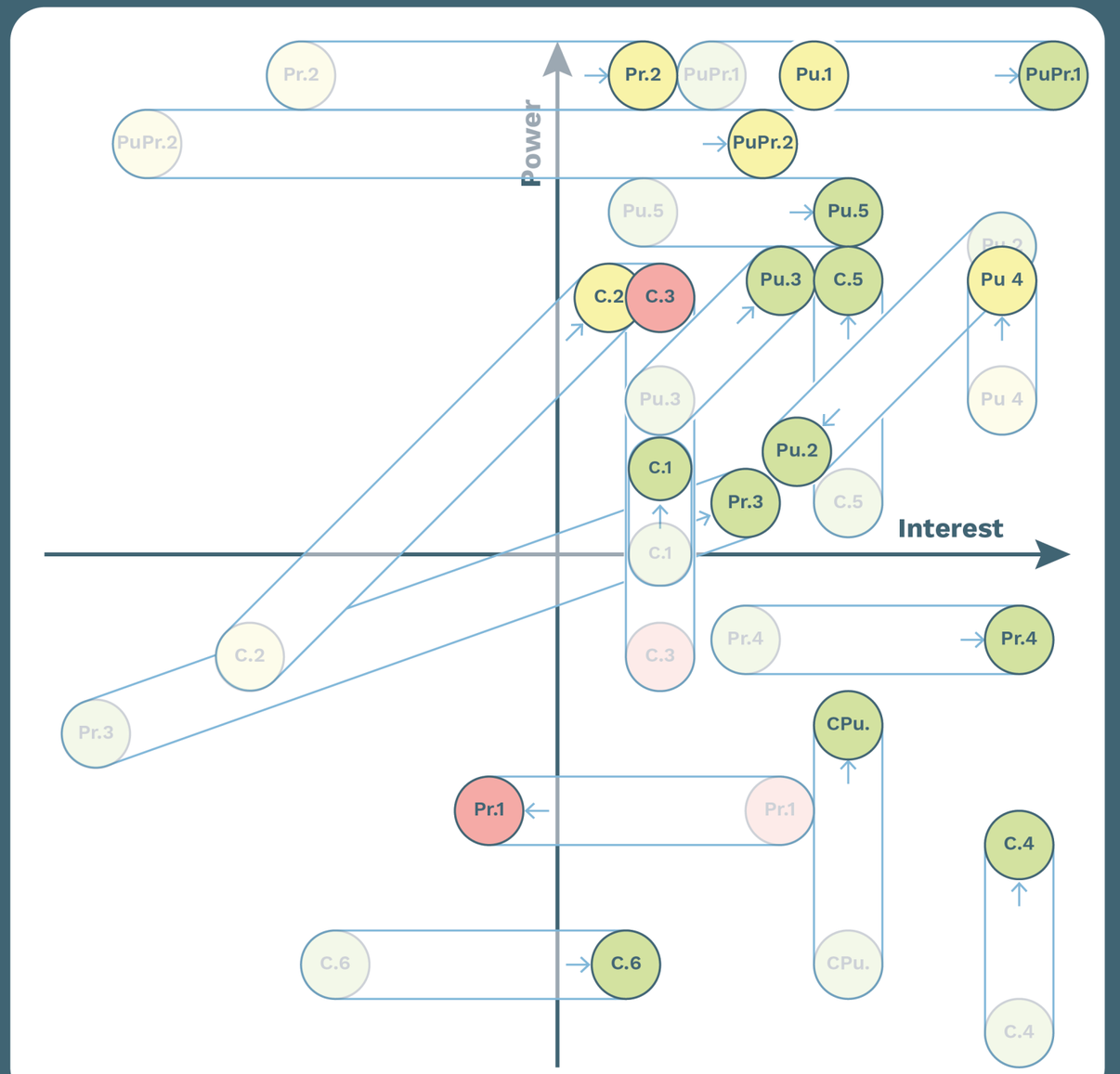


Figure 6.6
Future power-matrix diagram

In Figure 6.5, the stakeholders are placed in a power-interest matrix based on the current situation. This gives four quardrants of stakeholders who need a certain treatment during the process.

Figure 6.6 shows the power-interest matrix of the future. After the realisation of the future vision, stakeholders will have been treated in the way specified in the diagram. Consequence of that is a change in power, interest or both.

The future vision will cause most stakeholders to move into the upper right quadrant.

Stakeholders

Pu.1	EU	Pr.1	Container shipment comp.	C.1	Activist groups
Pu.2	National government	Pr.2	Developers	C.2	Citizens of Rijnmond
Pu.3	Water board(s)	Pr.3	Farmers	C.3	Current workers of the port
Pu.4	Municipality	Pr.4	Local businesses & start-ups	C.4	Future generations
Pu.5	Education institutions			C.5	Labour unions (FNV etc)
PuPr.1	Port of Rotterdam			C.6	Tourists
PuPr.2	Public transport comp.			CPu.	Wildlife

Current Policy Analysis

The policies examined are related to the three transition lenses of our conceptual framework, through the “healthy living” filter.

FRAMEWORK LENSES

1. Climate Transition
2. Social Transition
3. Energy Transition

EU

- UN Paris Agreement
- Natura 2000
- European Green Deal & “Farm to Fork” Strategy
- EU Skills Navigator Program & JUST transition fund

National

- National Climate Agreement
- National Climate Adaptation Strategy
- Environment and Planning Act of the Netherlands
- Delta Works Plan on Spatial Adaptation

Regional/Rijnmond

- RES 1.0 Clean and Safe Energy

City/Rotterdam

- Resilient Rotterdam 2022-2027 Plan

Port

Vision of the Port of Rotterdam 2050
Strategy plan by the Port of Rotterdam Authority, the Municipality of Rotterdam, and the national government to guide the Rotterdam port and its industry cluster to become “future-resilient.” The aim is to maintain the creation of economic and social value. The key items focus on strengthening the competitive position of the port of Rotterdam and achieving sustainable growth in a world-class port. We reject the principle of “sustainable growth” in our vision.

Our Fossil Fuel Disclaimer explained

Netherlands Climate Agreement 2030 goal to reduce [illegible]mate emissions by 50% in alignment with the Paris Agreement, is outlined in the current National Climate Adaptation Policy. **However, this target goal is currently projected to not be met unless more drastic measure is taken** (Corder, 2024)**.** We believe the first step to achieve this is the mandated removal of fossil fuels. For us, the removal is a catalyst for change, and shapes our other more radical policies to achieve the climate neutral target by 2050.

Health Policy Analysis

According to European Environment Agency, National Adaptation Strategies (NASs) in the EU “emerge as the most relevant national policies for addressing climate change impacts on health.” The Netherlands Climate Adaptation Strategy also highlights the negative physical and mental health impacts of climate change. However, the National Health Strategies of the Netherlands do not include climate change as a public health risk factor. Therefore, *new national policies are required that prioritize health in all aspects of life.*

New Policies Required

NEW POLICIES

1. Climate Transition C#
2. Social Transition S#
3. Energy Transition E#

EU/Global

E1
Global Energy import and export must be reduced by 50% by 2075, domestic energy production is mandatory.

National

C1
“Healthy Climate” Policy
require air, soil, and water in the Netherlands to be at levels that are non-harmful to human health by 2075.

C2
National Repair Policy
All companies in the Netherlands must produce reusable and repairable products that can be sent to repair centers such as the Port of Rotterdam.

C3
“Healthy Wildlife” Policy
All new development must improve health for all life through biodiverse green space with native plantings.

C4
“Healthy Delta Resilience” Policy
New coastal defence strategies created, such as Energy Island. They must incorporate natural methods to improve water quality.

S1
“Healthy Working Conditions” Policy
All workers are entitled to “healthy” work conditions that protect both their mental and physical health. This includes a living-wage,
anti-discriminatory and safe work environments, and sufficient leisure time.

S2
New Job Training Policy
Former fossil fuel workers must receive a 1-2 year training programs at no cost for new jobs related to renewable industries such as energy, farming, and manufacturing.

E2
“Healthy Energy” production policy that requires all energy produced to be renewably sourced and carbon negative by 2100.

Rijnmond & Rotterdam

S4
“Healthy Living and Mobility” Policy
All new developments must be based on the “15 minute City” planning principle in terms of zoning for developments and transportation.

E3
Regional Energy Production Policy
All energy produced in the region of only renewable sources such as solar, wind, tidal, bio-based, and hydrogen. Every neighborhood to have their own energy production and storage system by 2075.

S5
“Healthy Farming” Policy
Expands on “Farm to Fork Strategy,” use only pesticide free, regenerative and localized farming techniques in the region by 2075.

S3
Business Policy
Funding opportunities for local technology startups related to biofarming and renewable energy sources, and circular business practices.

Port

C5
Shipping Relocation Policy
Container shipment relocated to former fossil fuel area of the port.

E4
Fossil Fuel Divestment Policy
The Port Authority will require all fossil fuel industry to be completely transitioned out of the port by 2050.

C6
Degrowth Shipment Policy
All shipping must be reduced by 50% at the port by 2075.

Policy Timeline

The timeline shows current and new policies organized according to the vision zone they are relevant for.

The current policies listed are analyzed based on on how they align with our vision. They are either: changed completely and rejected, modified and continued based on our new vision, or simply completed.

The rejected policies ⊗ are:
the 'Vision of the Port of Rotterdam', and the 'RES 1.0', also known as the Regional Energy Strategy for Rotterdam/ The Hague. Based on our definition of a healthy future, they do not contribute to this, as they are focused on economic growth strategies for the port and increasing energy production.

EXISTING POLICY ANALYSIS

- ⊗ CHANGE OR REJECT
- ⊕ ADD ONTO AND CONTINUE
- ⊖ COMPLETE

NEW POLICIES

1. CLIMATE TRANSITION C#
2. SOCIAL TRANSITION S#
3. ENERGY TRANSITION E#

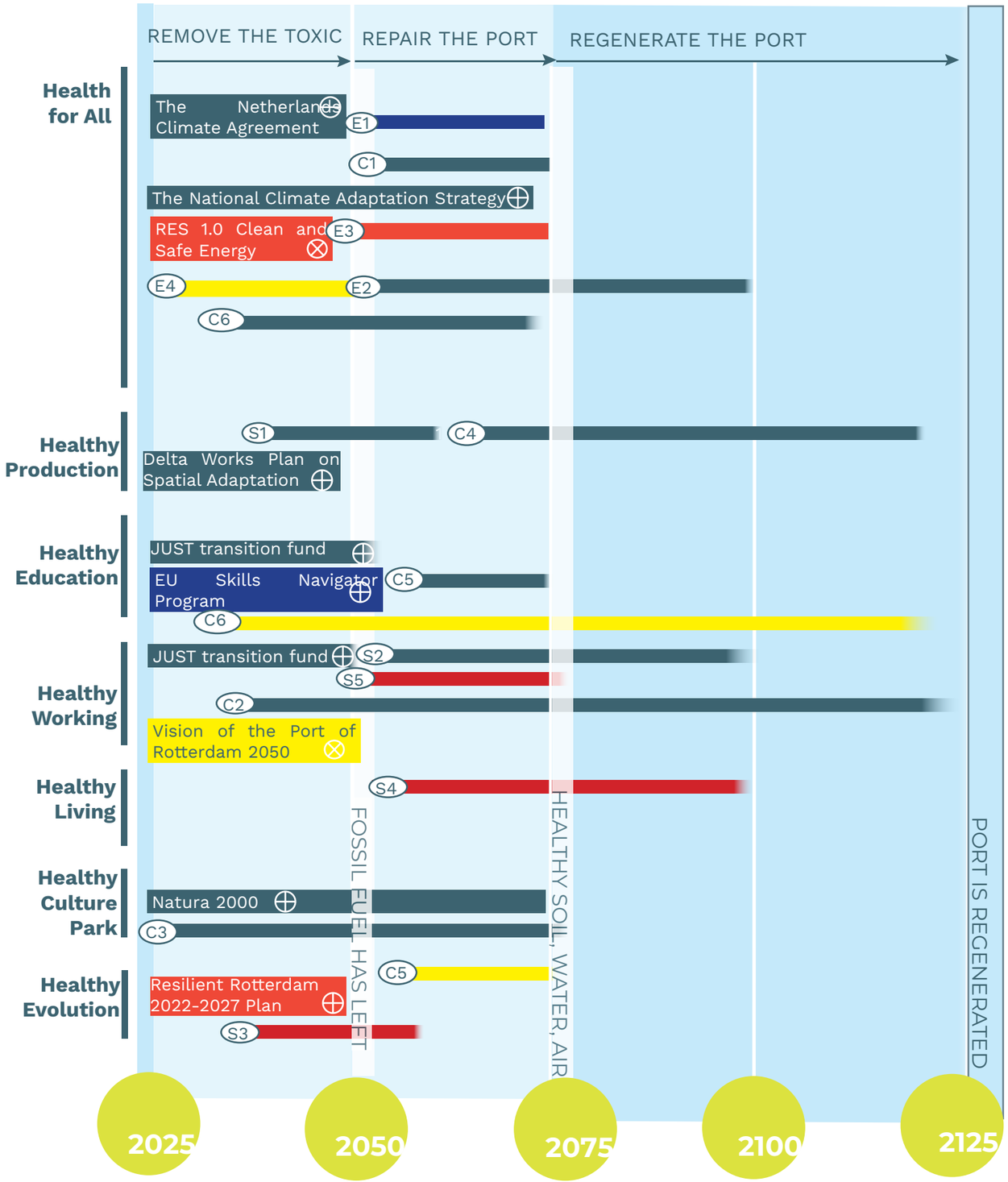


Figure 6.7
Policy timeline

Action Timeline

Spatial actions over 100 years leading towards a healthy regenerative port, divided in the zones based on the vision.

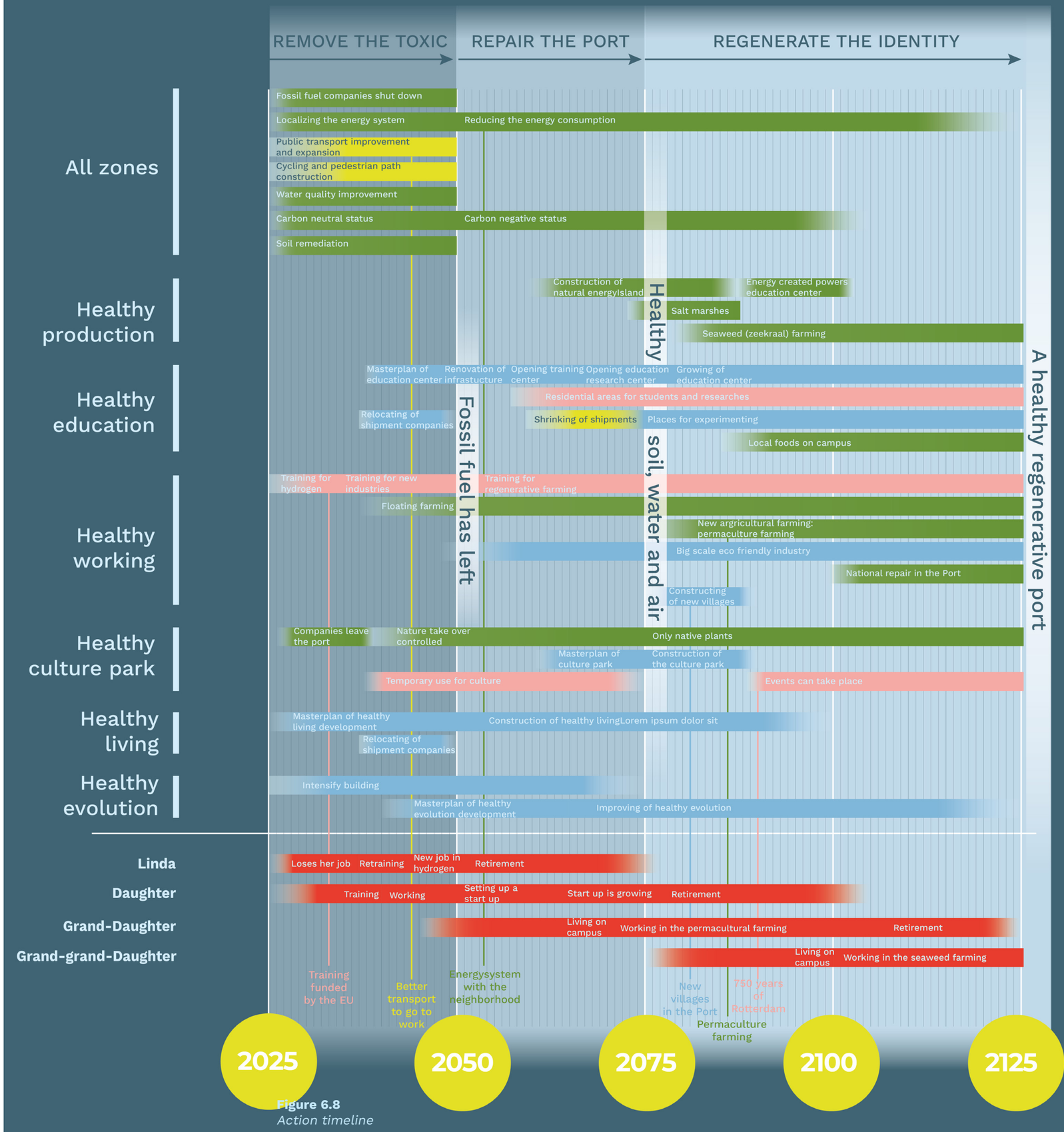


Figure 6.8
Action timeline

Health for All

Shipments

In the timeline is taken into account that in the future there is less international shipment in the Port of Rotterdam. By localizing the energy system and have more awareness about the impact of shipment, people would buy more products locally. This should also be promoted and prioritized by the authorities.

The shinking of shipments will create space for education and field labs in ‘healthy eductation’

Fossil fuel

Because of the large negative effects of fossil fuel, as discussed before, this industry will leave the Port of Rotterdam. However, this will take time, so in the timeline it has been assumed that the industry has left in 2050.

Soil, water and air

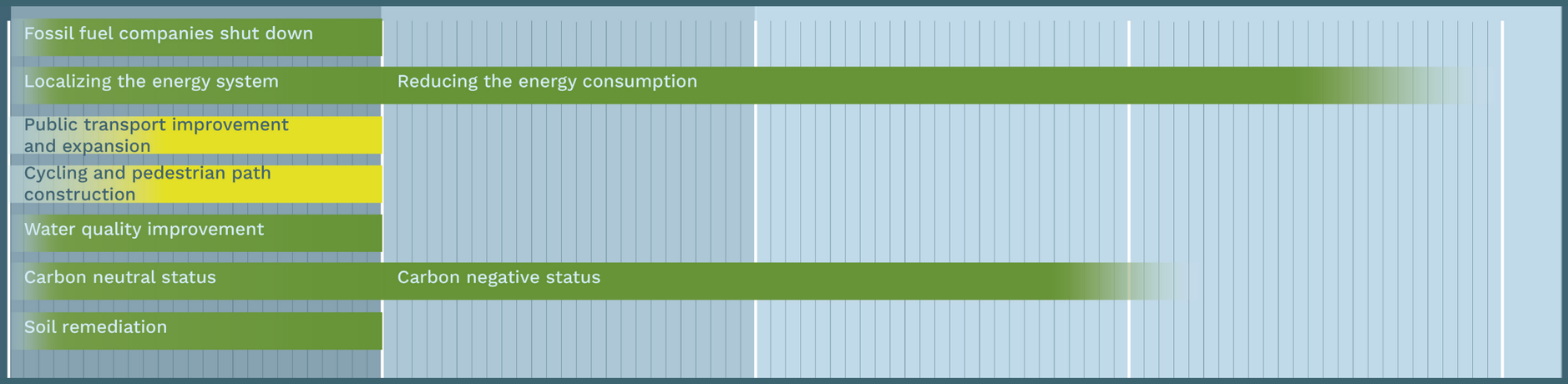
The fossil fuel industry and the large shipments in the POrt of Rotterdam has polluted the soil, water and air of the Rijnmond Region. To create a healthy future this should be remediated and purified. In the timeline it has been assumed that the soil, water and air are healthy in 2075.

Timeline

This timeline applies to the whole region. Remediation of the soil and purifying of the water are starting from the beginning to reach the goal of 2075.

When the system of energy is localized, the next step is to reduce the energy consumption of citizens and companies.

By starting immediately with the improvement and expanding of public transport and cycling - pedestrian path, the mobility will be finished right when the construction of different parts in the zones are finished. In this way the citizens and tourists can make use of the transport immediately.



Healthy production

Mobility environment

M1 Cycle and pedestrian path all the way to the end of the Port, made out of natural materials

M2 Radical connectivity, good public transport all the way through the port

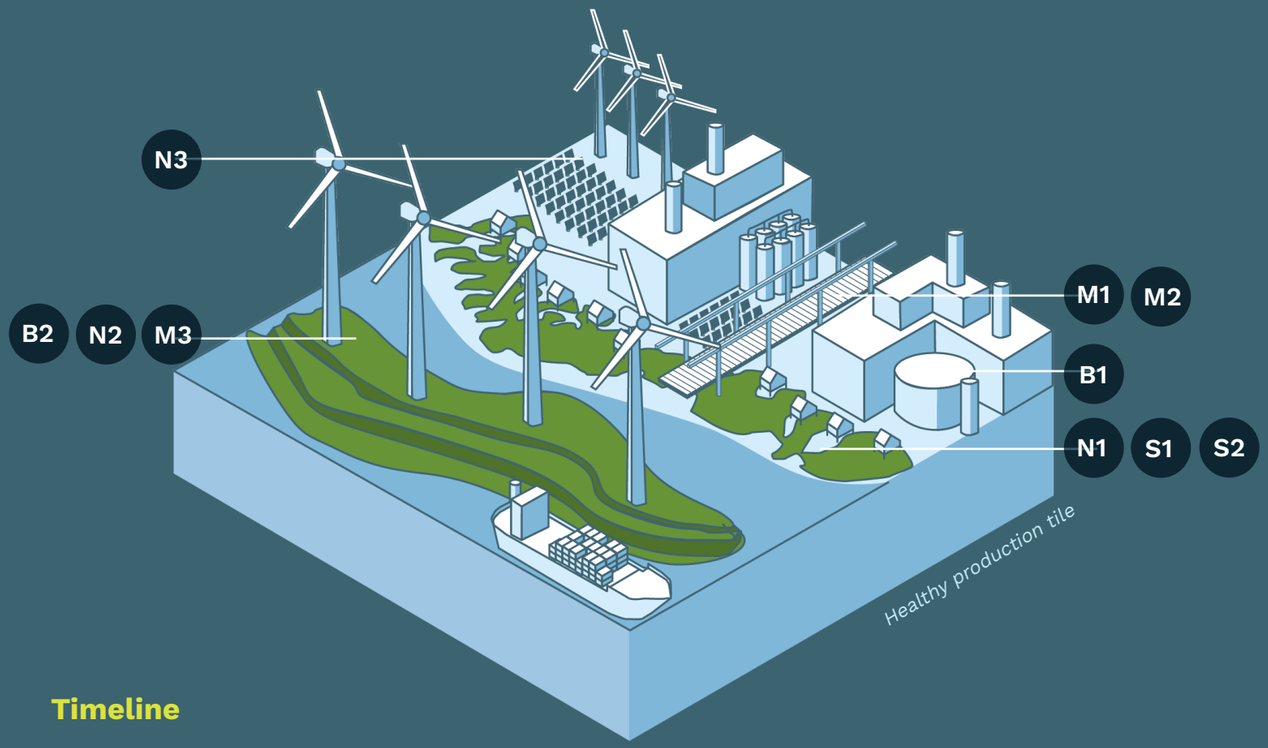
M3 Wildlife have the possibility to use the salt marshland and energy Island to rest.

Natural environment

N1 Salt marshland for biodiversity and to improve water quality towards the ocean

N2 Energy island, see next page

N3 Only clean renewable energy are produced here



Healthy production tile

Built environment

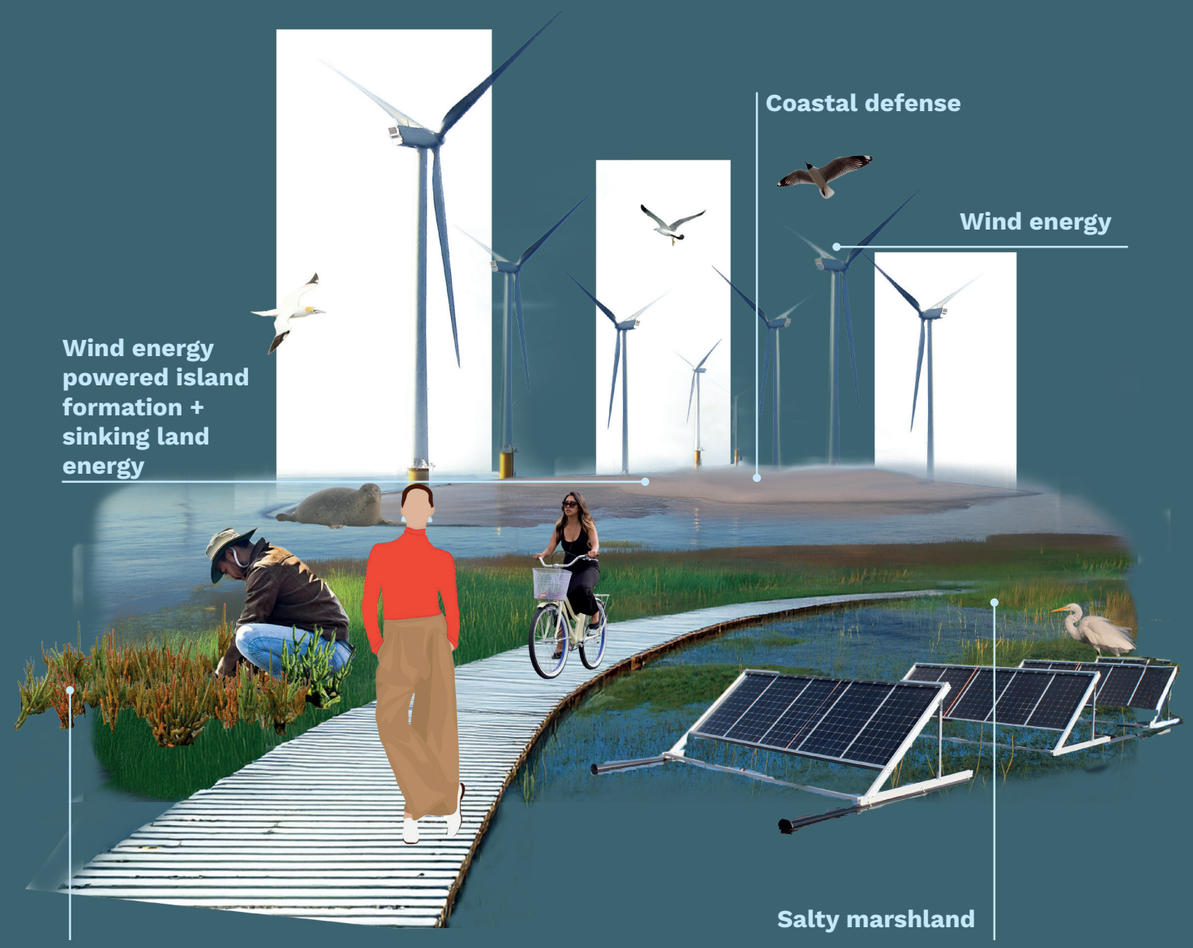
B1 Here is a concentration of energy production companies, for the favor of the people's health

B2 Coastal defence, see next page

Social environment

S1 The slat marshes give the possibility for seeweed farming, this provides jobs.

S2 This zone provides a quiet place for mental health, such as the beach



Healthy production collage

Timeline

For the spatial planning of the production zone, it is important that the energy island is constrcutted after the fossil fuel has left, because by then there is more clearness about the options and the way of working of the Island. The salt marshes are created when the soil and water are cleaned. By 2175, the Island should power the education center as a guideline for when the natural proces so construction of the Island shoud be finished.

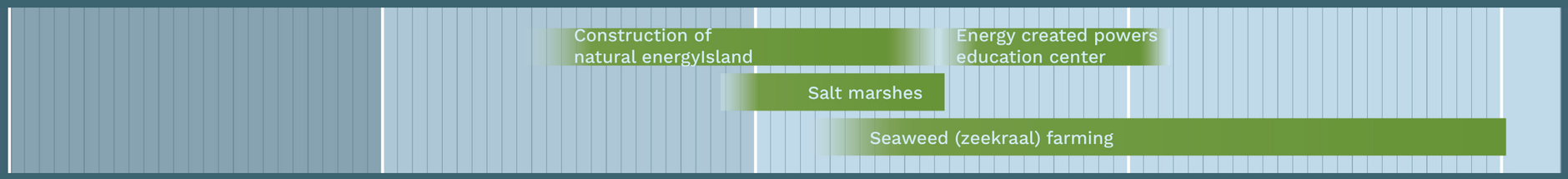


Figure 6.9
Healthy production tile, collage and timeline

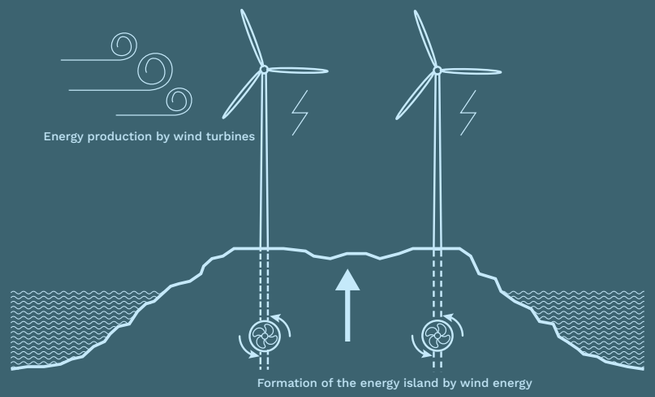


Figure 6.10
Energy Island wind situation

In a normal situation with wind, the wind turbines generate energy. To store energy, but also as a form of coastal defense, a part of this energy is used to pump up soil to cause the formatin of the island.

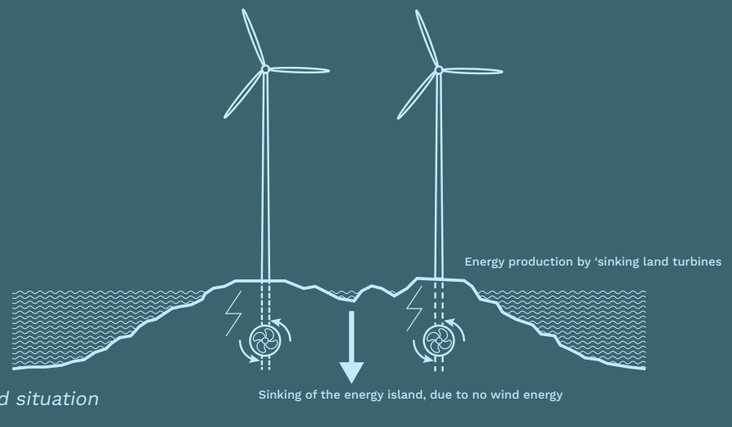


Figure 6.11
Energy Island no wind situation

When there is no wind, the turbines can not generate energy. If there is still energy needed, the island can still generate energy by 'sinking energy'. In the island is a turbine that generates energy from the movement of the sinking soil.

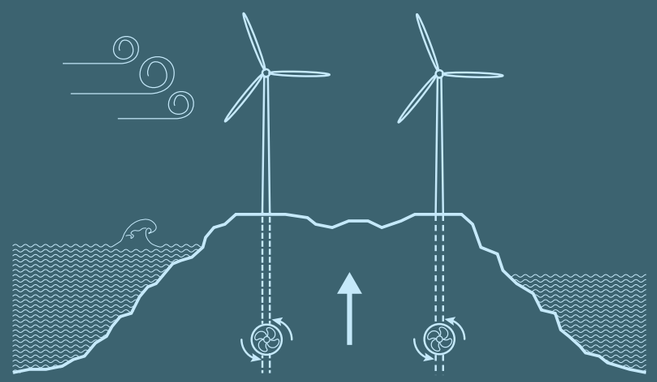


Figure 6.12
Energy Island emergency situation

In an emergency situation, such as a storm, There can be choosen to put all the energy in the formation of the island. There could also be send energy towards the island to do this. Then the island get bigger and there is more coastal defense when needed.

The principle of these island were inspired by the idea of 'Atollen Noordzee' by the architect Jón Kristinsson.

Figure 6.13
De Beer, the green beach. Jan Koolen.

Behind the energy island, there is space for salt marshes. This could be seen as the successor of the nature reserve de Beer. It would be the natural state of the delta. Salt marshes are known to have cleaning attributes (Nelson & Zavaleta, 2012). In order to protect the ocean, our 'commons', salt marshes are a good option.

Healthy education

Mobility environment

- **M1** Cycle and pedestrian path all the way to the end of the Port, made out of solar panels
- **M2** Radical connectivity, good public transport all the way through the port
- **M3** Test center for mobility
- **M4** The preservation of a part of shipping of international goods, which will shrink in time

Natural environment

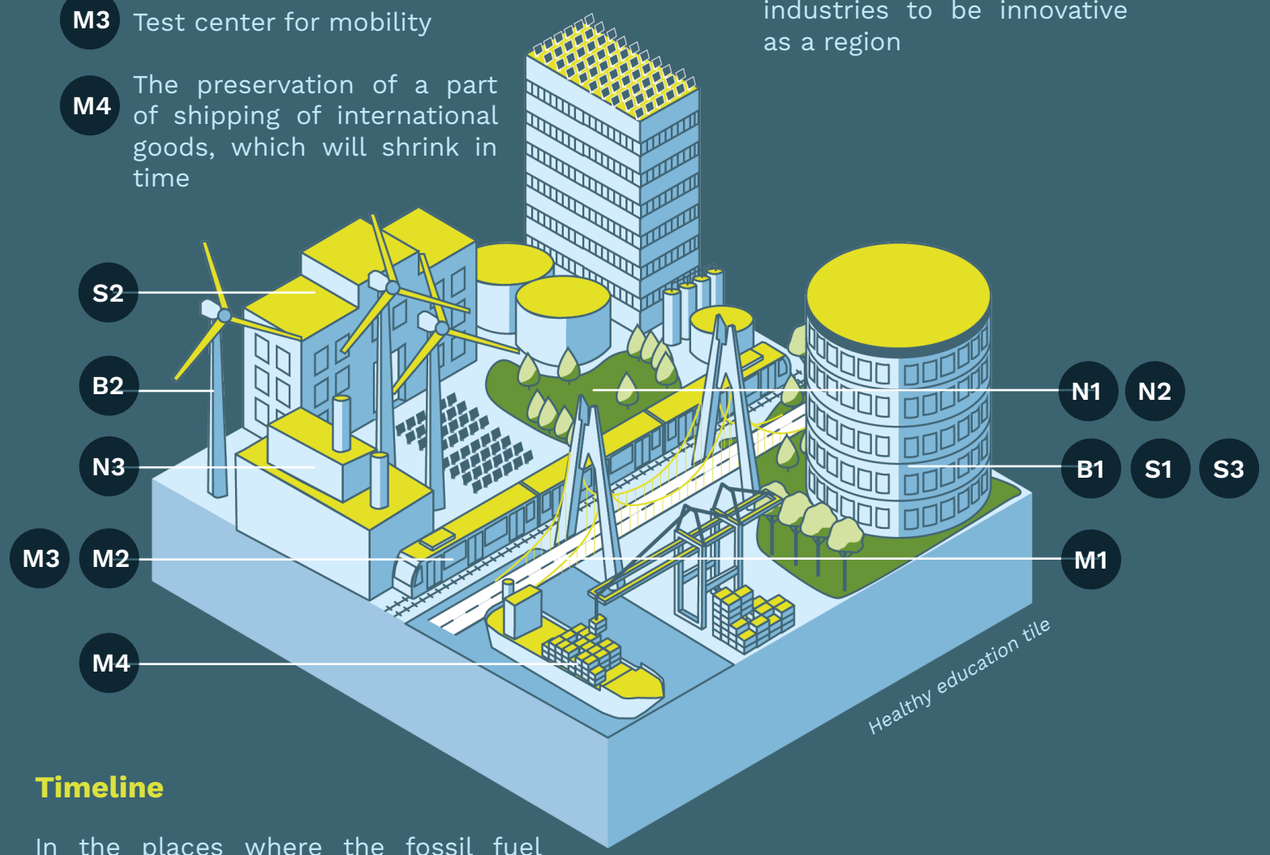
- **N1** Parks for the mental health of workers and students
- **N2** Parks with trees to reduce urban heat island effect
- **N3** Field lab, a place for experiments in the sector of farming, technologie and industries to be innovative as a region

Built environment

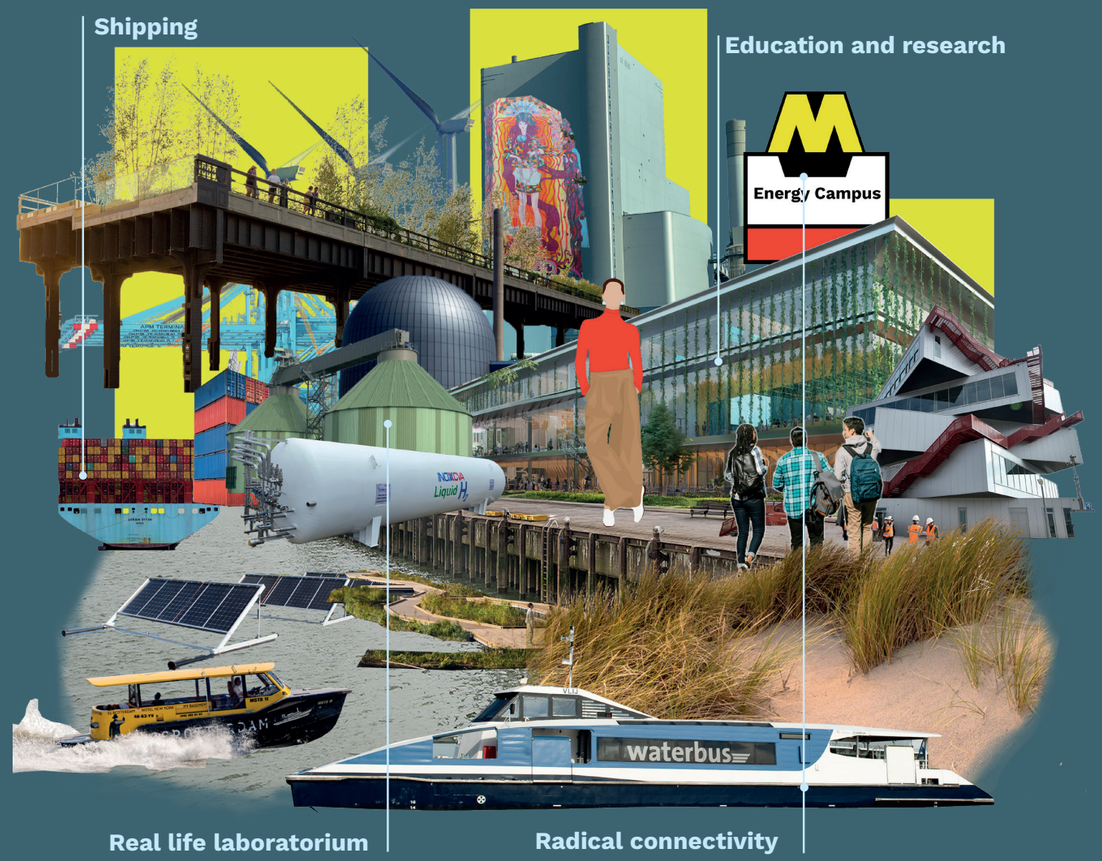
- **B1** Renovation for classrooms, labs, and housing in the existing Port infrastructure
- **B2** Renewable energy experiments and production

Social environment

- **S1** Eductation for the workers who lose their job and the future generations
- **S2** Musea and cultural functions, to connect the citizens with the innovations
- **S3** Possibility to live on campus, to reduce travel time



Healthy education tile



Healthy education collage

Timeline

In the places where the fossil fuel will leave, shipment companies from other areas will move here and other parts will be covered with a training center for hydrogen energy, farming and new industries. When international shipments shrink, there will be space for expanding of the education center as well as for the field lab.

When permaculture farming is introduced in the 'Healthy working' zone, this food will be used in this zone.

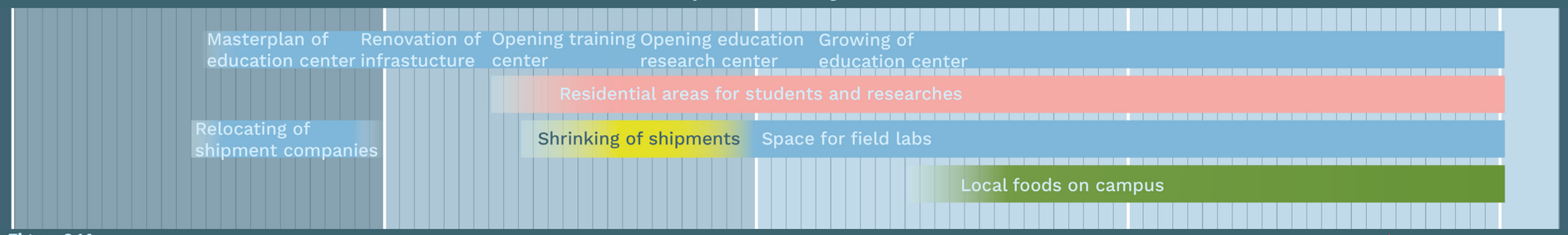


Figure 6.14
Healthy education tile, collage and timeline

Healthy working

Mobility environment

M1 Cycle and pedestrian path all the way to the end of the Port, made out of solar panels

M2 Radical connectivity, good public transport to the education all the way through the port

M3 Flow of used materials go into this area for a national repair of products.

Natural environment

N1 Permacutural farming and aqua farming

N2 Parts that can be flooded to be more adaptive for climae change

N3 Remediated soil for farming

Built environment

B1 Every village has their basic needs close by

B2 New worker villages are being developed to allow people to live near their workplaces and thereby improving the accessibility of the port.

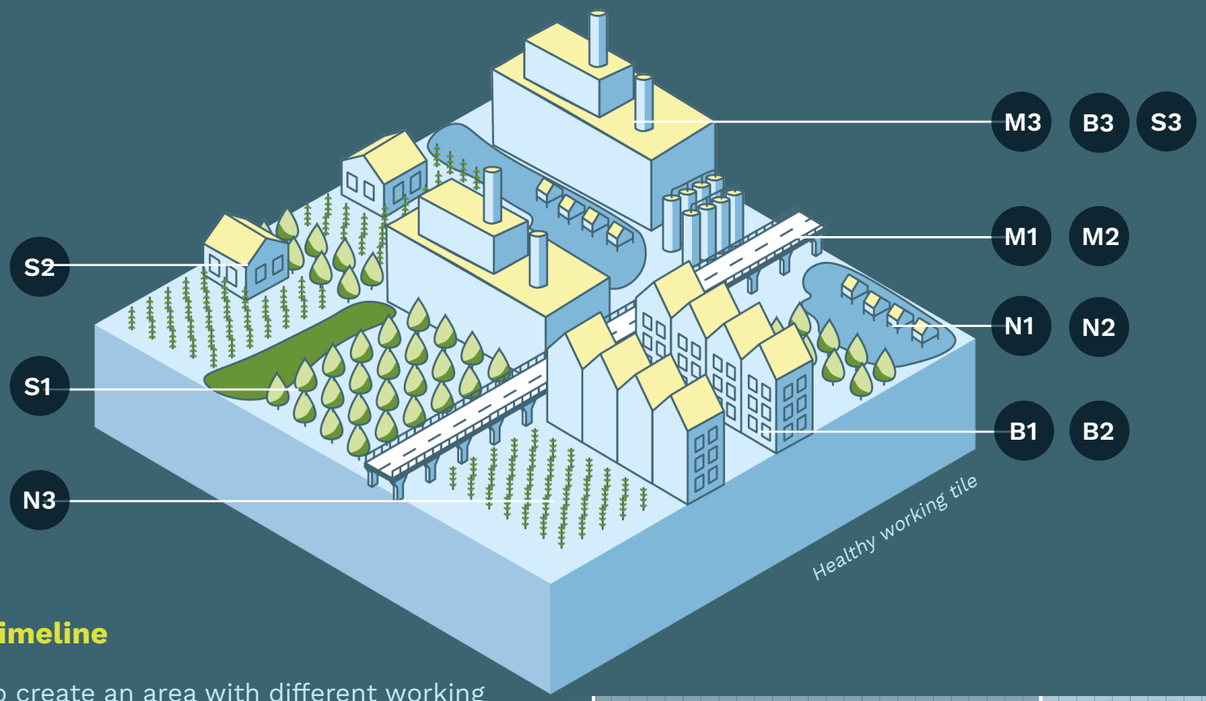
B3 Renewable industry that is carbon neutral and in the future carbon negative

Social environment

S1 Healthy work environment for mental and physical health by proximity to nature, clean air and colleages

S2 New job oppurtunities, provided with free training

S3 Start ups



Healthy working collage

Timeline

To create an area with different working opportunities, the people working here will be trained in the 'healthy education' zone. The timeline shows the order of training. Permaculture farming will be introduced later, because the soil and water quality first needs to be remediated.

Start-ups will get a change to start in this area, and after the industries have grown, the port will have a role in the national repair of products.

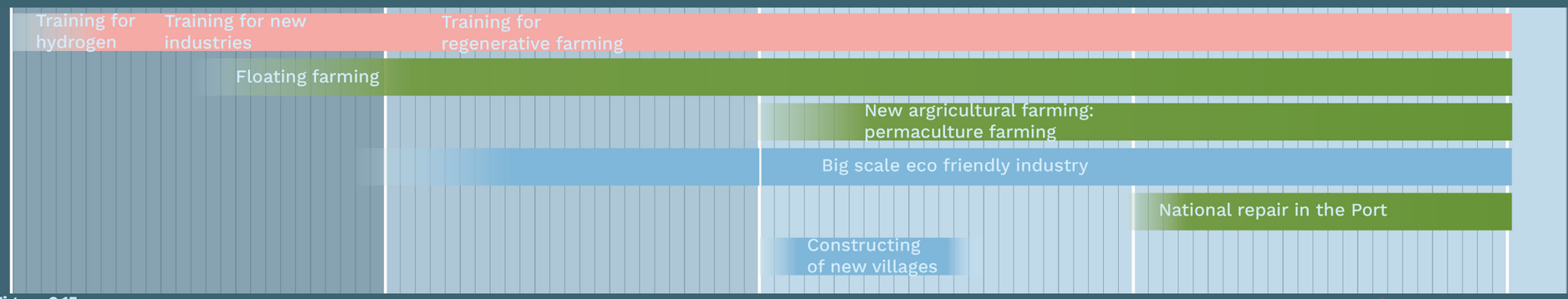


Figure 6.15
Healthy working tile, collage and timeline

Healthy culture park

Mobility environment

- **M1** Cycle and pedestrian path all the way to the end of the Port, made out of natural materials
- **M2** Radical connectivity, good public transport to the education all the way through the port
- **M3** Connection by water
- **M4** Green corridor for wildlife
- **M5** Car free park

Natural environment

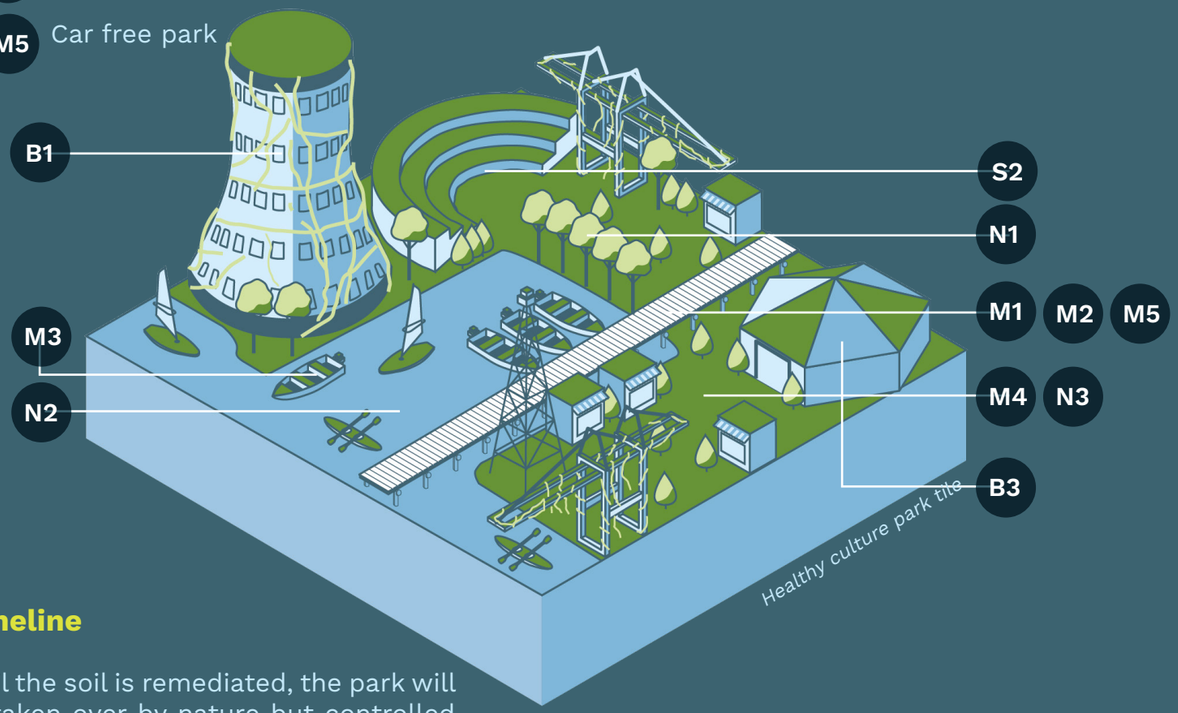
- **N1** All native plants, for the biodiversity
- **N2** Water recreation and the water has a soft edge
- **N3** Remediated soil, so the park can be used for recreation

Built environment

- **B1** Reuse of containers and port infrastructure for musea and other cultual functions, as well as for nature to take over
- **B3** Flexible zones, to leave space open for adaptation for the future

Social environment

- **S1** Big place for people to express themselves by events
- **S2** Meeting places, which are good for people's mental health and to reduce loneliness



Healthy culture park collage

Timeline

Until the soil is remediated, the park will be taken over by nature but controlled by people with knowledge. In this time there is also place for temporary activities of culture.

When the soil is remediated there are only native plants planted, to show tourist what the native nature is and to increase biodiversity.

In the year 2090, the city of Rotterdam exists 750 years, in this year the park will be officially opened.

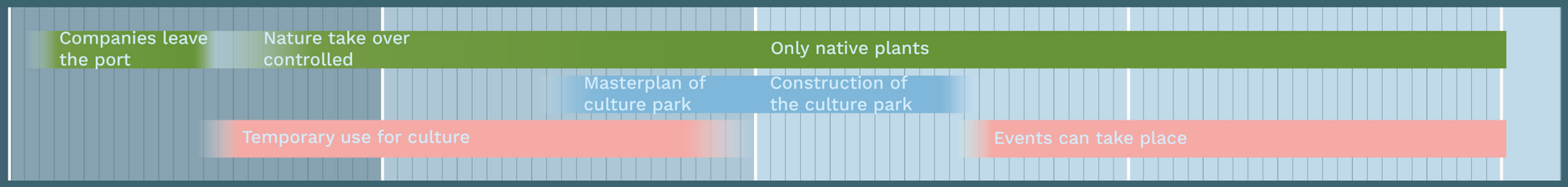


Figure 6.16
Healthy culture park tile, collage and timeline

Healthy living

Mobility environment

M1 Cycle and pedestrian path all the way to the end of the Port, made out of solar panels

M2 Radical connectivity, good public transport to the education all the way through the port

M3 “15 minute city”, so the people’s basic needs are close by

M4 Car free zones

Natural environment

N1 Remediated soil and water, so kids are able to play in parks and gardens

N2 Parks with trees to reduce the urban heat island effect

N3 Consumption of only clean renewable energy

Built environment

B1 Urban center with lots of facilities, to promote social connection

B2 Preservation of the old Port infrastructure to keep the identity, however human scale buildings are added to make it livable.

B3 Local energy system, to reduce the circulation of energy, so less materials are needed.

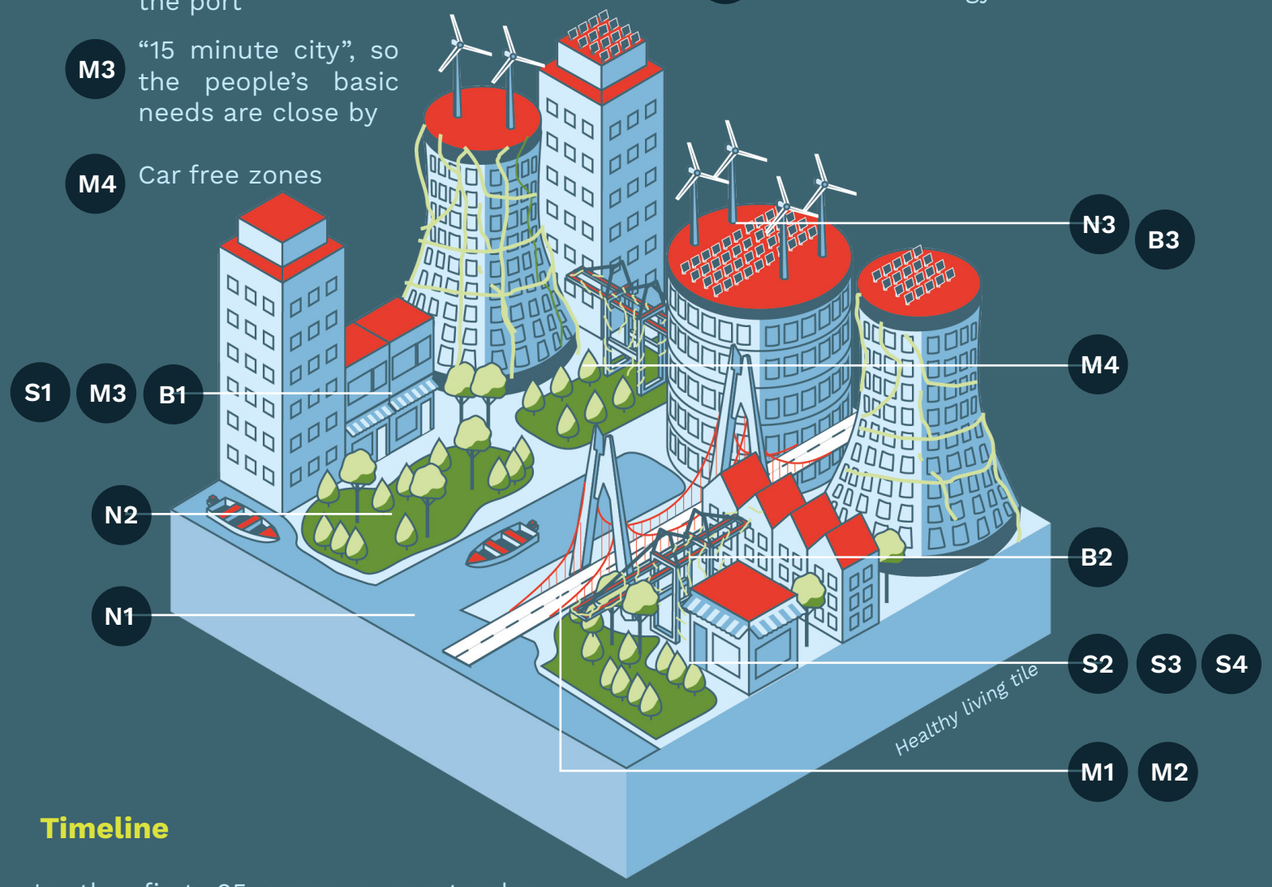
Social environment

S1 Promote local businesses

S2 Community spaces, which are publicly accessible for everyone to improve mental health

S3 Affordable facilities

S4 Access to local foods from ‘healthy working’



Healthy living collage

Timeline

In the first 25 years a masterplan is created for this new city. It will start with a few building blocks and gradually expand over time. This means the masterplan and construction will overlap eventually.

Before the construction can take place, the shipment companies currently located here, need to be relocated to the ‘Healthy education’ zone.

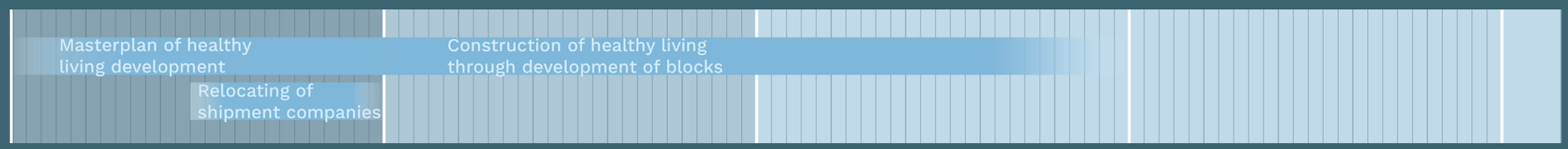


Figure 6.17
Healthy living tile, collage and timeline

Healthy evolution

Mobility environment

M1 Cycle and pedestrian path all the way to the end of the Port, made out of solar panels

M2 Connecting the existing public transport with the new zones in the Port

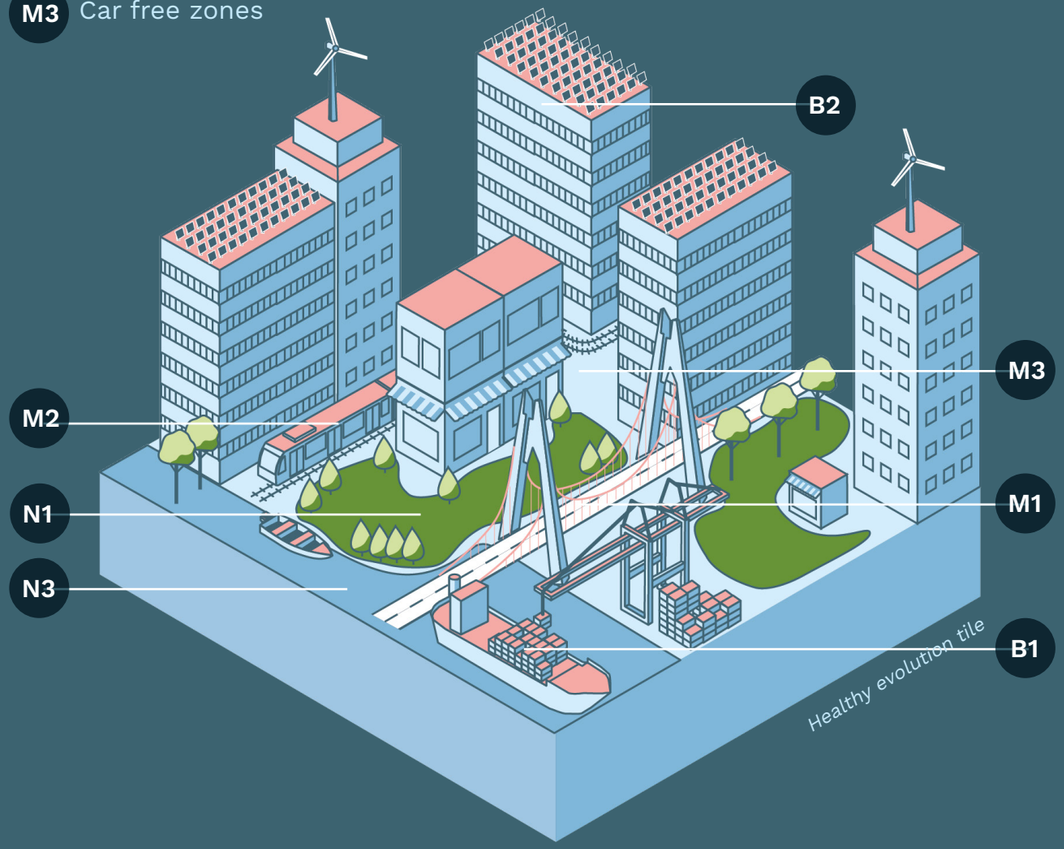
M3 Car free zones

Natural environment

N1 Parks with trees to reduce urban heat island effect

N2 Promote localized production of goods and food

N3 Purified water



Built environment

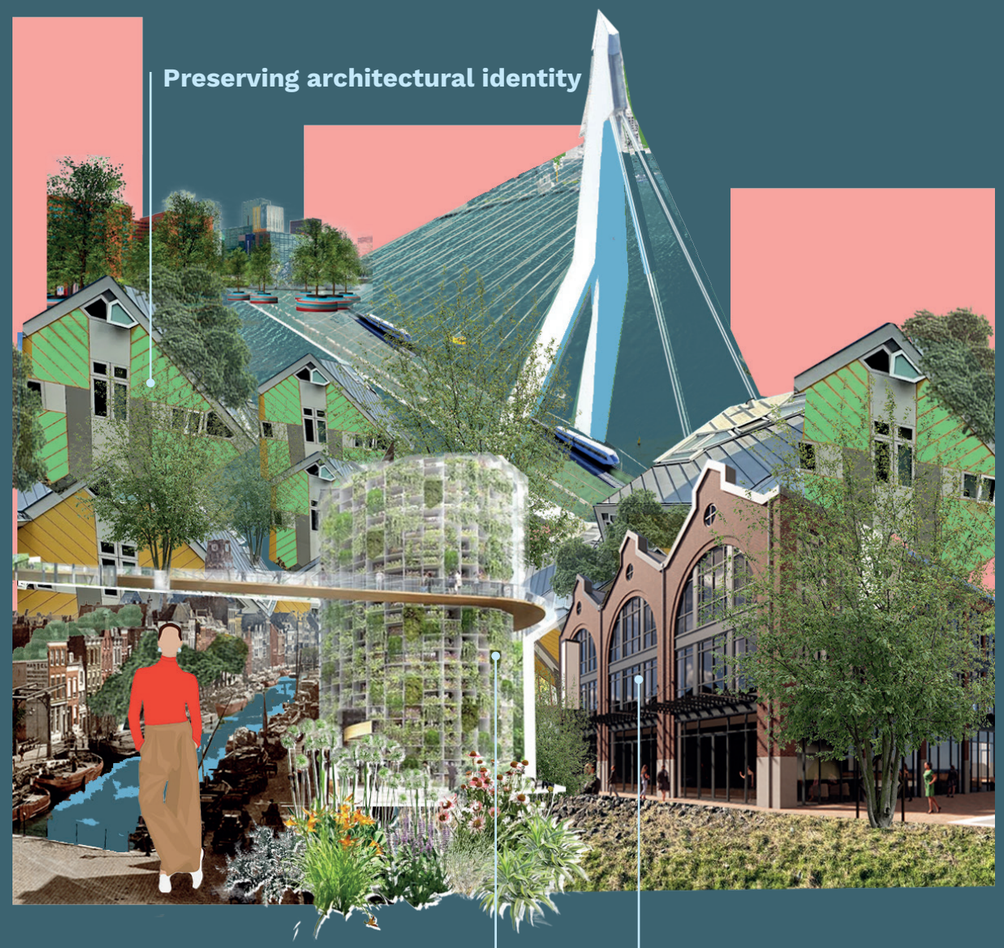
B1 The preservation of the shipping of international goods, will keep the identity of the Port in the center of Rotterdam.

B2 Intesify the existing city, to create more housing

Social environment

S1 Preserving architectural identity

S2 Being an example for other port cities globally



Healthy evolution collage

Timeline

Intensifying the area with housing and facilities is the priority, because of the current housing shortage. In the future there is room for a combination with a masterplan and improving the area to become an example for other port cities.

Figure 6.18
Healthy evolution tile, collage and timeline

Timeline in generations

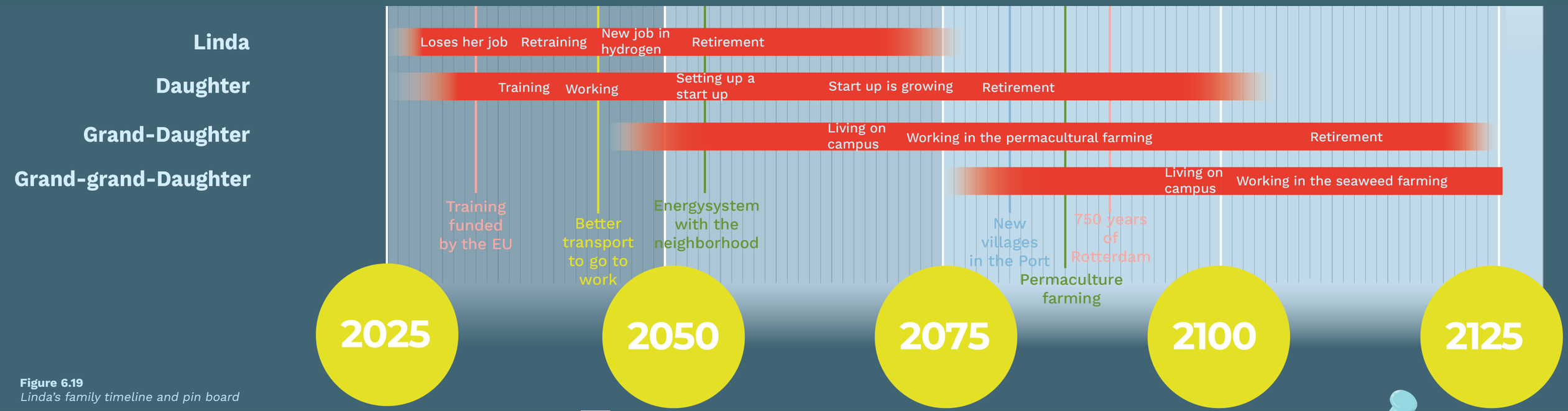


Figure 6.19
Linda's family timeline and pin board

I am currently 40 years old, and I will lose my job sometime in the coming years. However, this does not worry me. Luckily, I will get training funded by the EU in the hydrogen sector, and I can finish my career working in renewable energy at the Port. Plus, with the new improvements to the public transport system, I will be able to take the train to work instead of relying on my car. I am excited that my daughter will be able to experience even more improvements in the future.

- Linda
april 2025

I am currently 10 years and would really like to study in the coming 10 years. I will get training funded by the EU to find a sustainable job what would fit my interest. I really like fashion, so when I grow up I want to open my own clothing repair shop. First start small and later grow into a big factory, which is good for the climate. I imagine myself living in one of the new worker villages in the port when I retire. I will even experience the 750-year anniversary of Rotterdam, and I wonder what it will look like.

- Daughter
april 2025

I am currently 15 years and was born in 2045. I live in a world where there is no fossil fuel anymore. I want to study in the 'healthy education center' at the end of the Port. I really like plants and would like to work in the permaculture farming industry when I grow up. This is really cool because this is a new way of farming, that is good for the climate. I really look forward to healthy soil and water in 2075, so I can start my own farm and live next to it. When I hear my grandma talking about her work years, so much has already changed!

- Granddaughter
October 2060

I am currently 30 years old and was born in 2075 and grew up on a farm in the 'healthy working' zone of the Port. I remember the 750th anniversary of the city of Rotterdam. To celebrate, the big Culture Park finally opened, it was such a huge party! Now, there are fun activities there every week and I like to go with my friends in my free time. I studied at the Rijnmond University at the port, and now I am working in seaweed farming, in the 'Healthy Production' Zone. I go there by train, because I live in a village 15 minutes away in the Port, closer to my parents. When my family talks about how unhealthy the port was in their youth, I am really grateful for the Port I grew up in and that my children will grow up in.

- Grand-granddaughter
March 2105

Conclusion and Reflection

07

Conclusion

Our project “After the Smoke” deals with the consequences of fossil fuel removal from the Port of Rotterdam. Though we recognize this is a necessary action to take for the future health of the region, it would cause a major economic and cultural shift, particularly impacting workers in the port of Rotterdam’s industrial sector. To address these issues, we envisioned a ‘100 year regenerative vision’ strategy for the Rotterdam-Rijnmond region, where health is the filter we use to shape our vision. We hope that this health-centered vision can serve as an example for future regional planning efforts, as well as national policies.

Research Question: How can we transition away from fossil fuels in a way that promotes clean energy, is climate adaptive, and addresses relevant social issues, specifically for the workers at the port of Rotterdam and their families?
Health
How can health be defined and used to address the transition lenses?
Energy
2. What are the spatial implications of the transition away from fossil fuels towards a renewable energy system in the Port of Rotterdam? (add Energy symbol)
Social
3. How can the social identity of the port evolve in a way that the workers of the region can still be proud of?
Climate
4. What interventions are needed to address climate resilience for the region?

Health Definition
By defining health for our region, we were able to envision a new future for the port that addresses challenges related to the transition away from fossil fuels. Our definition focuses on preventative measures to improve both physical and mental health in the natural, built, social, and mobility environment, which we used to create a regional plan divided into different “health zones.” Through the creation of policies and spatial interventions outlined in a 100 year action map, this was accomplished.

Social
While our spatial interventions are at a regional level, we mainly considered the consequences of the interventions on our transition community: the workers at the Port of Rotterdam. Assuming a reality where the fossil fuel industry will leave the port of Rotterdam was a very bold action by us, since the fossil fuel industry provides a lot of jobs and contributes to the economic growth of the region. The port is in many ways tied to the city and region, because it has brought the city, the region, and the country tremendous wealth, which creates a strong sense of pride for the community.

Energy & Climate
Our plan shows a possible way of how one can transition away from fossil fuels and promote clean energy. By analysing current climate and energy policies to assess whether they contribute to our healthy vision for the future. If the existing policies are not adequate, we create new policies. We address renewable energy by localizing energy production by 2075 and through the creation of an energy production island. This energy island acts as coastal defense against rising sea levels in order to prevent excess flooding, but also plays a part in providing biodiversity. All these measures will create a climate resilient region and with the renewable local energy system in place it will eventually become carbon negative.

Group reflection

After an interdisciplinary complex project it is helpful to come together and reflect back on the essence of our project and whether we achieved our original goals.

Process

In the past nine weeks we achieved an understanding of the complexity in the port of Rotterdam related to the energy transition and climate adaptation. Starting out with radical spatial imagination in order to get a grip on the big scale of the region, we enabled ourselves to make bold choices. We came up with a long term plan for over 100 years. Creating an action and policy timeline, we could visualise this and create a workable and more 'realistic' timeline. In the spatial strategy we humanized the scale of the project. Combining timeline and strategies made us build a story which goes through time and space.

We sketched a possible future without fossil fuel. A future, which is not profit driven but instead driven by the desire for health. Renewable energy and coastal defense went hand-in-hand, creating new synergies. We created a future driven by an involved transition community. By adding a person, Linda, to our story, we were able to feel more connected to our transition community and able to visualize the outcomes of our vision. Humanizing complex problems and systems was also challenging, yet doing so helped us to tell the story to our audience.

The process made us realize that even though we worked as a tight team, all being on the same line, there still can be a large variety of different perceptions afterwards.

Social and Spatial Justice

The transition community that we focused on, the workers at the port of Rotterdam and their families, is one specific community in this region. Further research could also involve other communities and perhaps lead to different ways in which these transitions can take place while at the same time promote clean energy, be climate adaptive and preserve the local social identity.

Recognitional justice

By focusing only on the port workers in the fossil fuel industry as our transition community, rather than all workers in the region, we may have limited ourselves and failed to recognize everyone in our vision. Furthermore, we did not go into depth on which demographic of worker may be the most negatively impacted (migrant, non Dutch, female versus male), which is a key aspect of recognitional justice.

Procedural justice

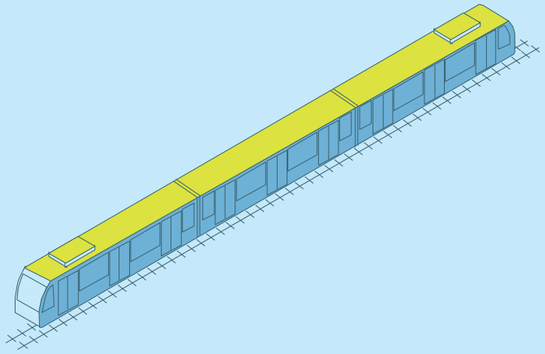
Our strategy focused on who we considered the most vulnerable community, the workers of the port. Other vulnerable communities we mentioned are the future generations and wildlife. However, we did not go into detail about discriminated groups such as the elderly, female, or those with migrant backgrounds. While including the most vulnerable community members in our stakeholder analysis, we feel that we did not empower them enough in our policy proposals and our action mapping. Instead we made inherent assumptions that they would be incorporated in our vision through our focus on social health, which includes support for diversity and inclusion.

Distributive justice

In our new vision, benefits and potential new burdens will be spread more evenly. However, envisioning a port without fossil fuels means some people will lose their jobs. The entire economy may even suffer negative consequences from this as well, but we deem it necessary as it will have a positive contribution to the "commons". It will have positive effects on the natural environment and by creating new jobs for the local region as well. The creation of new jobs distributes labor more evenly in a more healthy manner. Workers who lost their jobs in the fossil fuel industry might benefit more from this, since they are prioritized in the retraining programs. Nevertheless, we feel that the different zones of our plan, including entertainment, new sustainable industry and more green space will improve the health and livelihoods for the entire region.

Future: the next steps

- Developing a healthy masterplan for the Healthy Living Zones and Working Villages, further researching the consequences of health as a starting point for urban design on a smaller scale.
- Investigating the feasibility of the energy island and its coastal defense synergy. For the healthy production we came up with the energy Island, based on the idea of the architect Jon Kristinsson. However, this needs a lot more research on the feasibility of such an energy producing island that is simultaneously a part of coastal defense.
- Clarifying the power and influence of the Port Authority could perhaps make this project even more successful, since there is more information and research available on the Port of Rotterdam's authority. How much power do they actually have in the Netherlands and in the municipality? Further research into this could help shape this new power balance, which could have a great impact on the plan and the communities.
- Including more communities beyond the port workers to diversify the social focus. This project mostly focused on our transition community and in further research other communities can be tested and added into this vision.
- Investigating the reliance of the port on technology
- Conducting interviews with workers, to better understand their perspectives and lived experiences, because we did not have time to do interviews with people working at the port. They are hard to reach and work in a lot of different sectors, which is something that needs to be taken into account as well.
- Investigation into the reliance of the port on technological solutions to improve "sustainable economic growth of the port", and whether this is actually feasible.



We are all different wagons as we contribute different things to the goal, but we still manage to get to the same station at the same time. Luckily, we are not derailing that easily because we are really focused and motivated. We work most of the time in the same space and have good communication, that is why we also stay on track. However, sometimes we struggle in getting up to speed and can get lost in minor details. Once we are going though, we are really going, full steam ahead on the rails. An unstoppable force is coming towards the final destination, carrying all aspects and things to make it a success.

Individual reflections

Scope
The regional design project within the course ‘Spatial strategies for the global metropolis’ was a challenging yet interesting and enjoyable experience. The scale of regional design was new to me, just as the energy transition. However, I enjoyed learning so many new things about urbanism. It became clear to me how everything on the regional scale is connected with each other and how complex it is. I found this complexity both intriguing and overwhelming.

Process
The first five weeks focused on developing our vision, and presenting our results, helped to clarify some of the inaccuracies. Even though we considered our vision to be complete, working on the strategy ended up revising it entirely, eventually creating an even stronger vision. This process felt like a productive trial-and-error phase, as we also totally changed our title. Some of the workshops, like the Atlas.ti session, did not align for our project, since there were not a lot of good newsletters available in our research terms. On the other hand, The GIS workshops were a good method to get started on mapping the new scale. I learned in the feedback sessions among other things what radical spatial imagination is, how policies and a timeline can help your design to become realistic and how such a complex transition of energy and social identity can become spatial.

Transition community
It took me a while to understand the meaning of a transition community, but once I understood it, I really enjoyed having a community as the driven force behind our project. I particularly liked bringing Linda to life through drawings and text bubbles, imagining what future generations experience through time in our project. However, also mentioned in the group reflection, by taking this approach in design, other stakeholders and communities are left behind. In the methodology class there was a lot of attention on interviewing your community, but due to time and the large scope of our community, this wasn’t feasible for our project.

Groupwork
Working within a group presented its own set of challenges. We were a diverse group, including one team member who wasn’t Dutch, sometimes led to misunderstandings. However, after having an openhearted discussion with our peer review, we could laugh about it and gained a better understanding. We had good communication as a group, but the peer review proved to be essential for addressing some underlying issues. I felt that our team dynamic improved significantly, so for future projects, I would start earlier with sharing expectations. The project asked for a lot of discussion and debating, so as a group, we spend almost every day together. I think this collaboration made our project stronger, but it also led to tiredness. So, in future projects, I would like to find a better balance between discussion time and product development time. I am really satisfied with our end result and it was pleasant to see everything come together with the group.

- Eva Geleynse

After finishing my BSc at this faculty, I started my MSc Landscape Architecture. Though I really enjoyed my first semester and still having a huge interest in this discipline, I decided Urbanism would be a better MSc track for me. In brief, I really enjoy designing, but I also want to be able to develop myself in research and planning. Urbanism offers more opportunities in this.

Starting a new semester at a new study made me a little bit nervous. Do I lack knowledge and skills? But my doubts got overshadowed by enthusiasm and curiosity, because Q3 contains exactly what I would like to develop myself in, research and planning.

What inspired me a lot at the start of the course was the lecture about radical spatial imagination, given in our studio group. Trying to solve problems by their ‘roots’, combined with Roberto Rocco’s lectures and texts about the influence of planners, made me very motivated, fulling understanding why I was doing this: contributing to the formation of the future.

During the course, I had the opportunity to explore different skills. From not having a lot of experience in QGIS and Illustrator, I feel now more comfortable. Also diving into the skill of mapping I highly enjoyed, getting helpful feedback from teachers and peers. Valuable lessons for me are, do not let yourself get scared from ideas that might seem too crazy or big, they might be worth exploring. Besides that, also do not be afraid of challenging the status quo, things change quicker than we realize over time.

Being from Rotterdam and Rijnmond region myself, I was very happy with our chosen region. I already was quite interested in the port, but my interest transformed into something bigger, and I went for fun to the Maritime Museum and a documentary about the Port. I can’t wait to visit the new museum Portlantis. I am very curious how the port will develop itself in the future.

Making a regional plan with the theme of the energy transition was very satisfying. Before this course I did not know that much on this topic, especially on energy systems. I am not an expert on this topic of course, but it is impressive how we learned a lot in such a short time on this topic.

What I understood is that this is the first time this course I done through the perspective of an energy transition community. It made understanding the project a bit more manageable in the beginning of the course, because I could put things into perspective. This extra layer to the project also made it more complicated sometimes. Just having an extra thing to consider sometimes left me confused, but at the end of the course I think it is a nice addition to our product, exploring the human scale a bit more.

Doing this project in a group made everything much more enjoyable. Because of the size of the project, it would be very hard to do this alone. Also, the ability to come with ideas quickly in brainstorm sessions was a lot of fun. I think this project a result of real teamwork, we really did it together.

- Aaron van Dorst

Process
I came into this course with certain expectations about Regional Urbanism, expecting that I would learn a lot of technical tools related to QGis and map making. As a first year MSc MADE student, I chose this course as my elective out of all of the possible Q3 course options at Delft. I was a bit nervous to make such a large commitment. One of my main motivations for joining this course was to push myself to learn more "hard" skills that I could use after graduation in my future employment. However, I also wanted to do something creative and related to design, as this is my "comfort zone." My background is in Landscape Architecture, and I knew I could probably handle a design studio rather than trying to take a standard course with exams. When I was presented with elective options for MADE students, Roberto gave a presentation on this studio to us and I became more convinced that it would be a good fit for me, as I often enjoyed his lectures on spatial justice and urban theory. Despite receiving the presentation and reading the course guide, I was still surprised by how the course went. I figured it would be a more technical course, but this turned out not to be the case. In all honesty, it was much more aligned with my own interests and existing design skills than I had originally anticipated. While I did produce a few maps for our final report, I did not improve this certain skill set as much as I initially anticipated, but mainly due to time constraints for our group to produce this report, so there was not a lot of time for experimentation. Rather, as a team we played to our own strengths to contribute to the final output. Luckily, I now have access to good resources though for QGIS, and learned about new programs such as Atlas for document analysis.

Theme
The energy transition is already a very complex urban issue, and the addition of the transition community made it even more complex. I noticed that there was a general struggle, not just for the students, but the professors as well, on how to best tie in the new element of the transition community into the context of the energy transition given the time limitation and other factors that needed to be considered. While I appreciated this, because I think it is crucial to incorporate spatial justice and local stakeholder involvement in all regional planning efforts, I found it frustrating that it was a mandatory component. Many assumptions had to be made due to our inability to actually contact and research our community in depth, which goes against spatial justice principles- where assumptions and design solutions on behalf of others should not be made, but rather involve them in the decision making process. Nonetheless, I appreciated the challenge and learned a great deal about the complexity of the issue throughout this studio.

Results and Conclusion
Overall, I am grateful for the hard work and united efforts of my group to produce our vision in such a limited time period. Originally, I was intimidated by the reports I saw from the previous students, but now I know that my group and I created an original and well-thought out report of quality that we can be equally proud of- and maybe even be admired by students in future quarters as well. I am also super grateful to my tutors, Irene and Caroline, for pushing us to be radical in our designs. Their passion, knowledge, and enthusiasm inspired us to work hard and not limit our bold ideas. I feel that I regained my passion for design again through this studio, and pushed myself to create a vision I can be proud of, as I did not have to make concessions for what I believe in. While I look forward to getting to sleep in again and stop commuting almost three hours a day from Amsterdam to Delft, I am happy with my decision to join this course, and with the efforts I made for this report. I learned a lot, not only about the subject matter, but about myself as a designer and my role as a team member.

- Charlotte Schmitt

The past quarter has been one of discovery. Discovering a new aspect of urbanism, new peers and new levels of complexity. At the start of the quarter a lot of the things we were going to do seemed unclear, aside from creating a regional design.

Course
Navigating the course was challenging at times. I do feel that we 'got lucky' with our tutors, since they greatly emphasized the storyline and the ordering power this had. The new focus on the community was also helpful in that sense, but not all tutors or lecturers seemed to understand this. For the example materials from previous years, it was from time to time hard to understand exactly how far we had to 'push' our ideas since had the chance to really go in-depth in a certain topic or theme, whereas we had not. Aside from the time constraints, mentioned in almost every single SDS lecture which would have been useful one or two weeks earlier. Designing on a regional scale is very complex, being taught about these elements is therefore welcome and many things are so interesting. Yet a lack of overview on the course organization's side made it feel as if the lectures did not align with the studio process. Intertwining of theory in this, Roberto's wonderful lectures, is useful but felt very forced.

Group
As a group we managed to weather this storm, especially after the midterm. Before the midterm it was not always smooth, but the peer review assignment really forced us to address this and each other's personal strengths and weaknesses.
Improved communication and appointments boosted productivity. The downside was that we spent a lot of days together in the studio, which by the penultimate week had started to wear me out. Especially the need for 'meetings' useful for other group members, but annoying for me since I could not continue my production. Together with some other slightly questionable decisions those were the only irritations.
While we are not the most extraverted group out there, we were very good one. Clarity, and the willingness to step in if another team member was unable to finish or do it was amazing. Despite the fact that I also experienced this in the later weeks, where others did thing I was planning to do, I am very glad they acted and avoided falling me into my rabbit hole of perfectionism. Even though I feel 'less' since I might not have contributed as much as I'd like in the last weeks and I do not like this feeling.

Conclusion
I have learnt a lot about groups, what consistency I want in them (a balance between togetherness and alone time) and that I need to make myself more understandable: cultural differences makes picking up certain unspoken nuances harder, despite language proficiency. Regional design is something I like to do, but not in this limited timeframe. I like do go in-depth and this course did not fully let us, both in design as in theory. This is such a shame, since regional design is the place where urbanism intersects with so many societal, economic, technical and ethical issues. I hope I will be able to do that once, maybe in a graduation project: the regional scale felt a bit like a nice warm bath.

- Dieter de Waal

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08

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Datasets used per analysis map

FIGURE 4.6

Overstromingsbeeld primaire keringen (2020). (2020). [Dataset; GeoTIFF]. In Rijksinstituut voor Volksgezondheid en Milieu, *Overstroming* -. https://nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/f63c58b9-919a-47e0-ad69-ed49859d3139

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FIGURE 4.7

Provincie Zuid-Holland. (2024). Lijnen in Nederland [Dataset]. In *Openbaar Vervoer* -. https://geodata.zuid-holland.nl/geoserver/verkeer/wfs?service=WFS&version=2.0.0&request=GetCapabilities

FIGURE 4.8

Provincie Zuid-Holland. (2023). Invloedsgebieden gecombineerd [Dataset]. *In (Hoogwaardig) openbaar vervoer* -. https://geodata.zuid-holland.nl/geoserver/ruimte/wfs?service=WFS&version=2.0.0&request=-GetCapabilities

Provincie Zuid-Holland. (2024). Lijnen in Nederland [Dataset]. In *Openbaar Vervoer* -. https://geodata.zuid-holland.nl/geoserver/verkeer/wfs?service=WFS&version=2.0.0&request=GetCapabilities

Provincie Zuid-Holland. (2024b). Haltes Zuid-Holland [Dataset]. In *Openbaar vervoer* -. https://geodata.zuid-holland.nl/geoserver/verkeer/wfs?service=WFS&version=2.0.0&request=GetCapabilities

NDW. (2024). *2023_fietsintensiteiten.zip* [Dataset]. https://opendata.ndw.nu/2023_fietsintensiteiten.zip

FIGURE 4.9

Rijkswaterstaat. (2025). Vaarwegvakken (RWS) [Dataset]. In *NWB Vaarwegen*. https://geo.rijkswaterstaat.nl/services/ogc/gdr/nwb_vaarwegen/ows?service=WFS&request=getcapabilities&version=2.0.0

FIGURE 4.10

Cannatella, D., Hausleitner, B., & Forgaci, C. (2025). Data [Dataset]. In *AR2U086.* https://surfdrive.surf.nl/files/index.php/s/cGOnPkx5yWZrQ5h

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Rijkswaterstaat. (2024b). *INtensiteit WEgVAkken (INVEWA) 2023* [Dataset]. In INWEVA Verkeersintensiteiten. https://downloads.rijkswaterstaatdata.nl/inweva/INWEVA_2023.zip

FIGURE 4.11

Provincie Zuid-Holland (Ed.). (2019a). VOORZIENINGEN_PUNT [Dataset]. In *Kampeervoorzieningen, parkeervoorzieningen en sportaccommodaties voor de samenlevingsatlas* (Version 27-03-2025). https://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/E421FF3C-A264-477F-9863-225C63071FEE

FIGURE 4.12

Provincie Zuid-Holland (Ed.) (2019b). VOORZIENINGEN_VLAK [Dataset]. In *Kampeervoorzieningen, parkeervoorzieningen en sportaccommodaties voor de samenlevingsatlas* (Version 27-03-2025). https://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/54220655-32a3-4a7b-a932-3980a4c9afe1

FIGURE 4.13

Rijksinstituut voor Volksgezondheid en Milieu. (2023b). *Stikstofdioxide (NO2) [Dataset]. https://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/43fe76cf-96c6-416c-8b7d-532936b46551*

FIGURE 4.14

Rijksinstituut voor Volksgezondheid en Milieu. (2023). *Fijnstof 2023 (PM10)* [Dataset]. https://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/ce00e887-19ef-497f-8582-02fb2f9db3c7

FIGURE 4.15

Rijksinstituut voor Volksgezondheid en Milieu. (n.d.). *Milieugezondheidsrisico (MGR)* [Dataset]. Atlas Leefomgeving. https://www.nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/516035ea-42e7-4ca4-a444-d2bef3d6dce2

FIGURE 4.16

KRW-oppervlaktewaterlichamen-geometrie. (2024). [Dataset]. *In Kaderrichtlijn Water.* https://wkp.rws.nl/downloadmodule

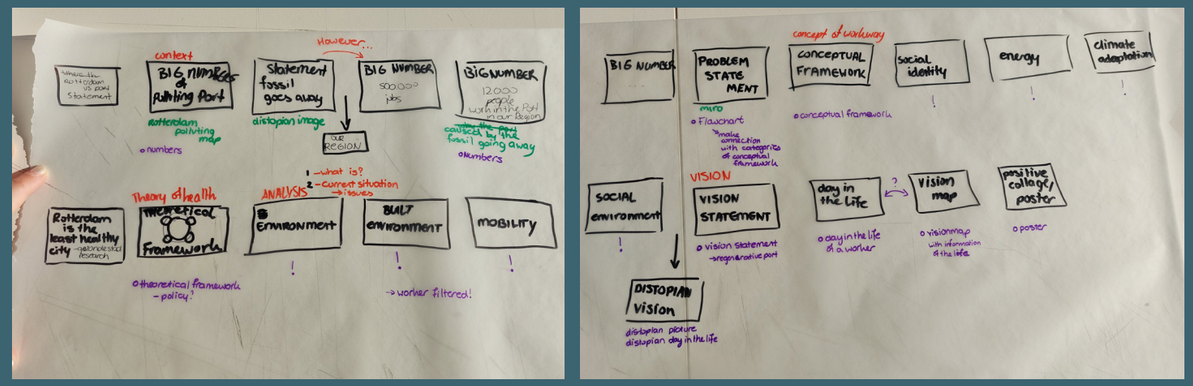
KRW-stroomgebieddistricten-geometrie. (2024). [Dataset]. *In Kaderrichtlijn Water.* https://wkp.rws.nl/downloadmodule

USED ON ALL MAPS - BASE LAYERS

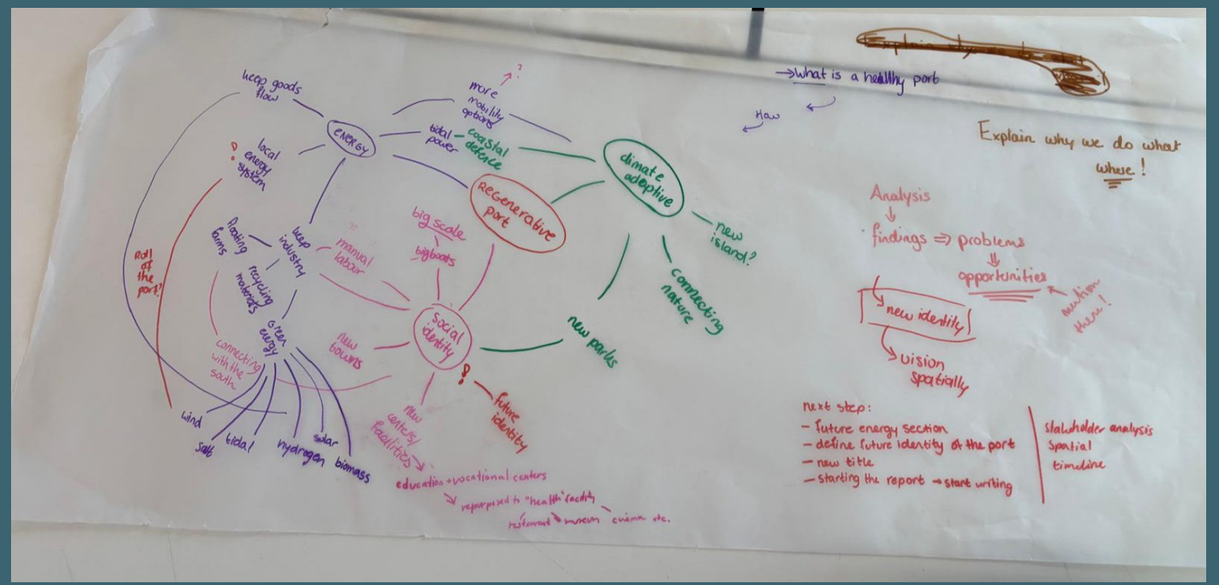
Cannatella, D., Hausleitner, B., & Forgaci, C. (2025). Data [Dataset]. In *AR2U086.* https://surfdrive.surf.nl/files/index.php/s/cGOnPkx5yWZrQ5h

Appendix
09

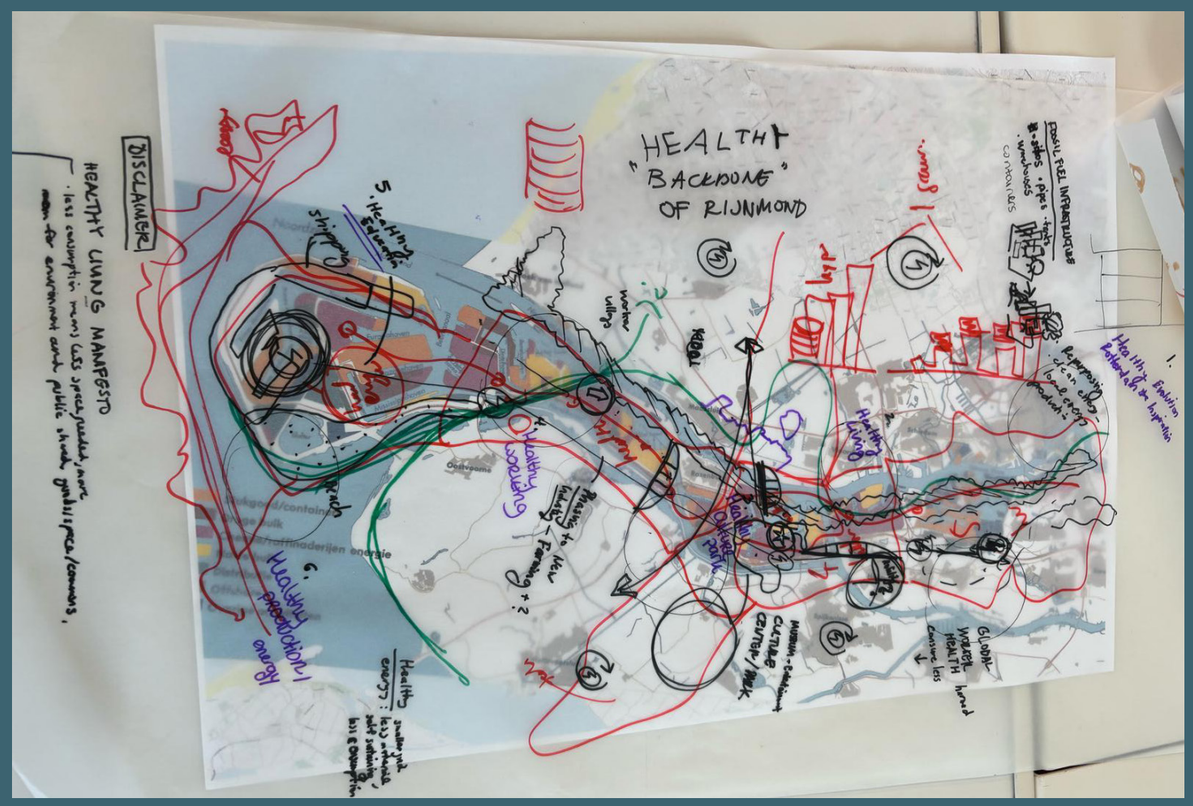
Sketches



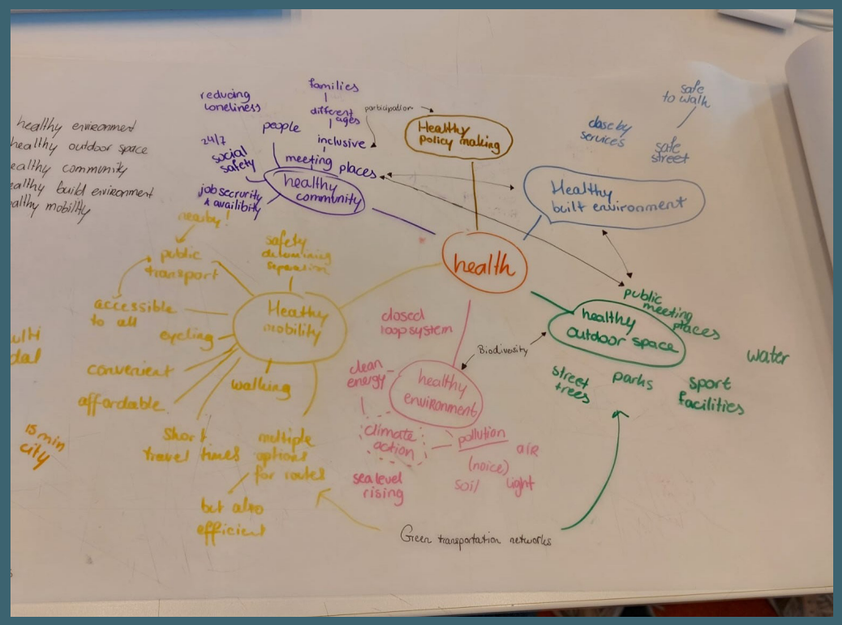
Storyboard for our midterm



Brainstorming session



Sketching of the strategy

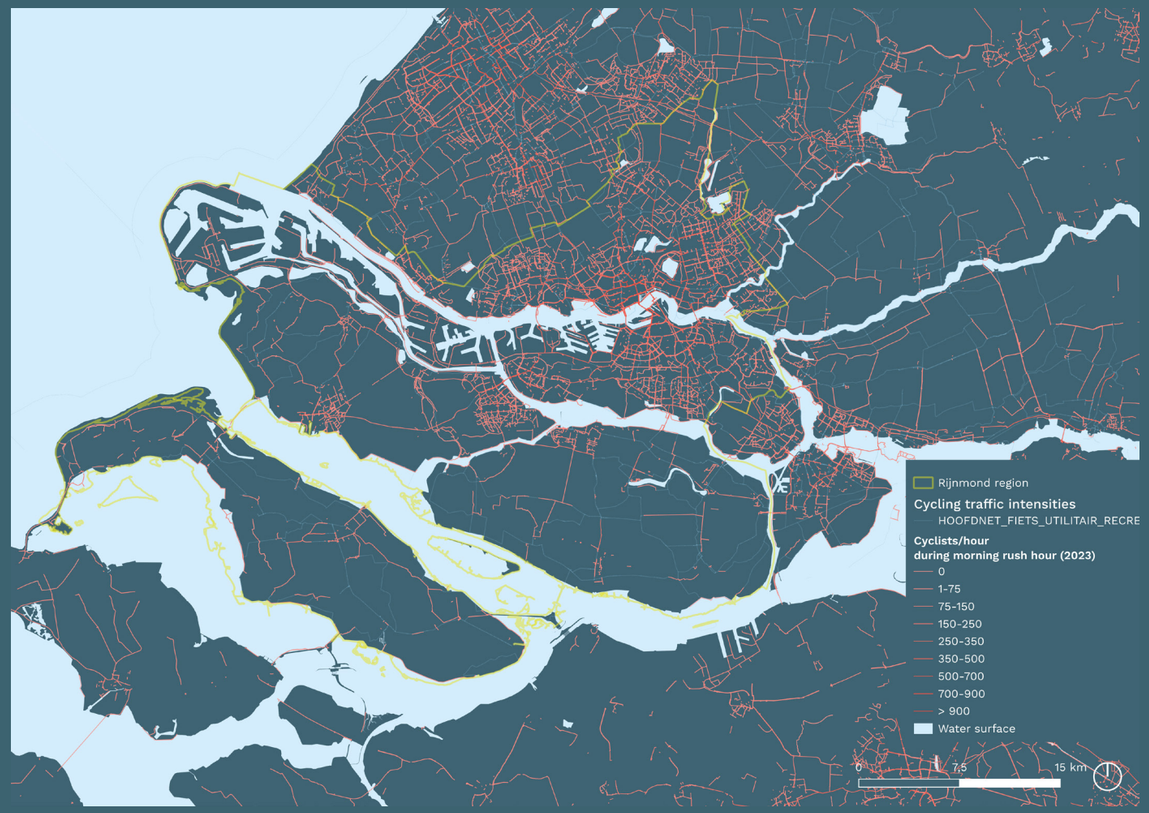


Health in a mindmap

Mobility environment

In the Rijnmond region, mobility is organized in several different ways: public transport, road transport and water-based transport. Being located in The Netherlands, there is also an extensive network of cycling routes available.

Cycling routes



Amount of cyclists during morning rush hour

Regional mobility

The cycling route network (see image) covers large parts of the region. It is however much more prevalent in urban areas, where more people live. Cycling is a well-used mode of transport in the Rijnmond region, despite being less extensive in the more rural areas. Figure X shows the traffic intensities on the cycle paths during morning rush hour. Clearly visible is are the paths in the center of Rotterdam, which are used a lot. Rush hour cyclists in the rural areas also often use the few cycle paths available between towns and villages. Interestingly, the port of Rotterdam is fully covered by the bicycle path network, despite a lower use of these paths. The routes to the port are also used frequently during rush hour, showing that people do cycle to their work in the port.

AI senarios

Who will take over when we do nothing?

Art

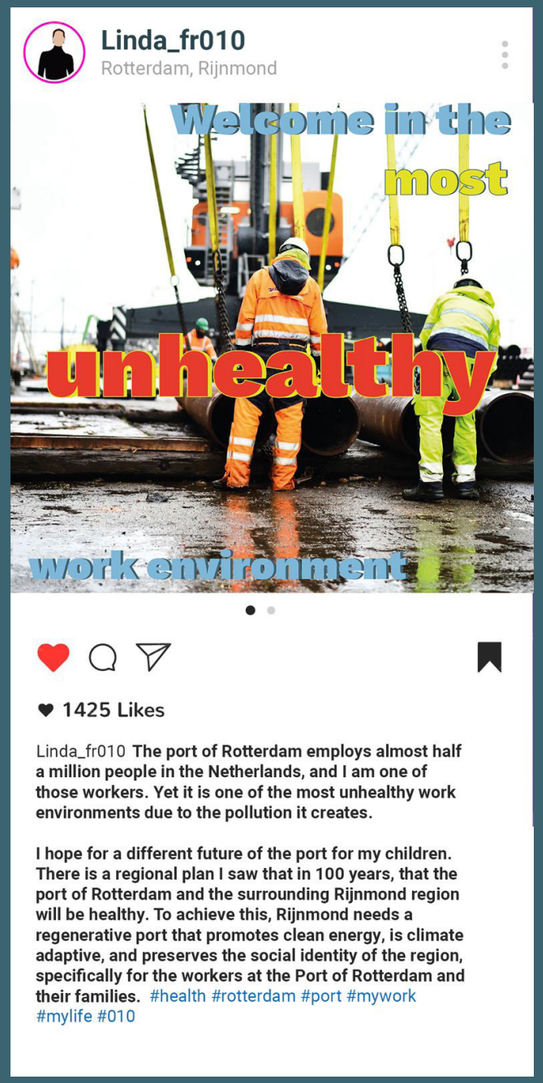
Nature

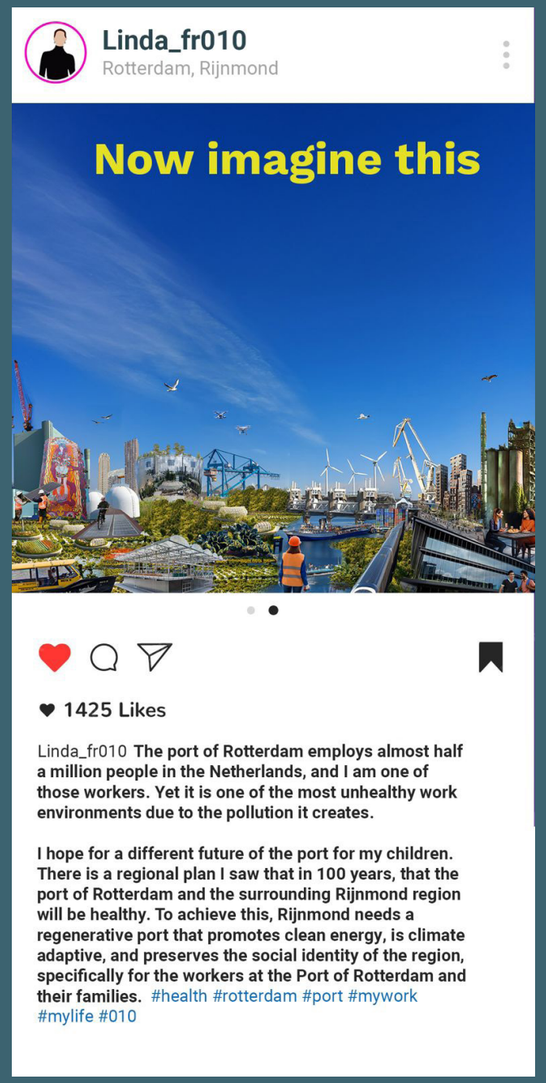
Industry

Defence

City

Instagrampost

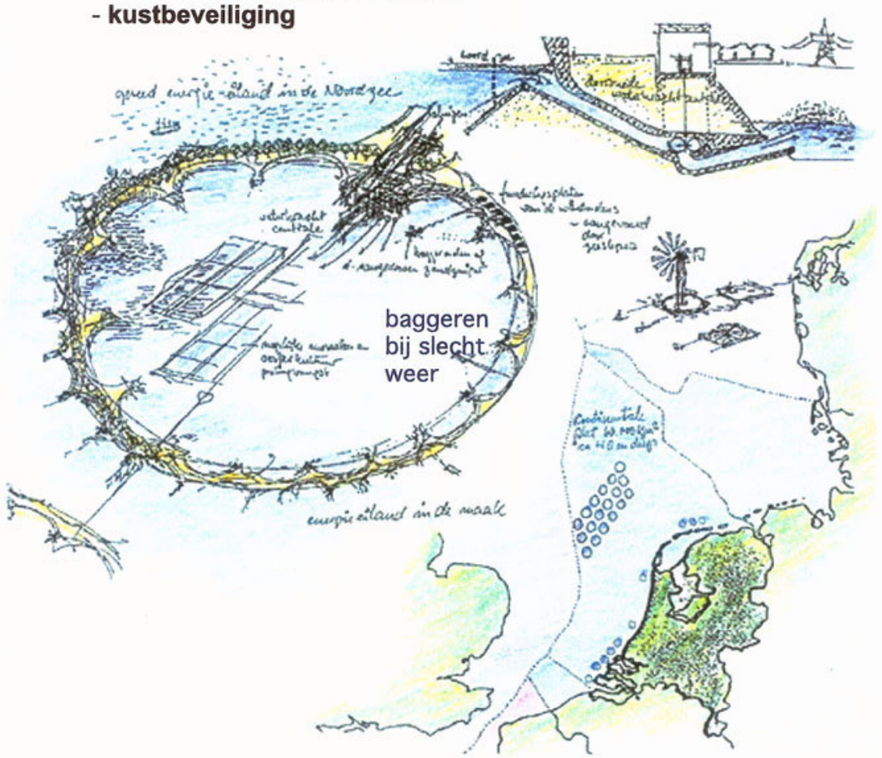




Inspiration for energy Island

ATOLLEN in de NOORDZEE

- **energie-eiland** met grote capaciteit poldermolens
- kinetische energieopslag door leegbemalen atollen
- piekuren elektriciteit opgewekt door waterturbines
- zand- en grindwinning onbeperkt - meer wateropvang
- vuile baggerspecie uit de grote rivieren moet ergens opgeslagen worden
- viskwekerijen - groene algen zijn geschikt als visvoer
- werkeiland nauwelijks bemand
- **kustbeveiliging**



waterkracht centrale

windmolens aangesleept

hoogteverschil Noordzee atolbodem 50 a 100 m diameter 5 tot 15 km

poldermolen die bij storm uit de wind draait

kerstbezinning 1980
prof. ir. jon kristinsson

architecten- en ingenieursbureau kristinsson, noordenbergsingel 10, 7411se deventer nl, tel. 0570-615035

History collage