Logbook

Project: Campus Greensteel

Graduation Studio 2021-2022
Master in Architecture

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Year: 4th master
Date: 19-06-2022

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Project Specifications

Design for a sustainable nature inclusive (Tata)Steel industrial area that improves the health, ecological- and economical status of its polluted environment.

Introduction

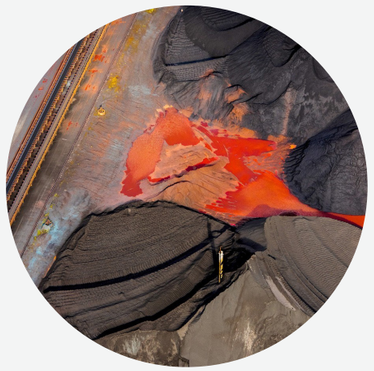
What caught my attention over the last years was the strongly upcoming debate on pollution in the Netherlands. Especially the pollution of nitrogen and carbon dioxide in the industrial sector. The debate surrounding the stricter regulations for farmers was in the news, but the air pollution of one steel producing factory in particular also received a lot of publicity.

Tata steel Ijmuiden is the largest industrial CO2 and lead emitter in the Netherlands. The companies heavy nitrogen emissions have major consequences for the biodiversity in the adjacent dune area. Because of the impact on the environment, dust & odour nuisance and the lack of clarity about the health consequences of that nuisance, Tata Steel has become one of the most controversial companies in the Netherlands. The ‘clean or stop’ ruling of the Dutch House of Representatives from last September is a reality check for Tata Steel. The company only has a future in the Netherlands if action is taken now to stop the pollution.

My intervention as an architect will make Tata Steel’s industrial site a campus and nature reserve. The whole site will become a universe where the visitor can learn new things about the green future of steel manufacturing and its positive impact in the environment. The visitor can experience the heat of steel producing in isolation, see the resulting pollution and be present at the cleaning process. The new transparent design of the factory does not pollute anymore, but strengthens its environment by turning waste products into firtilier or nature beneficial substances for rare flora to grow on. It shows the social aspects of modern factory design with an educational component that creates tourism and generates spin-off facilities for the locals. The whole area will be transformed and extended by the use of 1.4 million m3 excess sand that is dredged yearly from the excavating of the IJgeul and the IJmuiden sea lock (biggest sluice in the world). The sand will create dunes that connect and overgrow the factories. Walking paths will be created in(-between), over and trough the new factories and eco ducts connect dunes and wildlife from different sides of the campus with each other. Tata Steel’s pollution will be compensated by new nature reserves build on/ from the excess sand in the form of Island off the coast in the North Sea with breeding grounds for endangered animal species. A tour through the new factories and nature reserve will start from a new touristic harbour at the end of a pier that connect the Islands with each other, inviting tourists from England. The contrast between nature and heavy industry will be celebrated in this project.

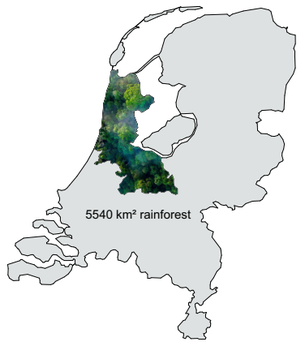
Climate change, Louis Prado, Noun Project

Tata Steel Ijmuiden, D.J.Prins, Ijmondig

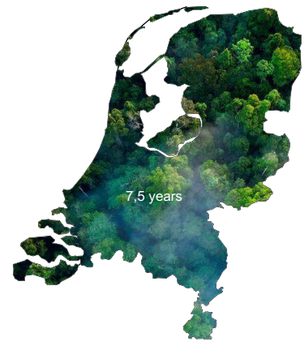


Aerial view of Tata Steel. John Gundlach , de Beeldunie

The CO2 emissions of the Netherlands is 166 megaton/ year



You need to plant a rainforest the size of the provinces Utrecht and Noord Holland to capture this much CO2 every year



If we try to compensate the CO2 pollution of the Netherlands at the current pollution rate, the whole of the Netherlands will be a rainforest in 7,5 years.

Largest Dutch CO2 emitter

7% of total emissions

Biggest Lead polluter in NL

22 % more chance on lung cancer

1,7 million kg NO

Endangered flora & fauna

Tata Steel’s Dutch production facilities produce 12 million tons of CO2 per year, and are therefore responsible for approximately 7 percent of the total CO2 emissions in the Netherlands. (RTL news, 2016) 1,7 million kilo’s of nitrogen emissions also make them one of the biggest polluters in that field. (Bokkum, 2021) .

Tata Steel is the largest lead polluter in the Netherlands. The factory emits more lead into the air than all Dutch traffic combined, and was responsible for more than half of the total lead pollution of the entire country in 2016. This was mainly due to the graphite rains that descended on the surroundings at that time. (Noordhollands dagblad, 2019)

In 2020, unrest broke out after the GGD concluded that 22% more lung cancer occurs in the IJmond than elsewhere in the country. (Havermans, 2021) Environmental institute RIVM concluded in April 2021 that there is more particulate matter in the air in the Tata steel area and that there are more health complaints.

Thesis, analysis & motivation

The Royal blast furnaces were established in the interwar period as a steel producing company. Today it is part of Tata Steel Europe under the name Tata Steel IJmuiden. For its location, preference was given to IJmuiden because of its good supply and discharge options via the North Sea Canal (fig. 1). More than ninety chimneys protrude from the site. According to the environmental permit, all air pollution comes from eight installations: two blast furnaces, a coke plant, an oxygen steel plant, a sinter plant, a pellet plant and two natural gas stations. (Sengers & Evert, 2019b)

The Netherlands has set clear climate targets, in line with the signing of the Paris Accord, aiming to reduce CO2 emissions by 49% (compared to 1990) by 2030.Tata Steel has come up with a development plan that consists out of 2 routes to achieve the climate targets for 2030 & 2050 (see fig. 2).

Tata Steel invests heavily in research of CO2 neutral steel production trough green hydrogen usage called DRI (Direct Reduced Iron). They are talking about building a hydrogen factory and a factory that converts Tata's flue gas into plastics together with Nouryon and DOW (chemical companies). (Bokkum, 2021) These investments together with the future clean successor to the blast furnaces (HIsarna) would make Tata Steel largely sustainable. (Sengers & Evert, 2019a)

The total costs are estimated at 600 million Euros of which 300 million are at the ready, according to Tata Steel. This money will be used to build new factories that make CO2 neutral steel producing possible. **By surfing on this transformational wave of the area I want to make sure that not only the company benefits from these developments, but also its polluted environment. I'm going to use Tata Steel's own development plan as a template to redesign the whole Tata Steel industrial site into a campus and nature reserve.** The whole site will become a universe where the visitor can learn new things about the green future of steel manufacturing and the positive impact the redesigned site has on the environment. This touristic impulse will generate spin-off facilities for the local people and nature. On the following pages I will talk about where I see possibilities to plug in as a designer according to external developments and the 600 million Euro investment plan.

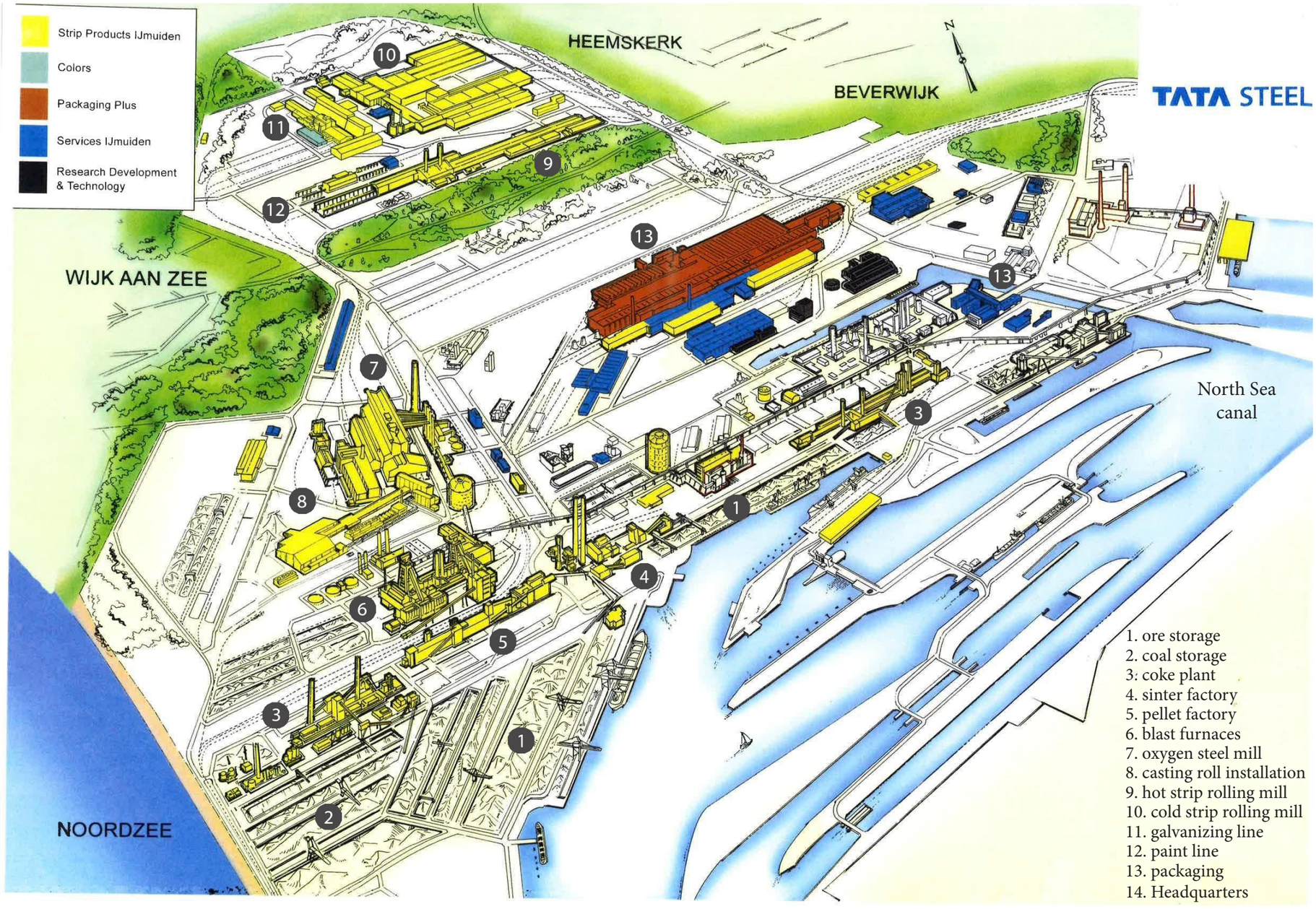


Fig. 1 Overview Roadmap 2030. Source: Tata Steel (reworked)

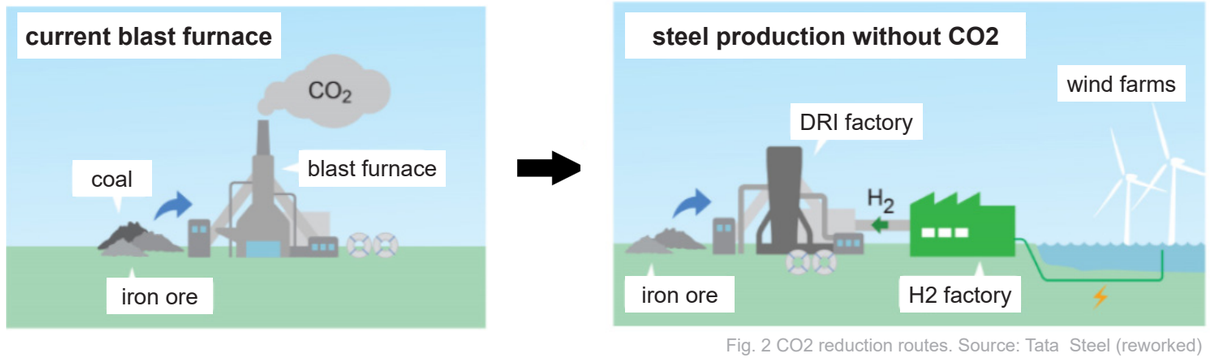


Fig. 2 CO2 reduction routes. Source: Tata Steel (reworked)

No CO2 emissions (goals for 2050)

The longer-term vision for 2050 is being realized by building large wind farms in the North Sea off the coast of IJmuiden. Wind energy will enable the production of green hydrogen. Carbon reuse will start at the new factory for CO2 capture and storage (Everest). At the same time, hydrogen production will start through a new factory (H2ermes). The green hydrogen will be used for CO2 neutral iron production on hydrogen, called DRI (Direct Reduced Iron).

Fig. 3 Current sitionion on Tata Steel site. Source: Tata Steel (reworked)

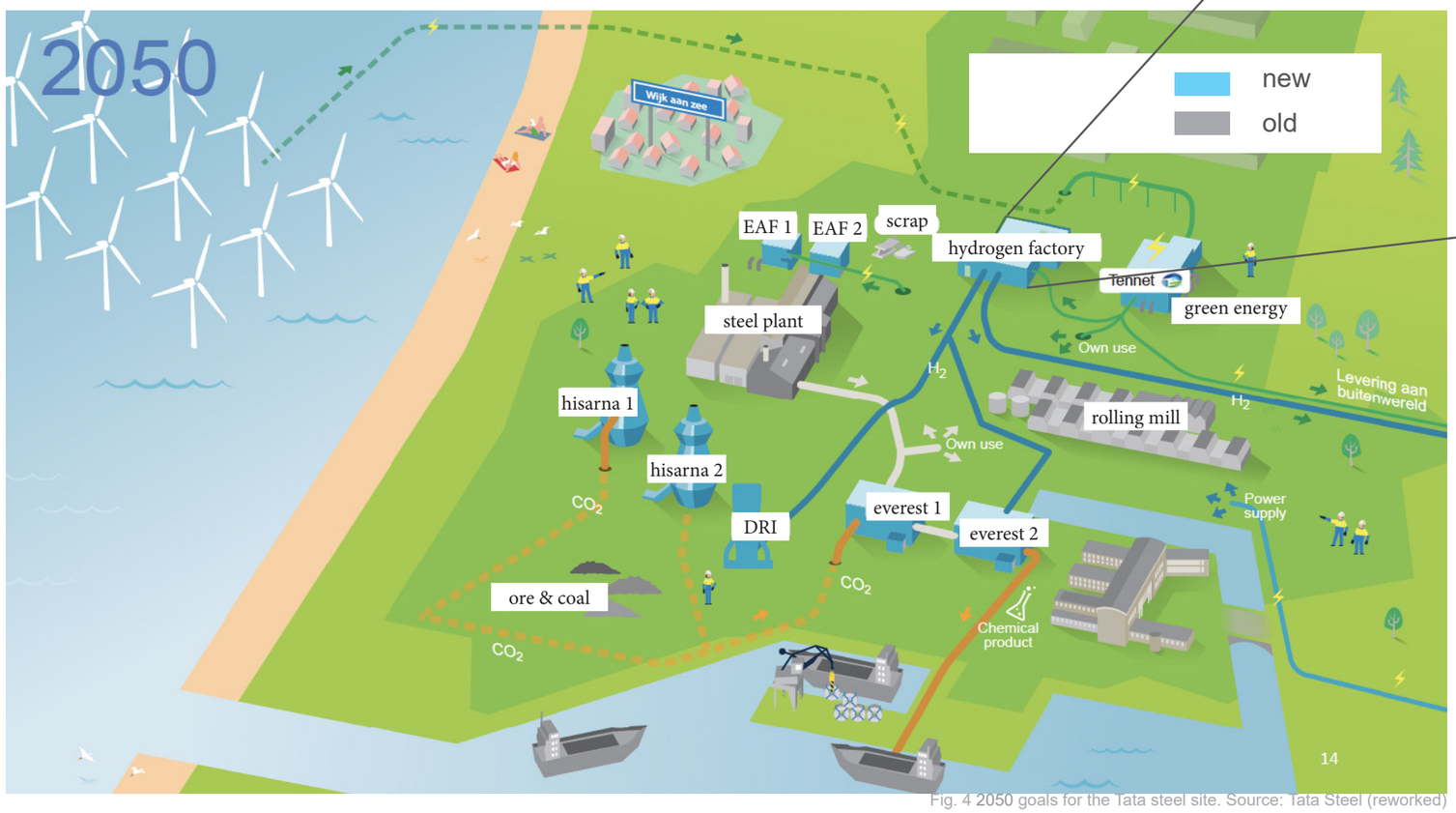
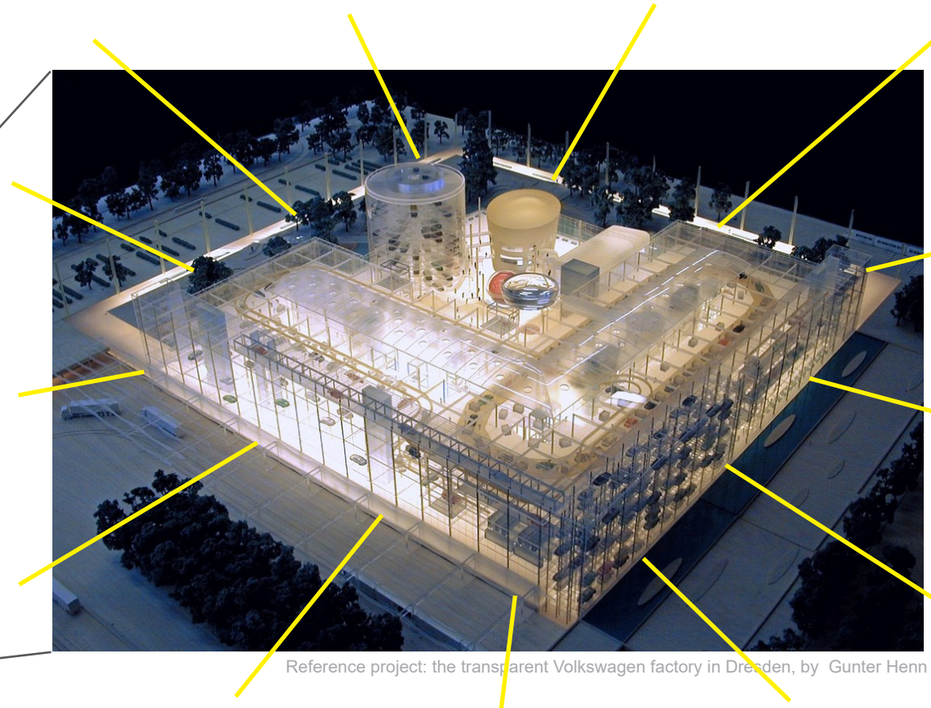


Fig. 4 2050 goals for the Tata steel site. Source: Tata Steel (reworked)

Figure 3 shows an artistic interpretation of the current industrial situation on the Tata Steel site with its coal burning blast furnaces, coke, sinter and pellet plants.

Figure 4 shows how the long term vision will be realized by building a green hydrogen factory, powered by large off coast wind farms, that enable CO2 neutral steel production.

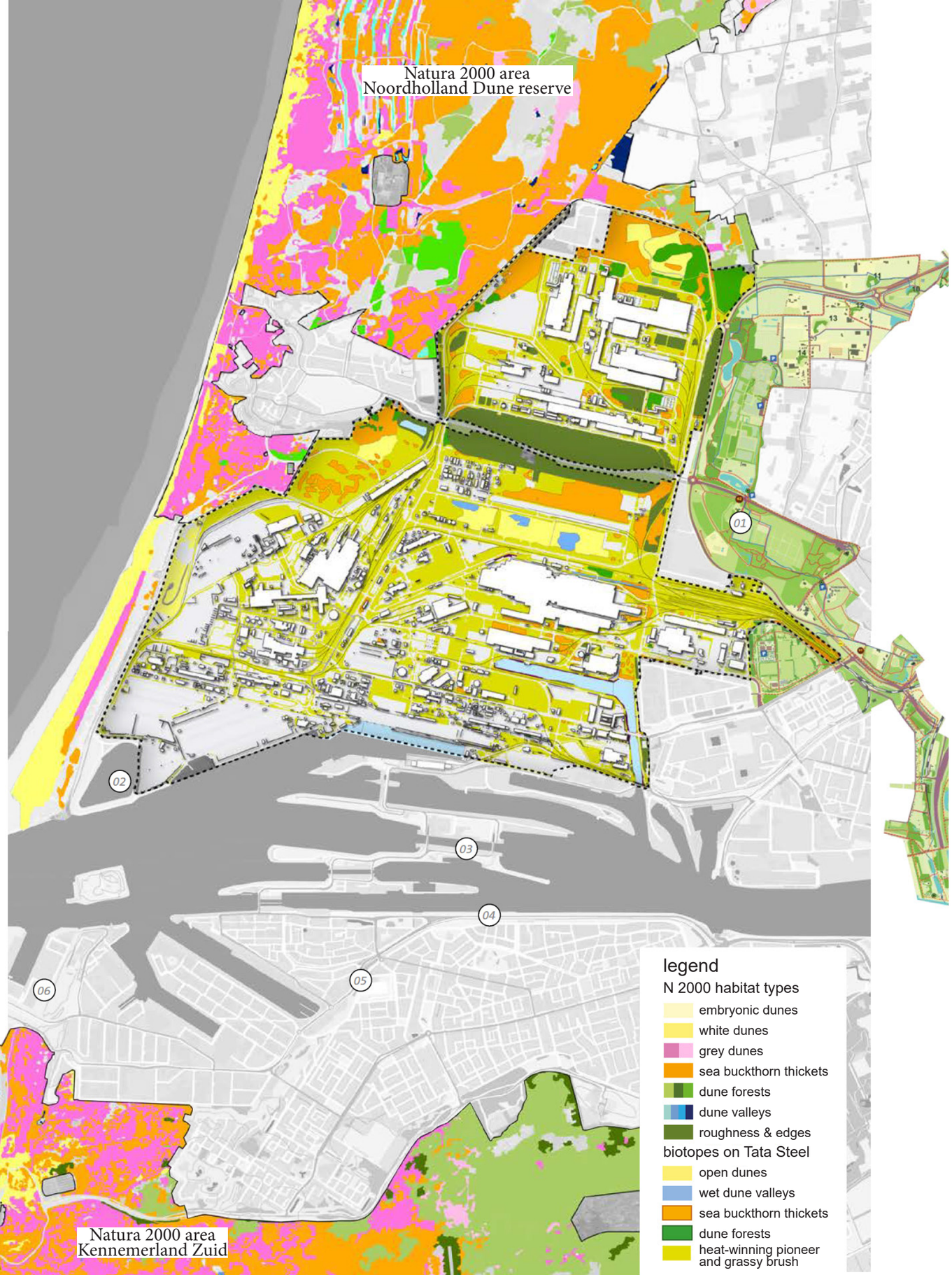
As a designer I can plug in on the designing of all the blue factories. For instance; the two new Everest factories for carbon capturing and reuse or the Hisarna Installation (clean successor of the blast furnaces).
I will design a plan that transforms the old polluting industry to a modern version which is transparent, open to the public and gives space to nature.
Then I will zoom in on the design of the new green Hydrogen factory (H2ermes).



Reference project: the transparent Volkswagen factory in Dresden, by Gunter Henn

The new hydrogen factory will become the throbbing heart of the new site. The old industry will be turned around completely to the opposite from what it is now.
The new design of the factory will be transparent and opened up to the public. The hidden universe of the factory will be opened up without disturbing its fabrication processes. It will invite the visitor with open arms to show a new way of industry. A non-polluting sustainable industry that fundamentally contributes to its surrounding ecosystems by integrating space for flora and fauna in its design and reworking its waste products into beneficial substances for rare flora to grow on while remaining fully operational. I believe this is the future of modern industry.

The visible machinery and exposed processes will be touristic attraction points by themselves. They even can be events. For instance; the visitor can experience the heat of melting metal in the new clean blast furnaces, see the resulting pollution and be present at the cleaning process that turns it into reusable material.



different types of green on the Tata Steel terrain

The Tata Steel site now consists of biotopes that are uncommonly monotonous, disproportioned and distributed in comparison to the natura 2000 nature reserves surrounding it. Some are even uncharacteristic to dune landscapes. My new design will bring the natural balance back on the site which is so characteristic of dune nature reserves to restore the threatened flora and fauna.

The North Sea canal & largest sea lock in the world

Since the 17th century, plans were made to improve the waterways that connect Amsterdam to the North Sea (fig. 8). This precise strategic intervention triggered an enormous chain of consequences for the whole of the Netherlands: the claiming of thousands of hectares of polder land, the expansion of Amsterdam harbour and the eventual closing of the IJsselmeer.

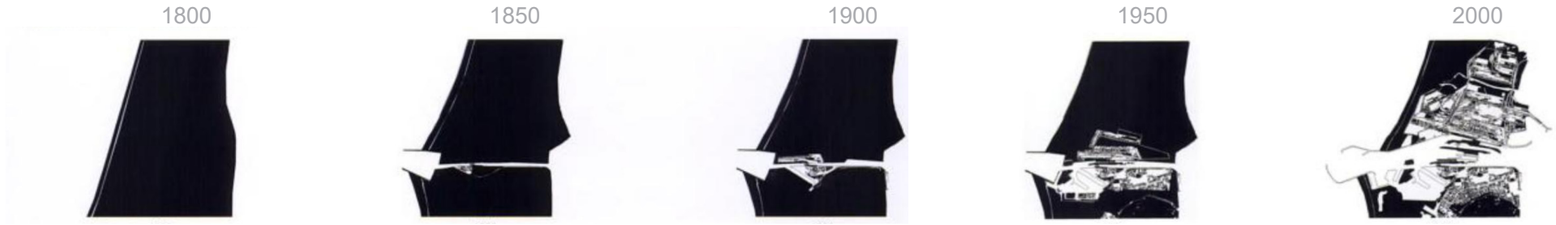


Fig . 8 Colonization of the Kennemerduinen. Ronald Rietveld.

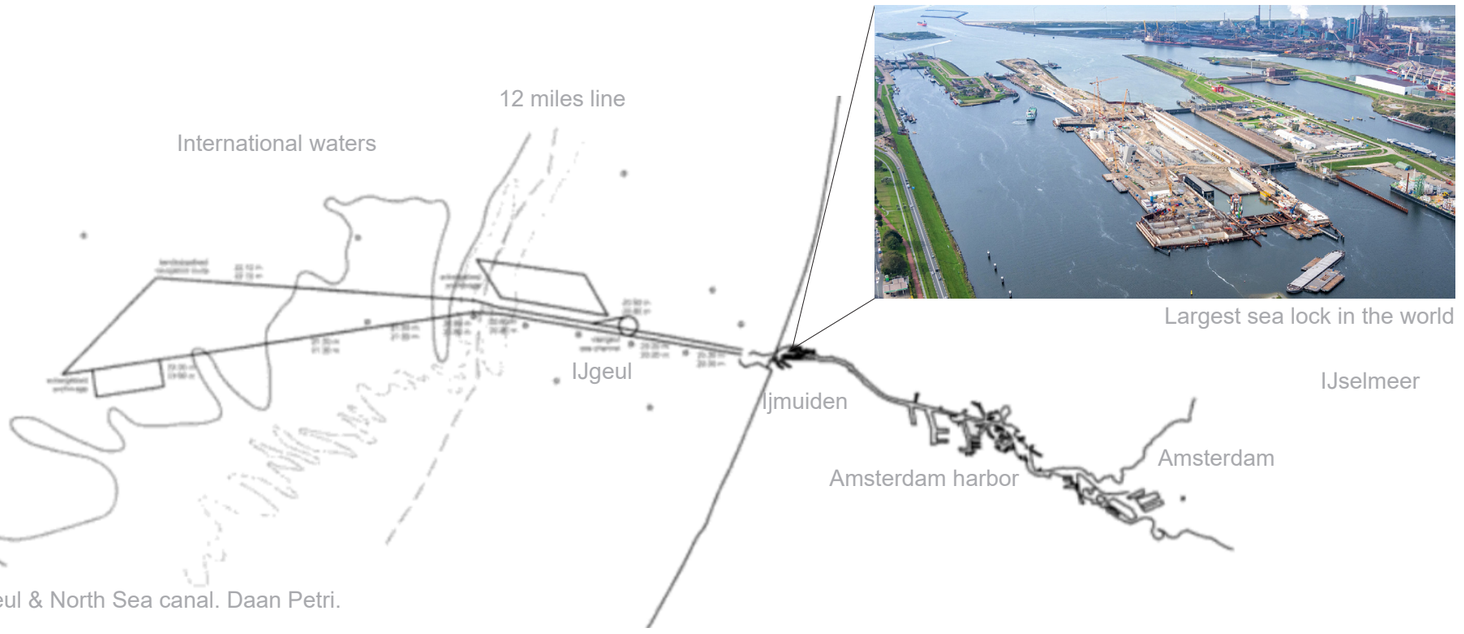


Fig . 9 IJgeul & North Sea canal. Daan Petri.

Largest sea lock in the world

Where the digging of the North Sea Canal cuts through the landscape above sea level, the IJgeul cuts through it below sea level (fig 9). This fairway turns out to be just as long as the distance between Amsterdam and IJmuiden. This means that the North Sea Canal is actually twice as long. This channel is continuously dredged to prevent silting. Currently, the depth of this channel is kept at 20m so that container ships with a draft of 17.8m can reach Amsterdam. (Petri, 2006)
Also the largest sea lock in the world is being build in the North sea canal at this moment. **Dredging of this lock complex and the IJgeul produces 1.4 million m3 of excess dredge sand per year that could be used in my design plans.**

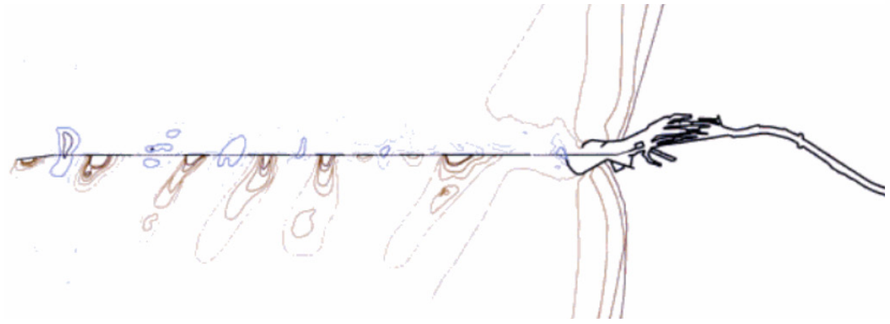


Fig . 10 Island with extended nature reserves off the coast in the North Sea

Islands with nature reserves can be created from the excess dredge sand off the coast of Ijmuiden as compensation for the former pollution. A pier connects these islands and leads the visitor on a tour to experience all the steps in the new transparent fabrication process, starting from a touristic harbour at the end of the pier. This harbour invites tourists from England.

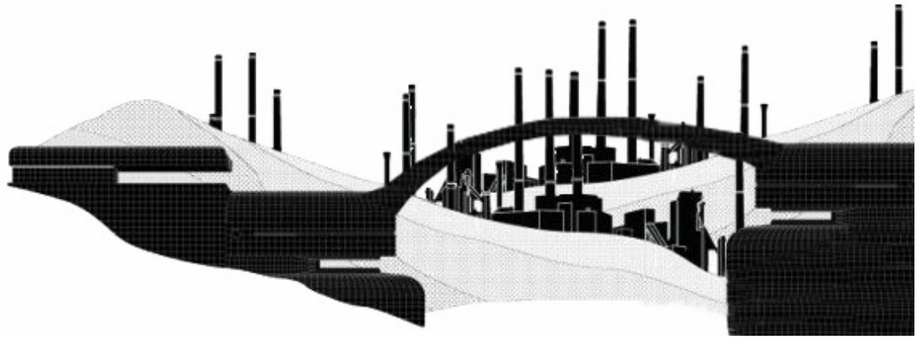


Fig . 11 Artistic interpretation of the interweavement of nature and industry

The whole industrial area will be transformed and extended by the use of 1.4 million m3 excess dredge sand. The sand will create different dune types that connect or grow over the factories. Walking paths and green corridors will be created in(between), over and trough the new factories and eco ducts connect dunes and wildlife from different sides of the campus with each other.

Fig . 12 Colonization of the Kennemerduinen. Ronald Rietveld.

By turning the whole industrial site into a touristic hotspot spin-off facilities will arise that improve the economic status of the locals.

Conclusion

Two things will happen. Firstly; the old factories will be demolished, creating vacant spaces. Secondly; factories will be built to produce CO2 neutral steel. By working with these developments and the 1,4 million tons of excess dredge sand from the dredging of the Ijgeul and the lock of Ijmuiden I will turn the whole Tata Steel site into a nature reserve and campus for the public to experience the future of green steel producing. The dredging sand will create different types of traditionally occurring dunes in the vacant spaces in(between) and on the new buildings that reconnect the polluted nature reserves surrounding it. As compensation for the pollution the site will be extended by new nature reserves in the form of island created from the excess dredge sand. A touristic tour will lead the visitor from a new touristic harbour through the nature reserves to the newly designed transparent factories. This will turn the old polluting factory site into a touristic hotspot with the new transparent hydrogen factory as its throbbing heart. The hidden universe of the factory will be opened up to the public without disturbing its fabrication processes while remaining fully operational. It will invite the visitor with open arms to show a new way of industry that fundamentally contributes to its surrounding ecosystems by turning waste products into firtilizer or nature beneficial substances for rare flora to grow on. This touristic impulse improves the economic status of the surroundings in the form of spin-off activities. I will make a plan for the whole site and then zoom in on the design of the new hydrogen factory. Special attention will be paid to its transparency towards the public, moderns social aspects of factory designing, its futuristic green approach towards steel producing, its nature inclusive design and ecosystem improving by-products.

(local) Stakeholders

IJmondig

This foundation aims to protect nature and environmental health interests in the IJmond/ North Holland region, by focusing on reducing air soil and water pollution, such as excessive CO2 and nitrogen emissions, graphite rain and other environmental contaminants.

Frissewind

Foundation that contributes through crowdfunding to financing and conducting meetings, events, technical research and other such activities necessary to protect nature, the environment and human health in the Ijmond.

Stichting Duinbehoud

Stichting Duinbehoud is an independent national organization for the protection of the dunes. By providing information, conducting campaigns, consultation and legal proceedings, Duinbehoud tries to strengthen nature along the coast.

Consultants

Tata Steel

I will interview Tata Steel on future developments.

Urgenda

Urgenda is the organization for innovation and sustainability that aims to make the Netherlands more sustainable faster, together with companies, governments, social organizations and private individuals on the basis of a 2030 vision with a concrete action plan and projects. Urgenda sued the Dutch government for CO2 pollution.

Frantzen et al

Architectural firm specialised in making large structures with wood. For instance; Patch 22, which is the largest wooden building in the Netherlands, located in an Amsterdam industrial area. I want to interview them to talk about the possibilities of designing the whole factory out of wood and other bio based materials.

Studio Roosegaarde

Studio Roosegaarde is on a mission for clean air throught the SMOG FREE PROJECT. This is a campaign to reduce air pollution and provide an inspirational experience of a clean future. It includes a series of urban innovations such as the SMOG FREE TOWER which provide a local solution of clean air in public spaces.

Planning

RESEARCH PHASE

Presentation 1: PROJECT SPECS_03-09-2021
Presentation 2: RESEARCH_15-10-2021

CONCEPT PHASE
(Start 22-10-2021)

Presentation 3: CONCEPTS_03-11-2021

PRELIMINARY DESIGN
(start 10-12-2021)

Presentation 4: PRE DESIGN_11-02-2022

DEFINITIVE DESIGN
(start 18-02-2022)

Presentation 5: DEF DESIGN_21&22-04-2022

EXAM

Presentation 6: EXAM_29-06-2022

Motivation for the proposed tutor

Ro Koster & Ad Kil

RO&AD Architecten

Architectural firm that designs both at building level and at system level. The design is connected to the system with as many tentacles as possible. This can be a social, economic, cultural or ecological ecosystem. Obviously my design will also aim to do this to.

Sidney van Well & Niek van de Calseijde

Foreshore Architecten

Nature-inclusive architecture and planning.
Objective: add value to the human living environment and interweave this with existing or new ecosystems.
Why Foreshore: In their projects they already work with the development urge on the coast, industrial sites and touristic developments in a fragile nature reserves, which is exactly what I'll be working with.

Daan Bruggink

ORGA Architecten

ORGA is looking for as much synergy as possible between architecture, people and nature. They work mainly with bio based architecture. Why Orga: I think it would be very interesting to design a factory with bio based materials in an ecologically responsible manner.

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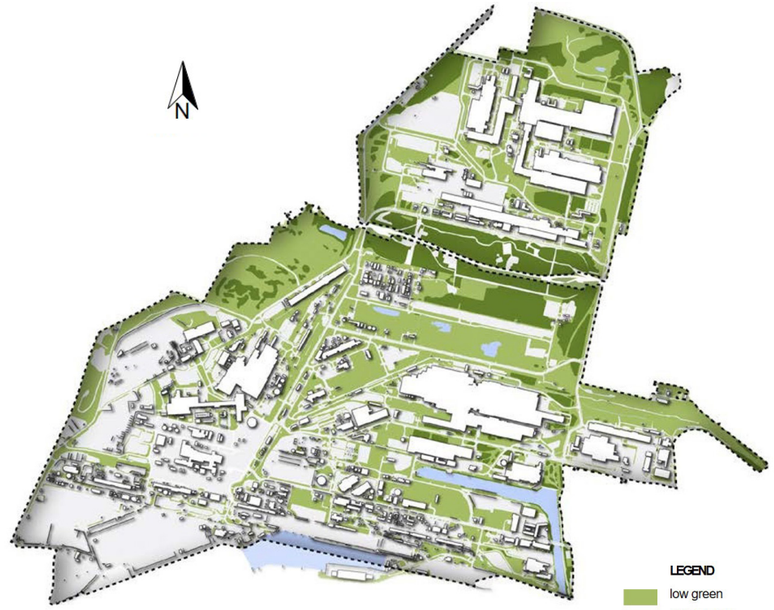
Location of the Tata Steel company in its immediate surroundings

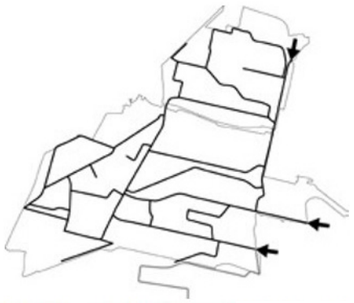
Property boundary of Tata Steel

Fencing along the Tata Steel site

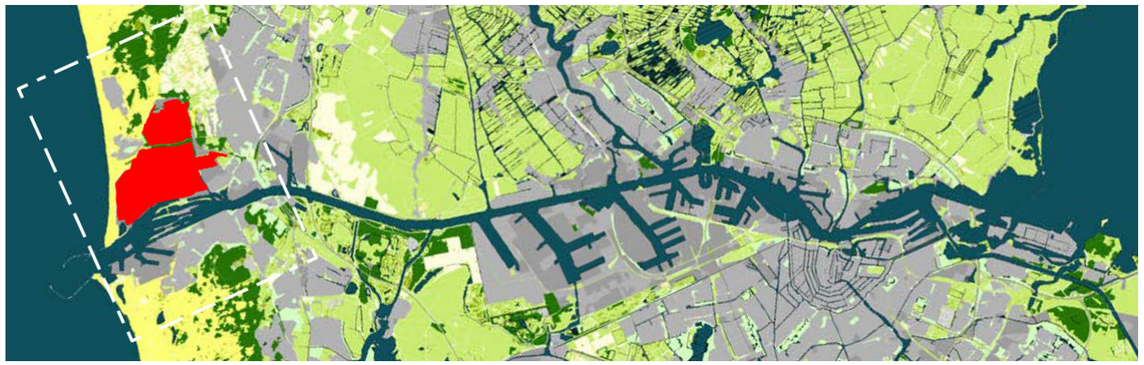


layout plan project area

Municipality boundaries



Entrances and main roads



The Tata Steel site as part of the industrial enclaves along the North Sea Canal

Historical context

The construction of a blast furnace company in the dune landscap, was made possible by the construction of the North Sea Canal (1865-1876) in 1920. The first phase consisted of two blast furnaces, a coke battery and the necessary infrastructural facilities such as an outer and inner harbour, railway yard, power station and a coke oven.The first blast furnace started in 1924 with the production of iron and in the mid-thirties ‘De Koninklijke Hoogovens’ was already the largest exporter of iron in the world. The company continued to grow and in the sixties it crossed the Zeestraat to Wijk aan Zee. Hereby a part of the dune area behind it has been lost. The cores of IJmuiden and Beverwijk extended hugely in addition to the industrial expansion in the area. From the high places in the dune landscape to the open polders in the area, the industrial complex is a landmark with its tall buildings and chimneys. Its site is part of the industrial enclaves along the North Sea Canal.

Page conclusion

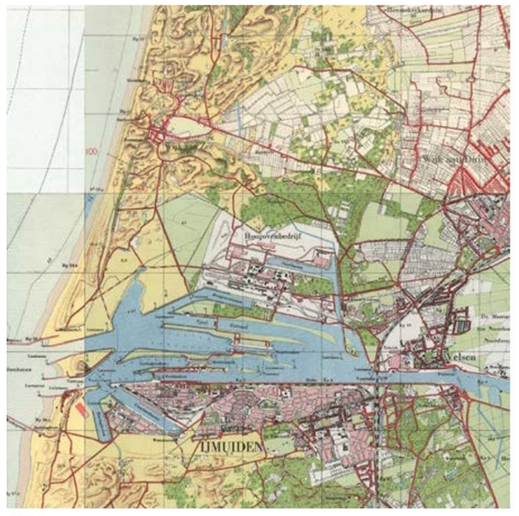
Vast area’s of dune landscape have been lost by the creation and development of the factory terrain.

1850

1890

1909

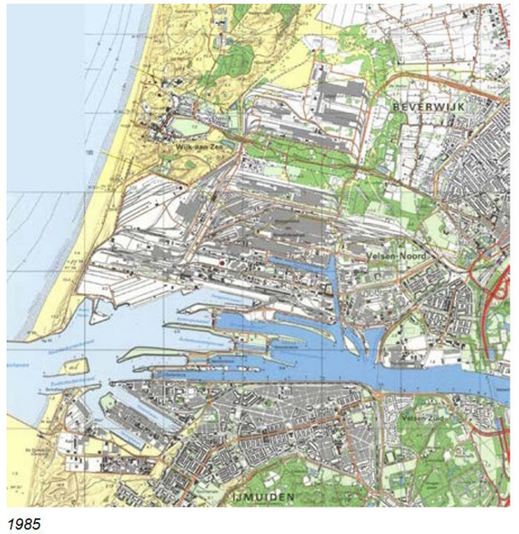
1930



1955

1965

1975



1985

2000

Visual characteristics of the dune landscape with the Tata Steel terrain

Page conclusion

The edges of the terrain border on natural areas with hints to the dune landscape, but many non dune specific species have taken over.

01 -Waterweg

02 - Zeestraat

03 - Creutzberglaan

04 - Reyndersweg

05 - Kanaaldijk

Terrain height

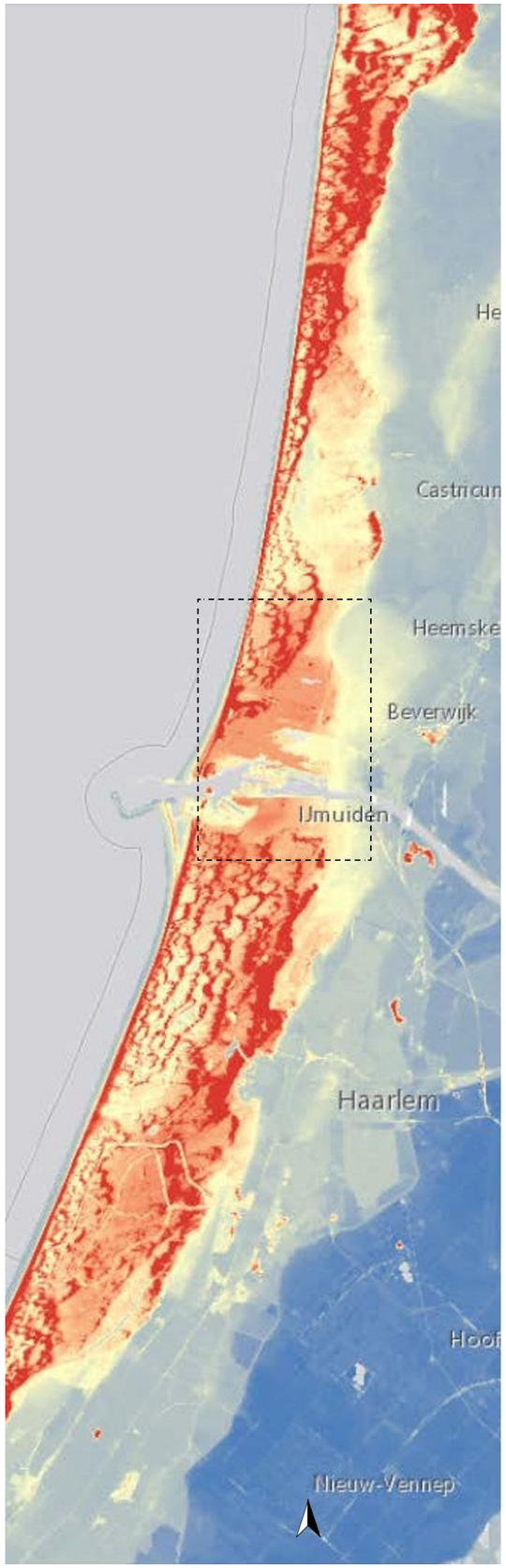
The dune landscape in the coastal strip has a clear pattern on the elevation map. The Tata Steel site has leveled out over time to a height of +8m NAP. Only the area around the steel harbour and Tata Steel Packing Plus has a ground level of +4m NAP. The dune landscape characteristic height differences on the grounds have virtually disappeared with the levelling of the Tata Steel terrain.

Present height differences on the Tata Steel site are the earth walls along a number of roads constructed with the aim of preventing trucks from parking along the roadside. Also the offset of the terrain with a height of +8m NAP to +4m NAP is clearly visible as steep edges.

A dune is constructed on the border with Wijk aan Zee as a buffer between the residential area and the Tata Steel site. Also a rampart has been constructed as separation between the sports fields and the industrial area on the western border north of the Zeestraat.

Page conclusion

The Tata Steel site has leveled out over time to a height of +8m NAP. Only the area around the steel harbour and Tata Steel Packing Plus has a ground level of +4m NAP.



Terrain hight dune area

Terrain hight dune area

Dynamics above and below ground level

The terrain of Tata Steel is constantly changing. The site is constantly undergoing construction,
demolishion and rebuilding. The image on the right page shows a
picture of the building dynamics of the past fifteen years. Large complexes have been added but also demolished with the continious shift of vacant spaces as a result. These new open space remain free from buildings for a short or longer period of time.
Spontaneous dune vegetation development takes place in these places.

In addition to buildings above ground, there is also a
huge amount of cables and pipes present underground. The ground is continuously subject to change when cables are removed
or new ones are added.

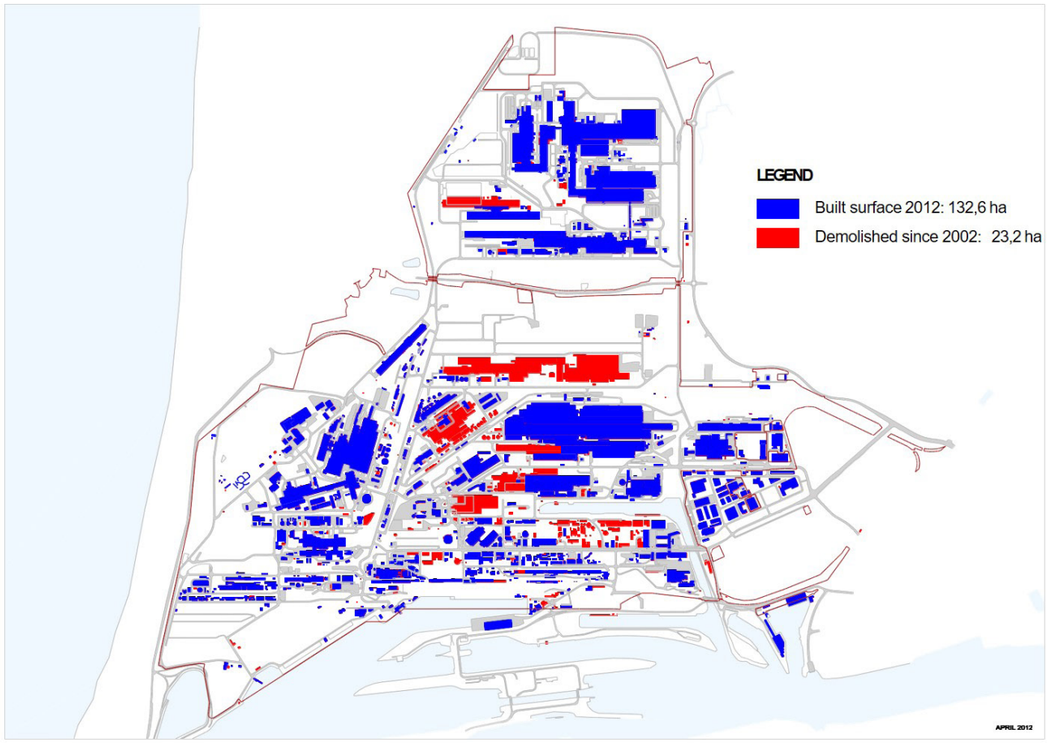
Page conclusion

There is a constant shift of many vacant spaces where dune vegetation develops spontanious after demolishment of old factories.

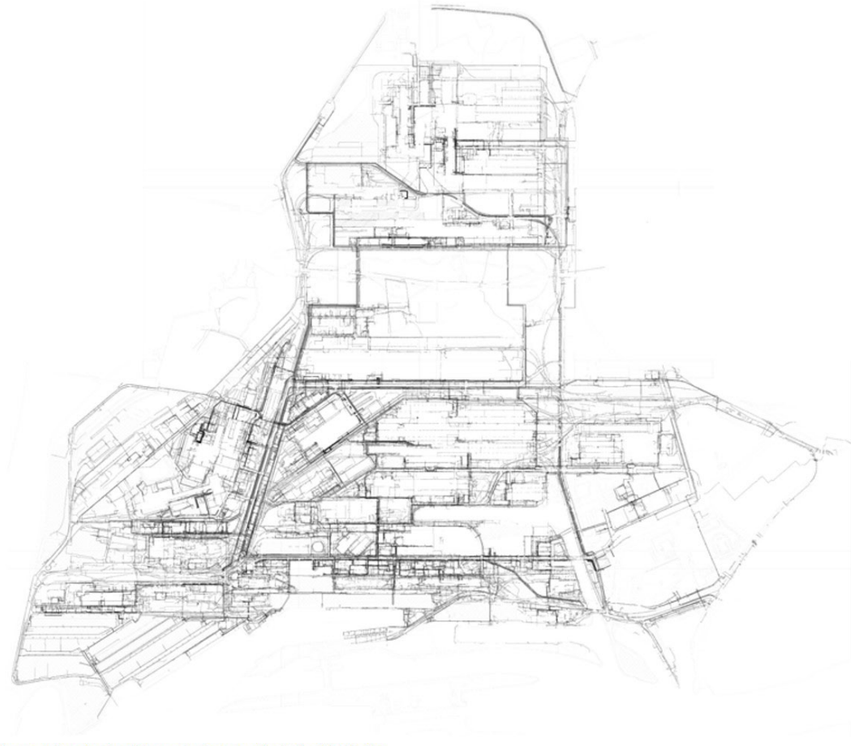
The dune landscape originally has a dynamic character

Vacant spaces with the possibility of redevelopment

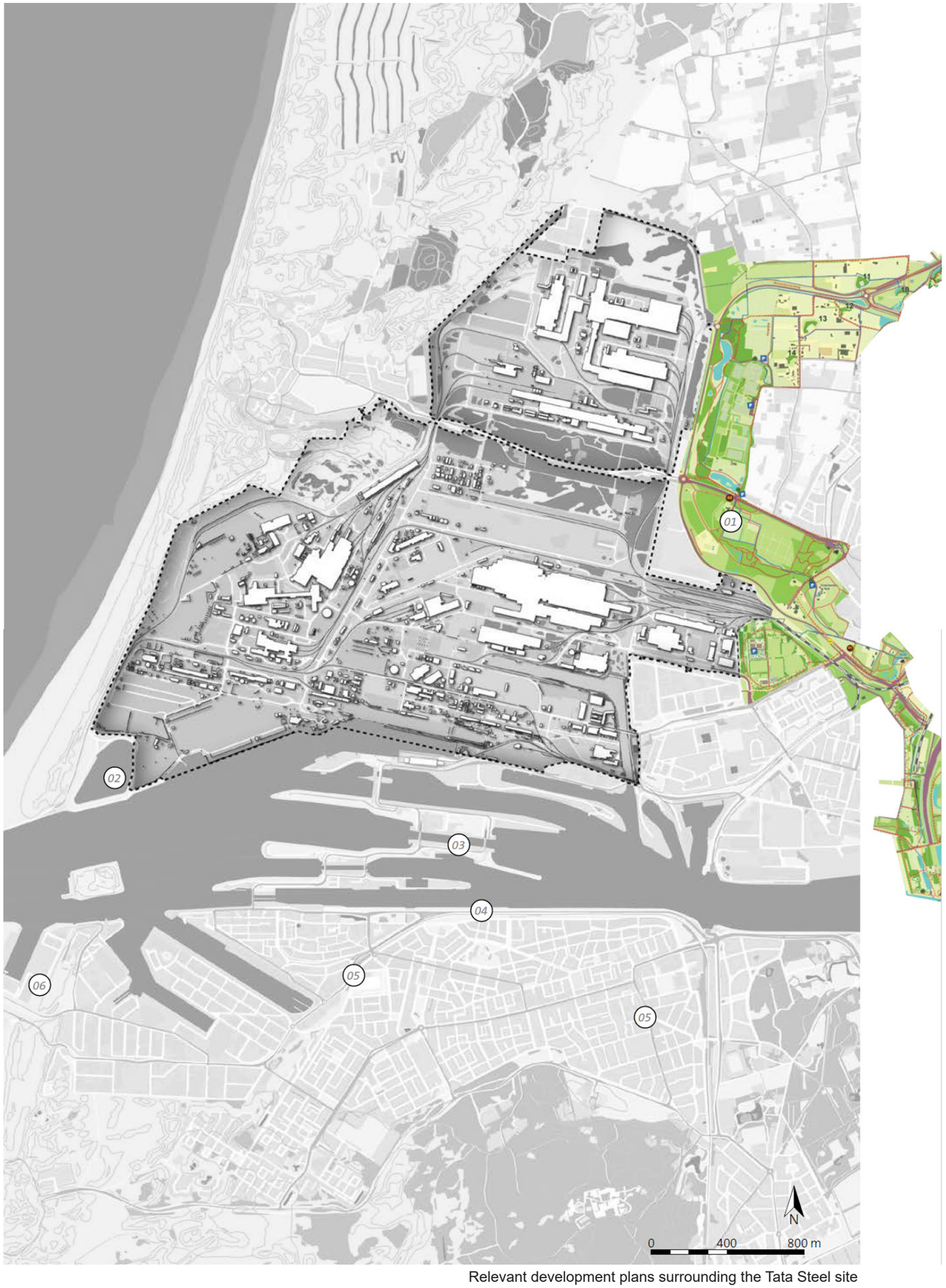
Spontaneous vegetation development of vacant spaces



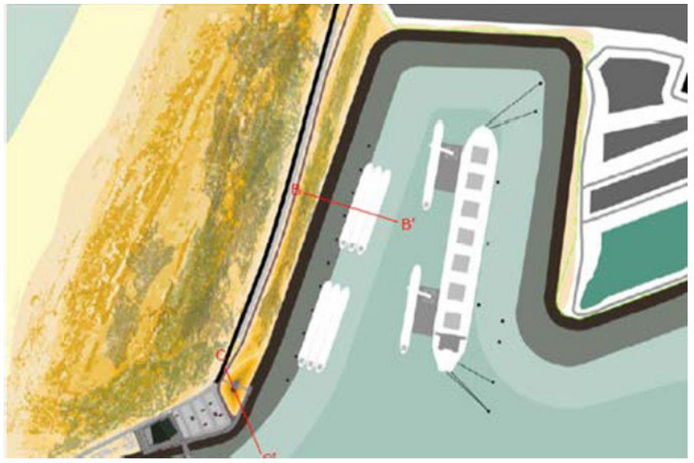
overview of existing buildings and buildings that have been demolished since 2002



Overview of dense network of cables and pipes on the Tata Steel site



Relevant development plans surrounding the Tata Steel site



02. plan of the lighter harbour to be realized at the site of the averijharbour

03. artist impression of the new sea lock. The green areas on the lock islands are to be realized with natural vegetation

04. natural vegetation is present on the roadside between the IJmuiderstraatweg and the Kanaaldijk

Relevant plans in the area

01) The Tata Steel site is adjacent to the area of 'Groen- en waterplan groene IJmond'. The plan has been drawn up as contramal of the urbanization of the region. It runs through the municipality of Heemskerk, Beverwijk and Velsen and has a relationship with the water systems of the northern terrain on the Tata Steel site.

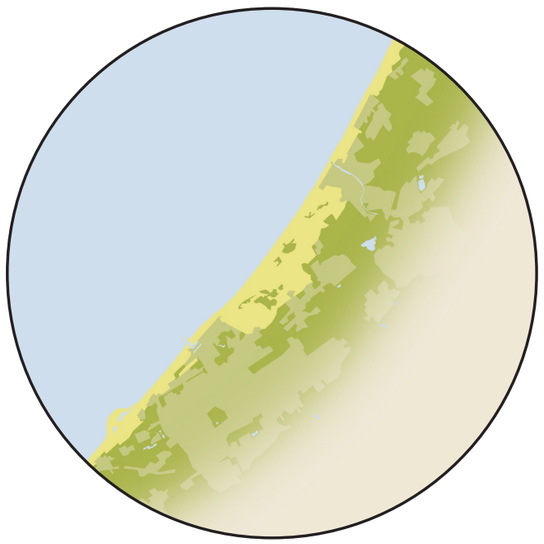
Page conclusion

The biggest plans in the area are the development of the biggest sluice in the world and the dredging of the old averijhaven.

2.2 Analysis current situation

Ecology (importance of the dune landscape)

300 km long dune landscape
40.000 hectares



Patchwork of biotopes

Richest ecological organ in NL

65-75% of all Dutch flora grow here

Original habitat of wild bees

>100 different species

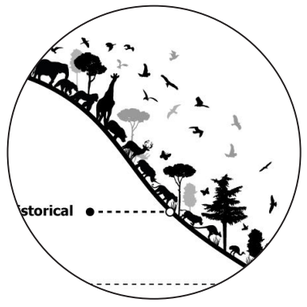
Nitrogen deposition
& accidification

Grass, scrubs, trees and sea buckthorn take over

up to 100 species/ m2

9% is specific to the dune landscape

flowers don’t produce enough nectar due to pollution



Biodiversity decline

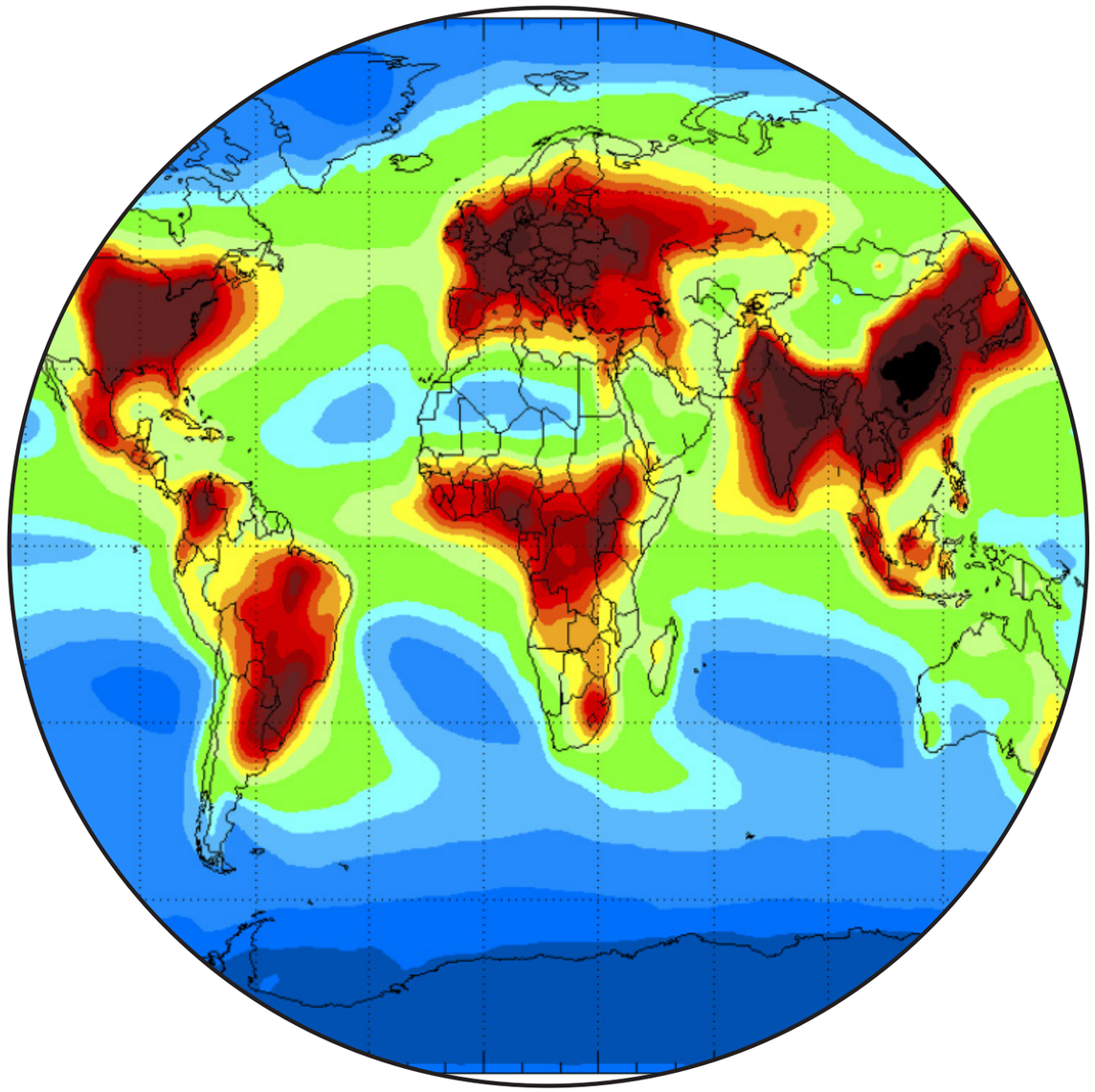
The 300 km long dune landscape of the Netherlands is our nations richest ecological organ. With almost 10% of national flora species specific to it, it also houses 65-75% of all Dutch flora species. This makes the dune landscape valuable and in many cases protected natura 2000 nature reserves (see picture below). Due to global nitrification and accidification we see nation wide biodiversity decline in our dune landscapes. Tata Steel is a heavy point source polluter of nitrogen, resulting in an even bigger local biodiversity decline of dune spcific flora and fauna species. Grass, scrubs, trees and sea buchthorn takes over from dune specific flora species because they are nitrogen and accid heavy soil loving species. Many naturally accuring plants are vanishing alltogether or dont produce anough nectar anymore to keep the dune specific fauna, like wild bees, alive. By cleaning and maintaining these grounds of nitrogen and accid we can reverse this biodiversity decline.

Page conclusion

There is an enormous biodiversity decline because of the nitrogen deposition and accidification of the ground in the dune reserves.

Tata Steel pollution = point source

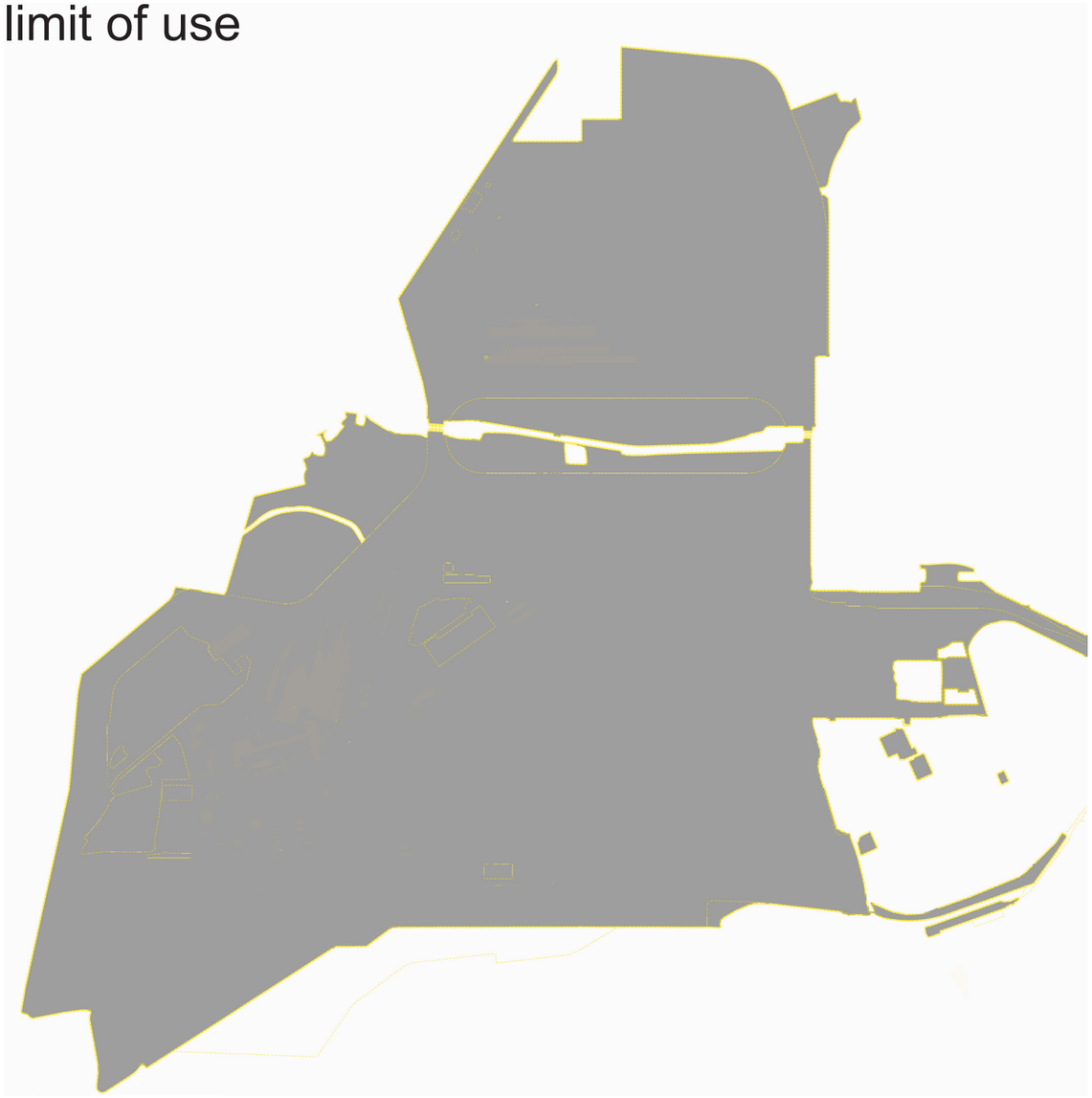
Global nitrogen deposition &
accidic rain = diffuse source



Tata steels pollution is part of a bigger problem; the global nitrogen deposition.
The nature around Tata Steel is extra polluted.

Course of action:
1) Stop Tata Steel pollution
2) Clean up Tata Steel pollution
3) Long term routine maintenance will be necessary

Property land and limit of use



Property boundary of Tata Steel

Limit of use

Property land of Tata Steel

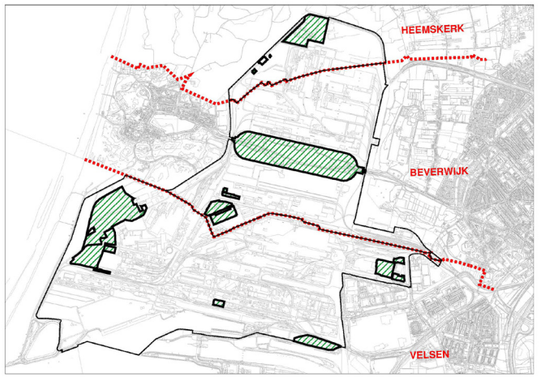
Land in use by Tata Steel

Land leased to other companies

1) H2 verlading & opslag
2) Harsco Metals (slack processor)
3) Pelt & Hooikaas (supplier of secondary raw materials)
4) Lindegas (industrial gas company)
5) Train tracks

Green zones

6) Green area
7) Green strip
8) Green area



Biotopes Natura 2000 reserves

embryonic dunes

white dunes

grey dunes

sea buckthorn scrub

dune forests

dune valleys

roughness and edges

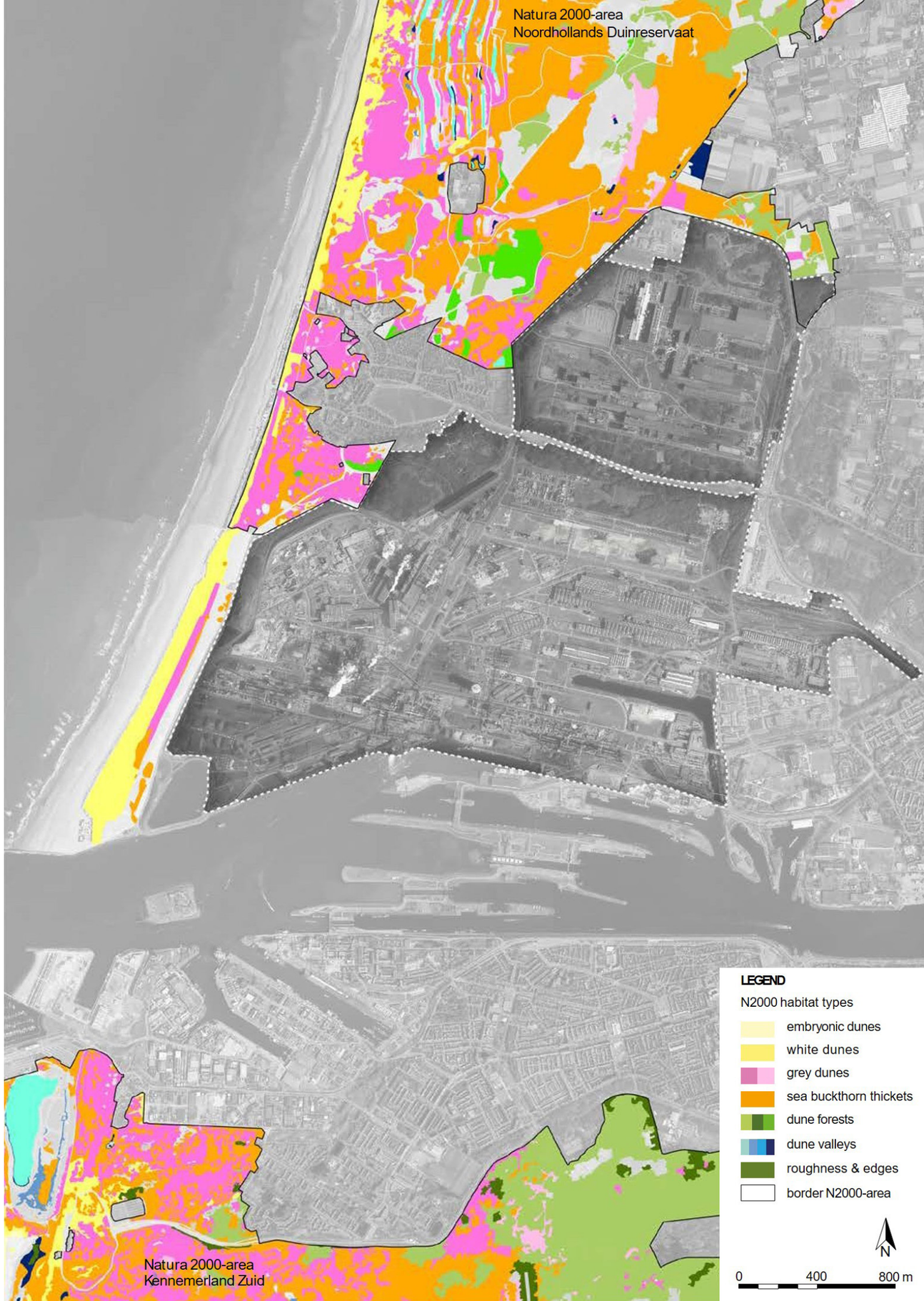
Natural values in the environment

The Tata Steel site borders on the Natura-2000 area in the north called the North Holland Dune Reserve and in the south on the North Sea Canal, IJmuiden and directly south of that the Natura 2000 area Kennemerland-South.

Natura 2000 is a European network of protected natural areas. In these Natura 2000 areas, certain animals, plants and their natural habitat are protected in order to preserve biodiversity (species richness). In this way we prevent nature in Europe and the Netherlands from becoming more and more of the same.

Page conclusion

Tata Steel borders on two Natura 2000 nature reserves that are a patchwork of of dune specific biotopes.



Open dune

Open dune vegetations are found on the Tata Steel site sometimes on completely unnatural substrate, such as calcareous zinc sludge. This concerns vegetation with sand sedge, yellow bedstraw, sand dodder grass, stonecrop, sheep sorrel, common piglet weed. The rarest species in this biotope is the dogweed. The species grows in vegetations with true bitter herb, bitter herb broomrape, narrow torch grass and wound clover. As might be expected in an open dune, rabbit, fox, blue-winged grasshopper and also sand lizard (only at the edges) occur here.

Moist dune valley

At a few locations, vegetations can be found that belong to the moist dune valleys. In all cases, these are situations that have arisen in a non-natural way. This concerns vegetation from open water and reed beds to more closed herbaceous vegetation to creeping willow dominated vegetations. The moist dune valleys on the Tata Steel site are where most special and protected species have been found. It's about plant species as swamp wasp orchid, reed orchid, parnassia, beautiful centaury, and water punge. The parts with open water are important for the reproduction of the natterjack toad. More common species found here are green frog and common toad.

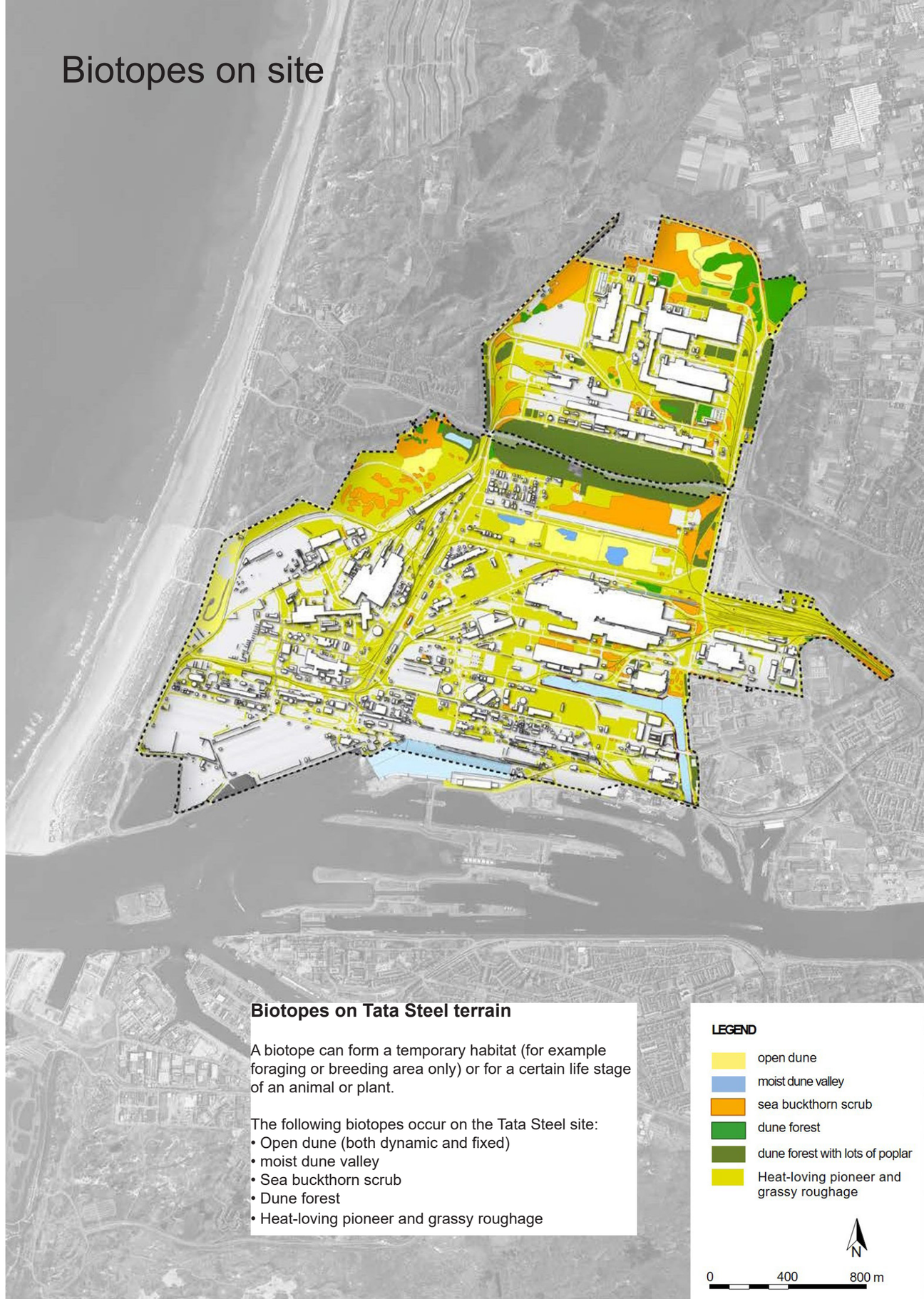
Sea buckthorn thicketts

Sea buckthorn scrub can be found all over the site. In some places they are vegetation-forming. It's about relative species-poor vegetation. Besides sea buckthorn, privet, elder and hawthorn are also often found in these thickets. Other nitrogen-loving plants such as cleavers and nettle are found on the soil. Sea buckthorn is important during the migration season for birds that feast on the many berries of this shrub. In places where sea buckthorn borders on open sand, it provides cover for sand lizards. Older sea buckthorn thickets can be important for special (crust) mosses.

Dune forest

Spread over the entire Tata Steel terrain are forests and groves. This mainly concerns planted forests with species such as aspen, white poplar and silver birch. The groves are poor in plant species and are characterized in the undergrowth by species that prefer nitrogen-rich conditions. This concerns blackberries and nettles. However, berry-bearing species such as hawthorn and rowan are regularly encountered. Part of the forest is still original and contains 150-year-old hawthorns that have not been planted. Although they are fairly poor floristically, the bushes can be important for breeding birds and possibly bats.

Biotopes on site



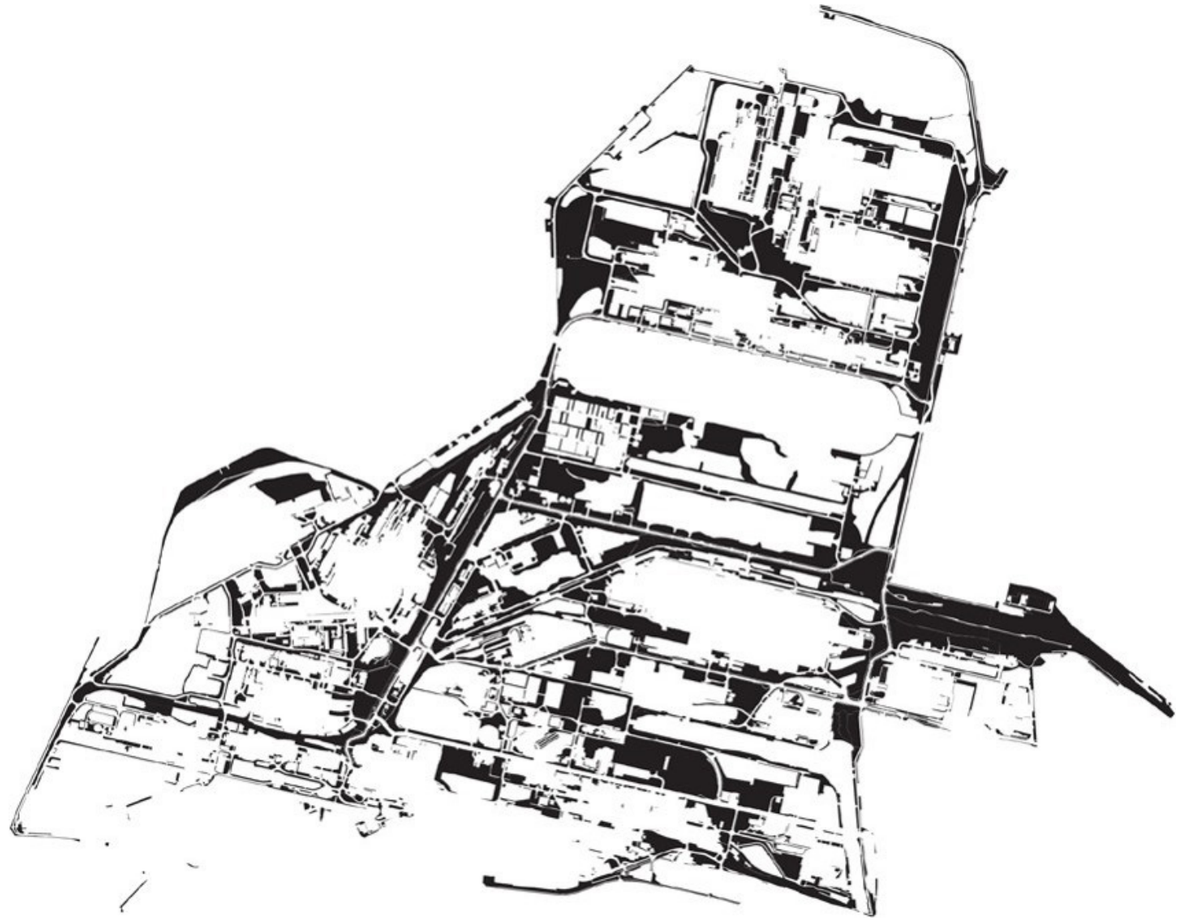
Biotopes on Tata Steel terrain

A biotope can form a temporary habitat (for example foraging or breeding area only) or for a certain life stage of an animal or plant.

The following biotopes occur on the Tata Steel site:
- Open dune (both dynamic and fixed)
- moist dune valley
- Sea buckthorn scrub
- Dune forest
- Heat-loving pioneer and grassy roughage

Heat-loving pioneer and grassy roughage

Many (recently) derelict areas, but also roadsides, are overgrown with heat-loving pioneer and grassy brushwood. This biotope is therefore relatively common and scattered on the Tata Steel site. Eye-catching species of this biotope on the Tata Steel site are snakeweed, ox tongue, flax beak, wild reseda, mullein, evening primrose. In addition, species such as white honey clover, black mullein and tansy are present. Given its aesthetic value and its great significance as a nectar source for insects, this biotope deserves special attention. As a ruderal biotope, it is dependent on human interventions, which disrupt the natural character of the landscape. For a long time, the biotope has benefited greatly from earthmoving for drinking water extraction in the dunes. Now that sand extraction and construction of channels in the dunes are a thing of the past, the high dynamics on the Tata Steel site is an important factor for the presence of this biotope in the dunes.



fine veining of the heat-loving pioneer and grassy roughage on the Tata Steel site

Page conclusion

The patchwork of biotopes on the Tata Steel site is very monotonues and mostly consist of a network of heat-loving pioneer and grassy roughage.

map from nature research [source: Witteveldt & Van den Tempel, 2015]

Legally protected natural values on Tata Steel terrain

In 2015, a nature study was conducted into the occurrence of protected plant and animal species on the Tata Steel site (Witteveldt & Van den Tempel, 2015). The subareas involved in this research are both the terrains with a possibility for future development and the terrains that do not qualify for this. The map above shows the spatial image of the location of these two types of terrain.

Despite - or perhaps partly because of - the industrial environment and the enormous activity, there are a surprising number of protected species on the Tata Steel site. The following protected species (table 2 and table 3 of the Nature Conservation Act) were found: natterjack toad, sand lizard, dogweed, reed orchid, bee orchid, marsh wasp orchid, parnassia, long speedwell, meadow sage, rapunzel bell and wild marjoram.

In the map (right page), the range of action is also indicated for each sand lizard found. This is an indication of the places where the found specimen may be present.

It should be noted that the nature research was not specifically aimed at the occurrence of protected breeding birds and bats (year-round). In any case, it is clear that there is a steep wall in the north of the terrain in which sand martin breeds. This kind and his residence is protected all year round.

sand lizard

natterjack toad

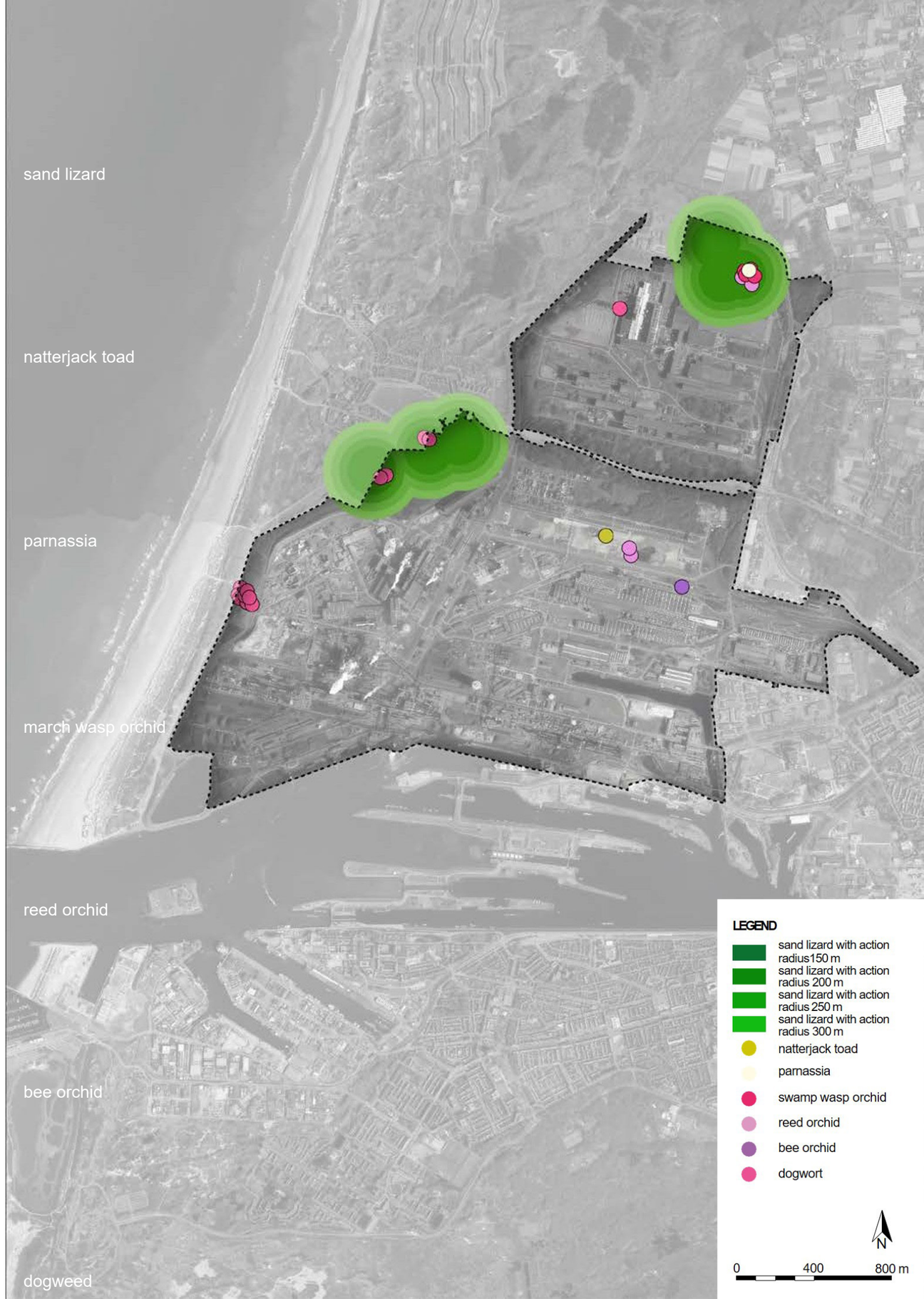
parnassia

march wasp orchid

reed orchid

bee orchid

dogweed



Endangered species

Water systems on and around Tata Steel terrain

There are three sewage systems with different types of water on the northern site: process water, sanitary waste water and rainwater. The process water system drains the cooling water from the factories to the sea al. In the rainwater system, the water is drained from the roofs to various water storage facilities to the east and west of the Tata Steel site. There are also two small water storage facilities between the commercial buildings. The ditches on the northern site were dug to locally lower the high groundwater level. The water is drained back to the ring ditch via these ditches.

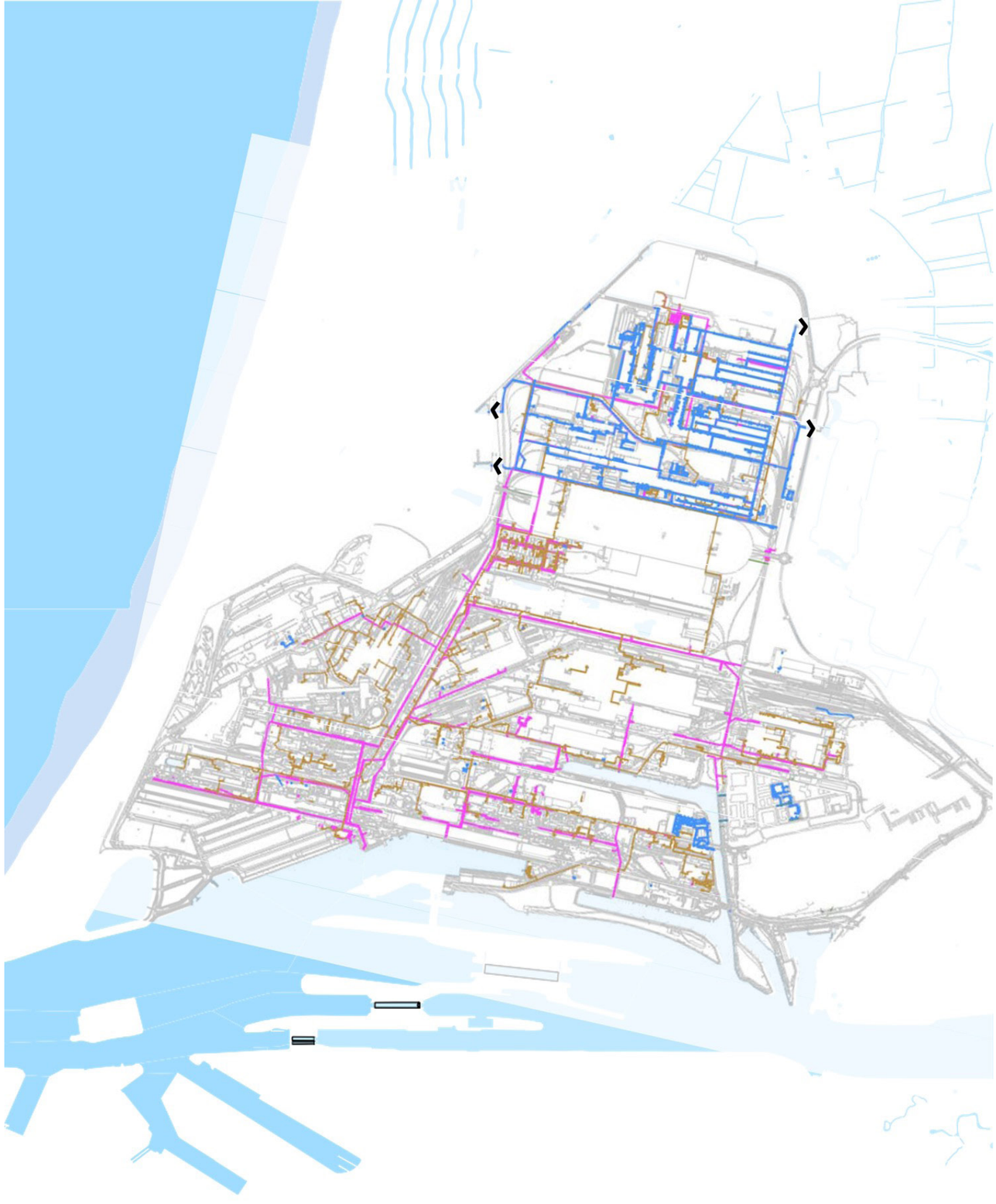
Only a process water system and a sanitary drainage system are present on the southern site. The process water system on the southern site is linked to the process water system on the northern site. The rainwater that falls on the roofs of the buildings on the southern site is drained by the process water system, which discharges into the North Sea. As a special water element, north of the Tata Steel Packaging building, there is a ditch that is fed by seepage water. This water flow is caused by the difference in height in the terrain of 4 meters north of the ditch. Due to the good water quality, special vegetation is present here.

The separate system of rainwater drainage on the northern site offers opportunities to expand the moist dune valley biotope instead of draining the water in a sewer system as quickly as possible to the Lunettten zone of Beverwijk. A larger buffer capacity in combination with the application of a moist dune valley biotope is certainly an opportunity with increasing peak rainfall due to climate change. The construction of infiltration facilities (wadis) can create a moist dune valley biotope.

waterstorage in the norhtern area

watercourse in the norhtern area

seepage ditch north of Tata Steel Packaging building on the southern site



water systems on the Tata Steel site

Large green areas

The large green areas are all owned by Tata Steel but have no destination industry. For these areas it is unlikely that in the next five years plans for the construction of a production facility arise. There are many protected natural values in these areas present.

Wasteland (with plan)

A number of sites are fallow, due to the (recent) removal of buildings or infrastructure. They are big to medium-sized green areas. In many of the areas you will find spontaneous vegetation development. Both dune valley vegetation develops in the lower and wetter parts as sea buckthorn thickets, open dune vegetations and the heat-loving pioneer and grassy roughage on the higher parts. However, these parts can be used for future industrial development.

Production environment

The green areas of the production environment are small to medium-sized areas that can be seen as residual space and for which no plan has been made in the short term. Most of the areas have a vegetation of the heat-loving pioneer and grassy roughness. In a number of cases sea buckthorn thickets are planted from an earlier layout plan.

Railway embankments and yards

The railway embankments consist of heat-loving pioneer and grassy roughage. The vegetation has a different species composition compared to the roadsides and is less high. The yards around the Oxystaalfabriek and north of Rooswijk gate are special open spaces on the terrain.

Roadsides

There is a system of main and secondary roads on the site present. Along these roads, the industrial area is ‘experienced’. There are earthen ramparts constructed along parts of the roads for the purpose of stopping the parking trucks in the roadside. In the verges there is almoste verywhere heat-loving pioneer and grassy brush, which blooms beautifully in the summer months. In places where the sandy subsoil was once covered with black earth you can now find grassy vegetation.

Harbor embankments

The embankments along the Staalhaven are high and covered with grassy roughage, shrubs and trees that do not realy fit in the dune landscape. The water and embankments can only be experienced from a few places from the road. The forecourt in front of the Dudokhuis and the parking lot of the convention center is adjacent to the water from the harbor. The potential of the embankments in these areas are hardly used.

Office environment

There are several offices on the site that belong to different production units. The surroundings of some offices have been landscaped. In some cases, the planting consists of shabby greenery that fits in a residential area and to a much lesser extent in the dunes. Also the design of the plant boxes does not encourage employees to take a break outside.

Entrances

The green areas around the entrances deserve special attention because they present the atmosphere and imaging of the site. The entrance at the Wenckebachstraat, with the Dudok House as its main building has a clear character. The planting around the entrance is cluttered and lacks the same stateliness as the main building. The entrance at Rooswijk gate is messy in terms of buildings and the planting has a shabby park character that is not in tune with the dune landscape. The Northern entrance gate ‘de Caeg’ has a small gatehouse and is a bright and open space. The plants around this entrance consists of roadsides and bushes that fit well with the dune landscape.

Types of green areas

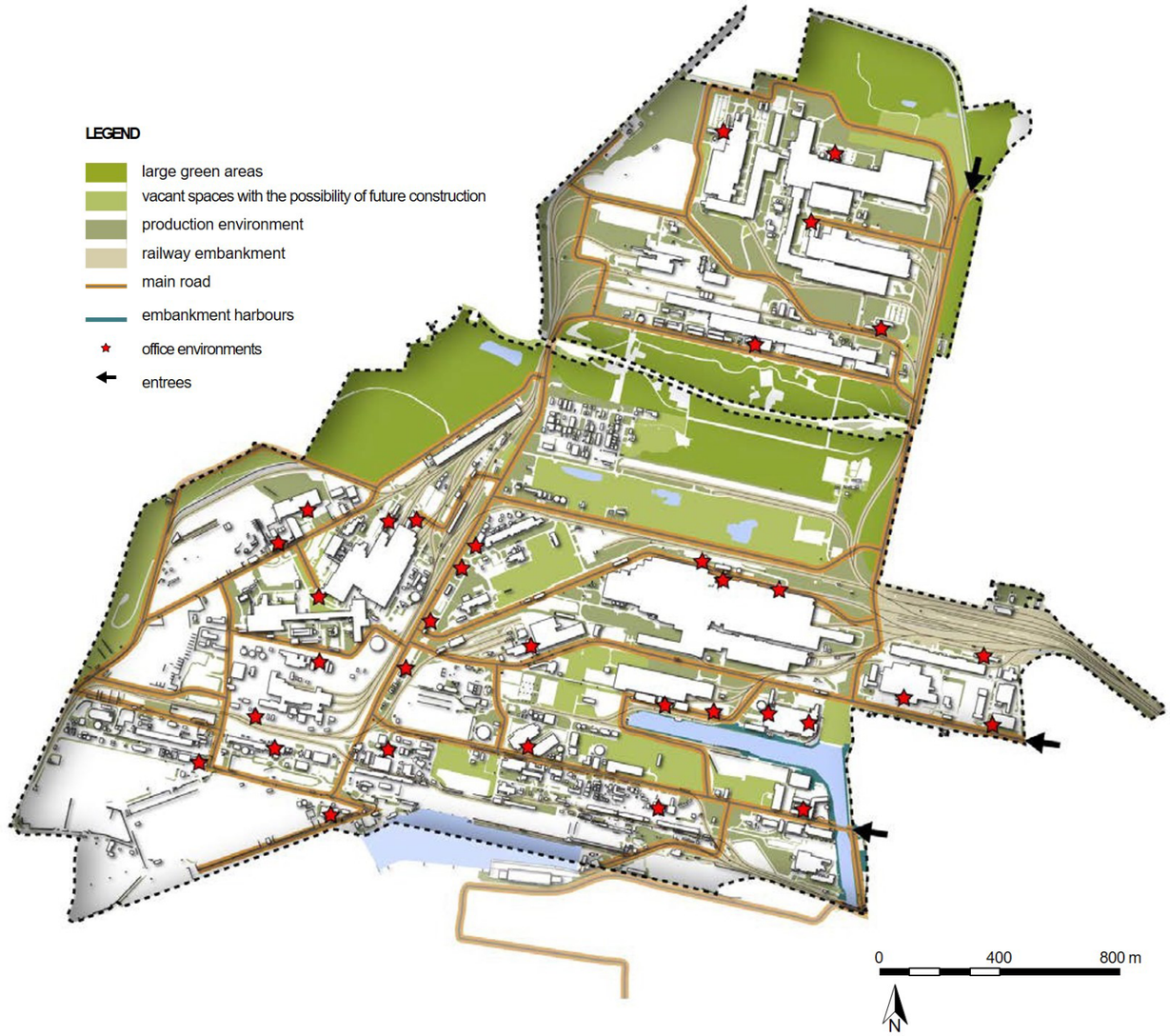


Image value of vegetation on Tata Steel terrain

Vegetation with a lot of natural value is present in many places on the site. The image value of these places is also high. The vegetation with a lower image value does not fit in the dune landscape due to the choice of planted species. Its quality is to low for a place on the property. These are in particular the areas around the office locations and the entrances of the site. The lack of maintenance also has a negative effect on the image value of the vegetation on the site.

The building is anchored in the dune landscape by a dune with sea buckthorn thickets.

Dune vegetation develops on a vacant lot after the removal of a building and access roads, but the terrain remains uncharacteristically flat for of a dune landscape.

Between the Oxistaalfabriek and the block warehouse, a dune landscape can be seen as a background.

Also in the southwestern part of the site there is vegetation in some places that fits into the dune landscape.

Sea buckthorn scrub has been used as greenery around an office and forms a natural separation between the building and the road.

The steep edges and earthen walls present along the roads enhance the experience of the dune vegetation.

The natural vegetation strip on the slope at the congress center is terminated at the entrance with a strip of ivy that has a completely different character.

The tightly mowed lawn fits neither the industrial estate nor the dune landscape.

The landscaping around the entrance gate Rooswijk has the appearance of a residual space instead of a harbinger of the qualities further on the site.

The characteristic dune landscape sometimes seems to have been planted away with poplars.

It is clear that a lot of attention is paid to some open-plan offices, where the design fits better with a garden in a residential area than with an industrial estate.

The poplar species present in part of the forest planting on the site does not match the dune landscape in terms of scale and structure.

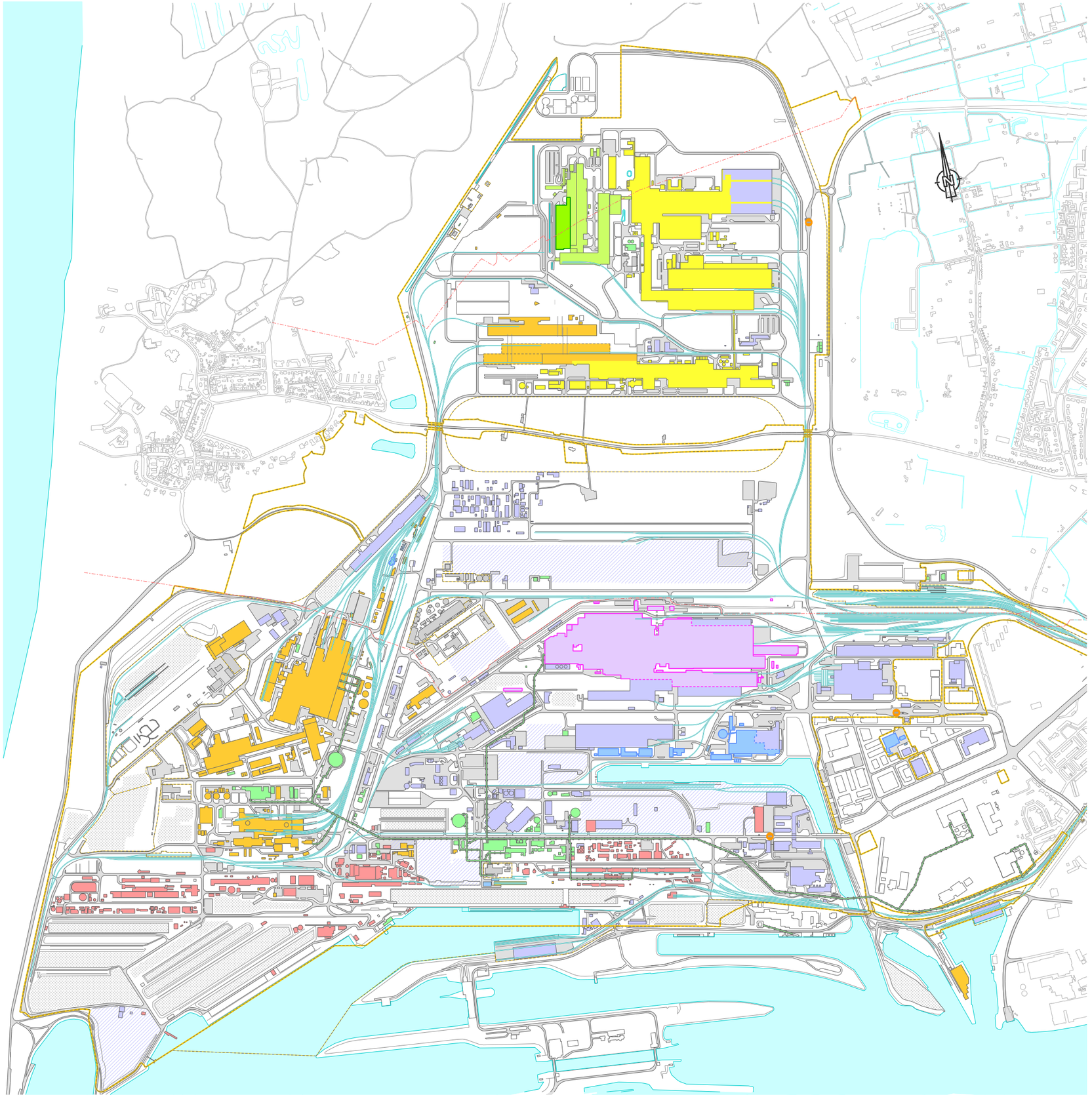
2.3 Current Industrial activity on site

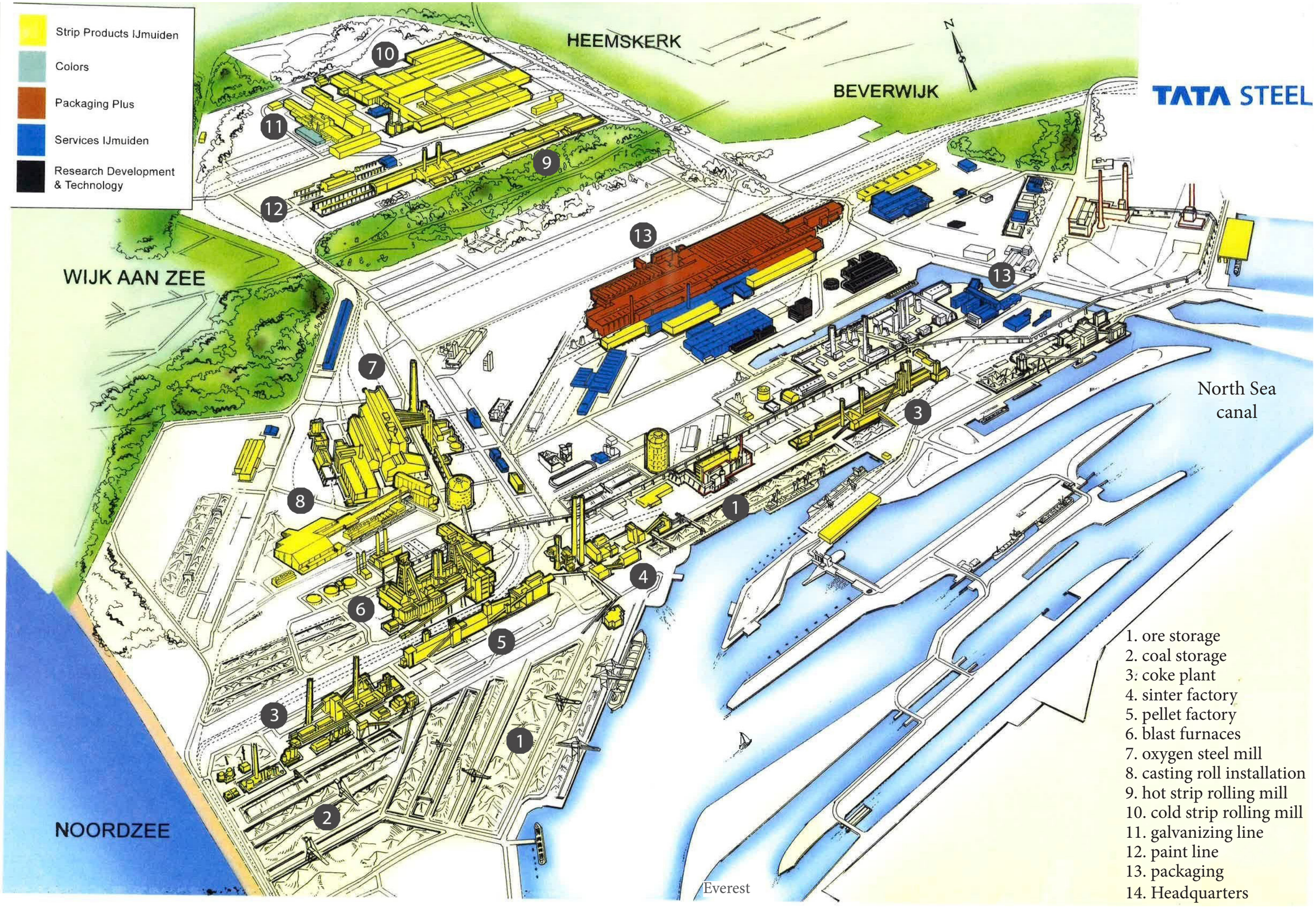
Overview map of terrain layout

- Ore Preparation, Coke and Gas Plants
- Steel production
- Hot and cold strip rolling mill
- Coated products
- Energy company
- Services
- Steel packaging
- Research, Development & Technology
- Paint line
- Third parties
- Terrain under development
- Storage of raw materials

- Property boundary Tata Steel in IJmuiden
- Limit of use of Tata Steel in IJmuiden
- Municipal boundary

- Overhead Pipe
- Railway track
- Access to Tata Steel terrain




Strip Products IJmuiden
Colors
Packaging Plus
Services IJmuiden
Research Development & Technology
HEEMSKERK
BEVERWIJK
N
TATA STEEL
WIJK AAN ZEE
NOORDZEE
North Sea canal
Everest
1. ore storage
2. coal storage
3. coke plant
4. sinter factory
5. pellet factory
6. blast furnaces
7. oxygen steel mill
8. casting roll installation
9. hot strip rolling mill
10. cold strip rolling mill
11. galvanizing line
12. paint line
13. packaging
14. Headquarters

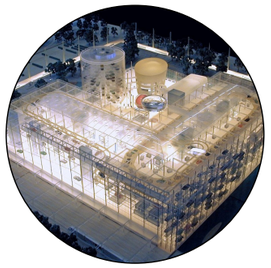
2.4 Tata Steels future development plans

Development plans

3 wind turbine parks at sea

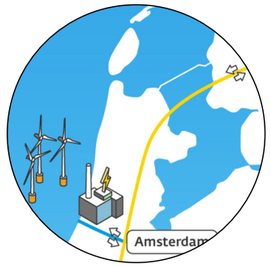
Produce 2100 MW

Power plant
2 GW



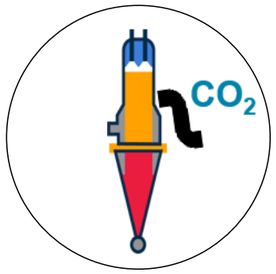
Hydrogen factory
500 MW

Largest Hydrogen factory in the world



Hydrogen backbone

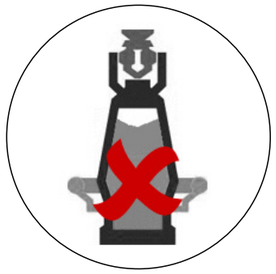
cross border network



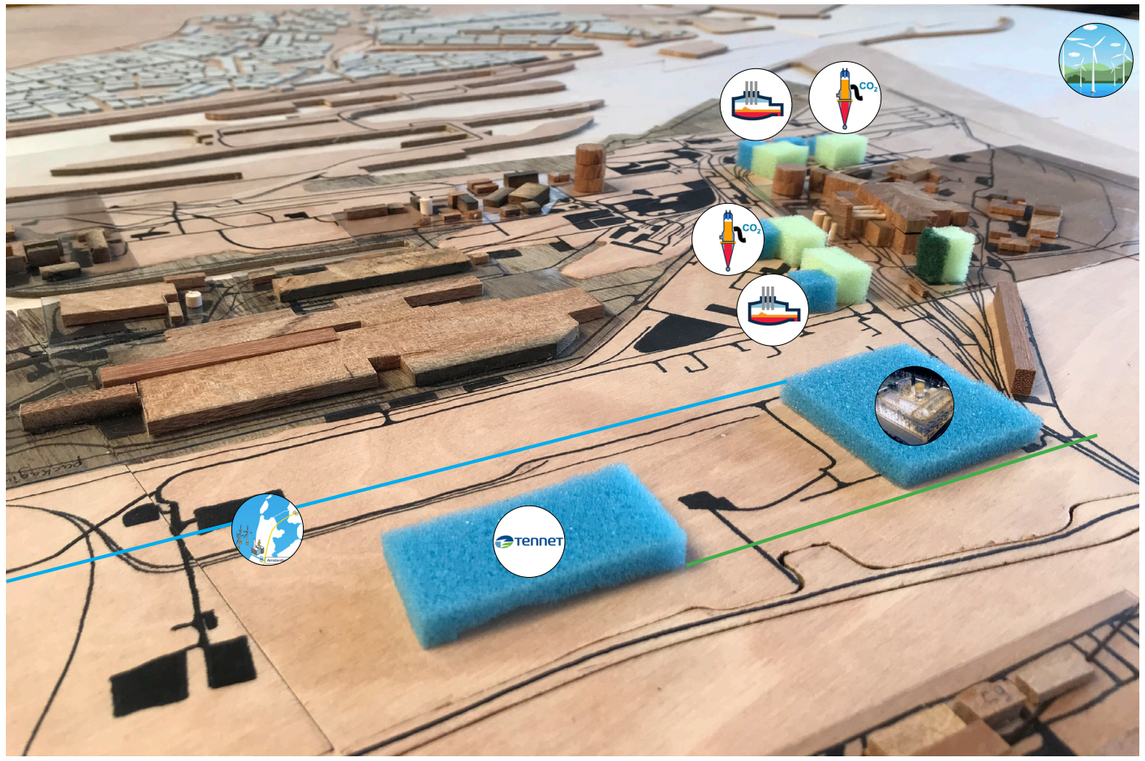
DRI x2
2,5 Mton +3,5Mton

E-oven
x3

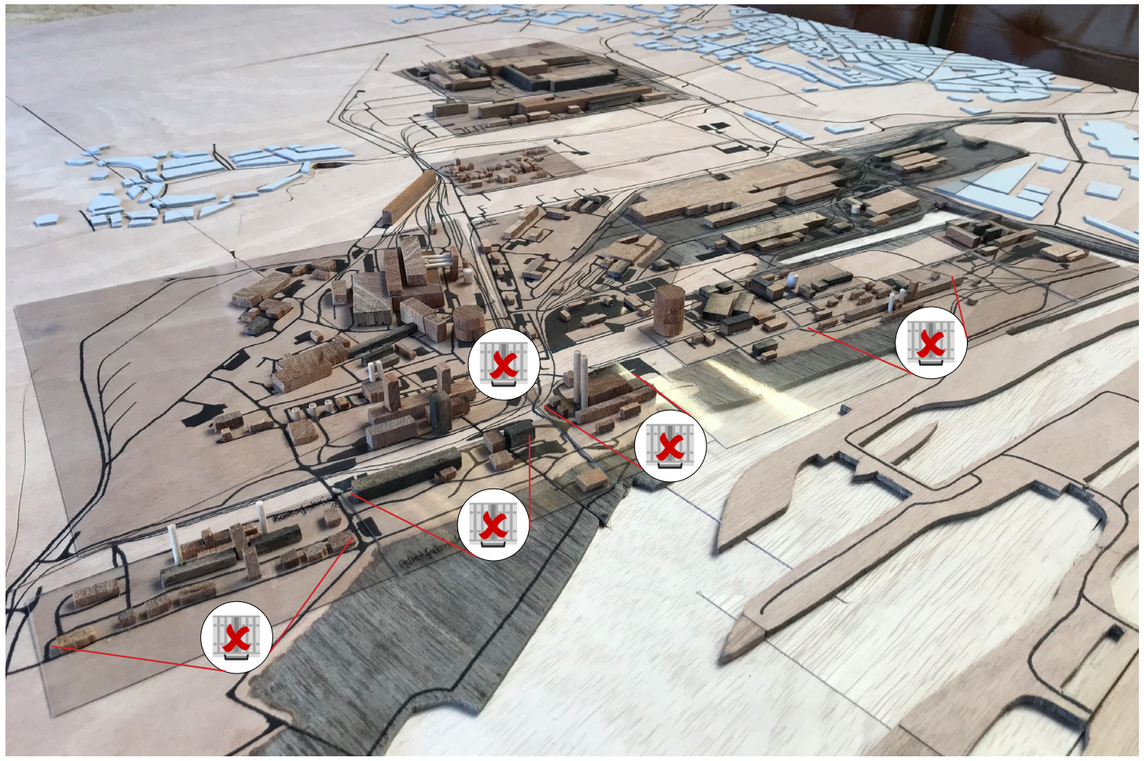
Cokes plant 1&2
sinter & pellet plant



Blast furnace 6&7



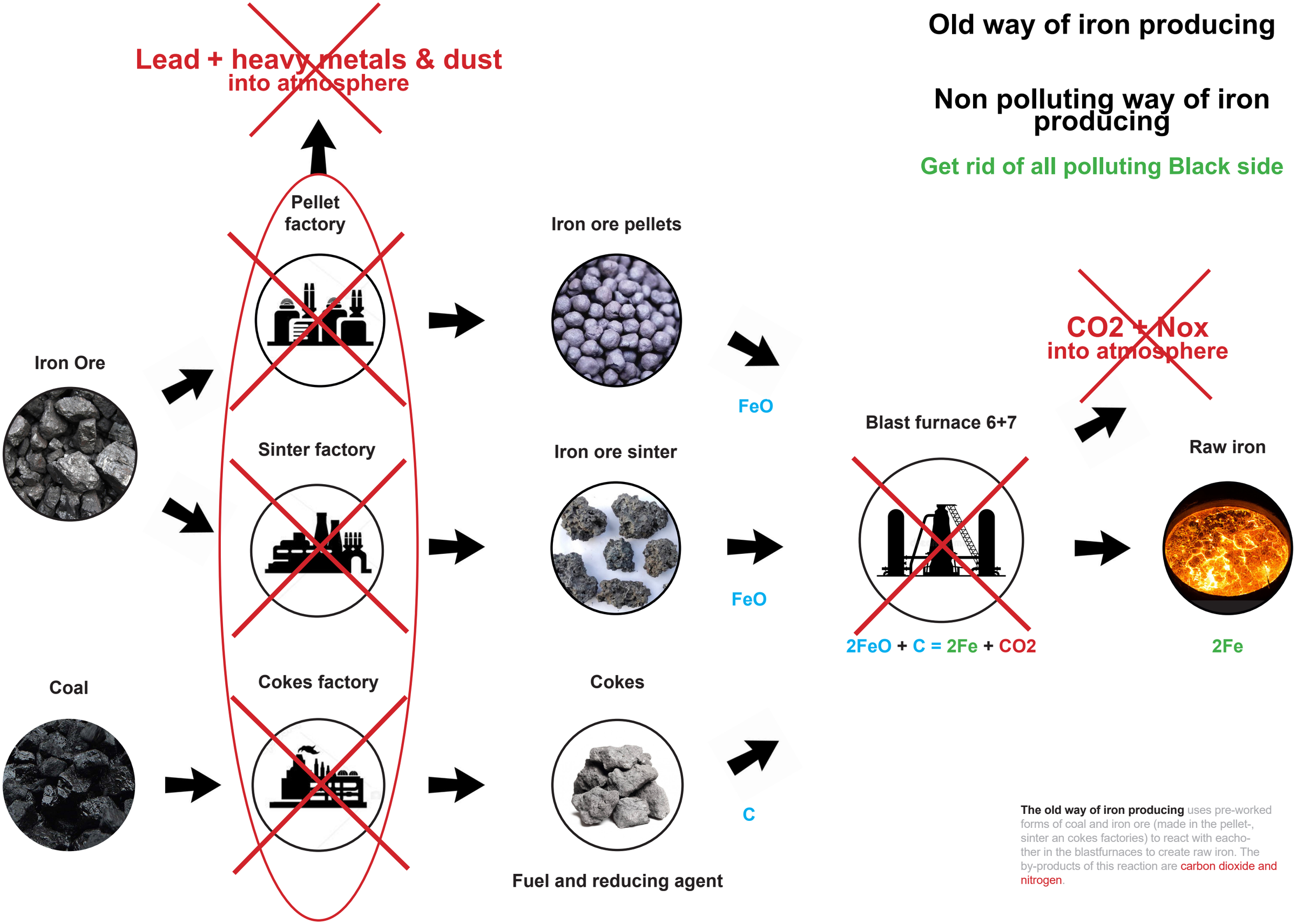
New situation



Demolishable factories

Tata steel is the biggest CO2 polluter in the netherlands with 600 million tons of CO2 emission. This is nearly as much as the 700 million tons of steel they produce. Tata Steel has plans to become a CO2 neutral steel producing company. In order to do this they will need to replace the blast furnaces with 2 Direct Reducing Iron plants (DRI's) and 3 E-ovens that run on Hydrogen. In this way the byproduct of the iron ore to raw iron convertion will be water instead of CO2.

Firstly 3 wind turbine parks will be build in the North sea that produce 2,1 GW of energy that will be made available in the new Tennet energy plant on site. A new hydrogen factory will be build that needs 500 MW of energy.
This will be the largest hydrogen factory in the world. There is 4 times as much energy available, meaning that the new DRI plants will be connected to a national hydrogen backbone. The old factories, that made up the black (polluting) side of the terrain, can be demolished. This means that the coal fields, the pellet & sinter plants and the cooks-factory will become absolete.



Old way of iron producing

Non polluting way of iron producing

Get rid of all polluting Black side

The old way of iron producing uses pre-worked forms of coal and iron ore (made in the pellet-, sinter an cokes factories) to react with eachother in the blastfurnaces to create raw iron. The by-products of this reaction are carbon dioxide and nitrogen.

New way of iron producing

Producing CO2 neutral steel by using H2

30% rest warmth

Use in design!

Water

H2O

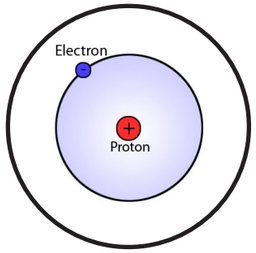
Hydrogen factory

Electrolysis splits water into hydrogen and oxygen

Iron oxide (powder)

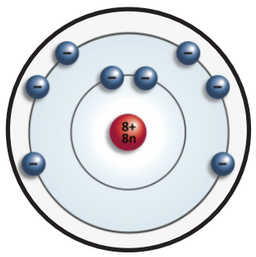
FeO

Hydrogen



H2

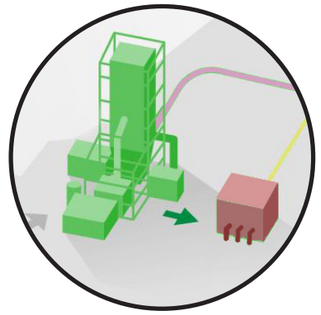
Oxygen



O

O steadies temp.

3x DRI + 5 x E-oven



FeO + H2 = Fe + H2O

Raw iron

Fe

Oxysteel plant

Raw iron enters existing non polluting part of the production proces

25 % Scrap metal

Re-use scrap metal from old factories

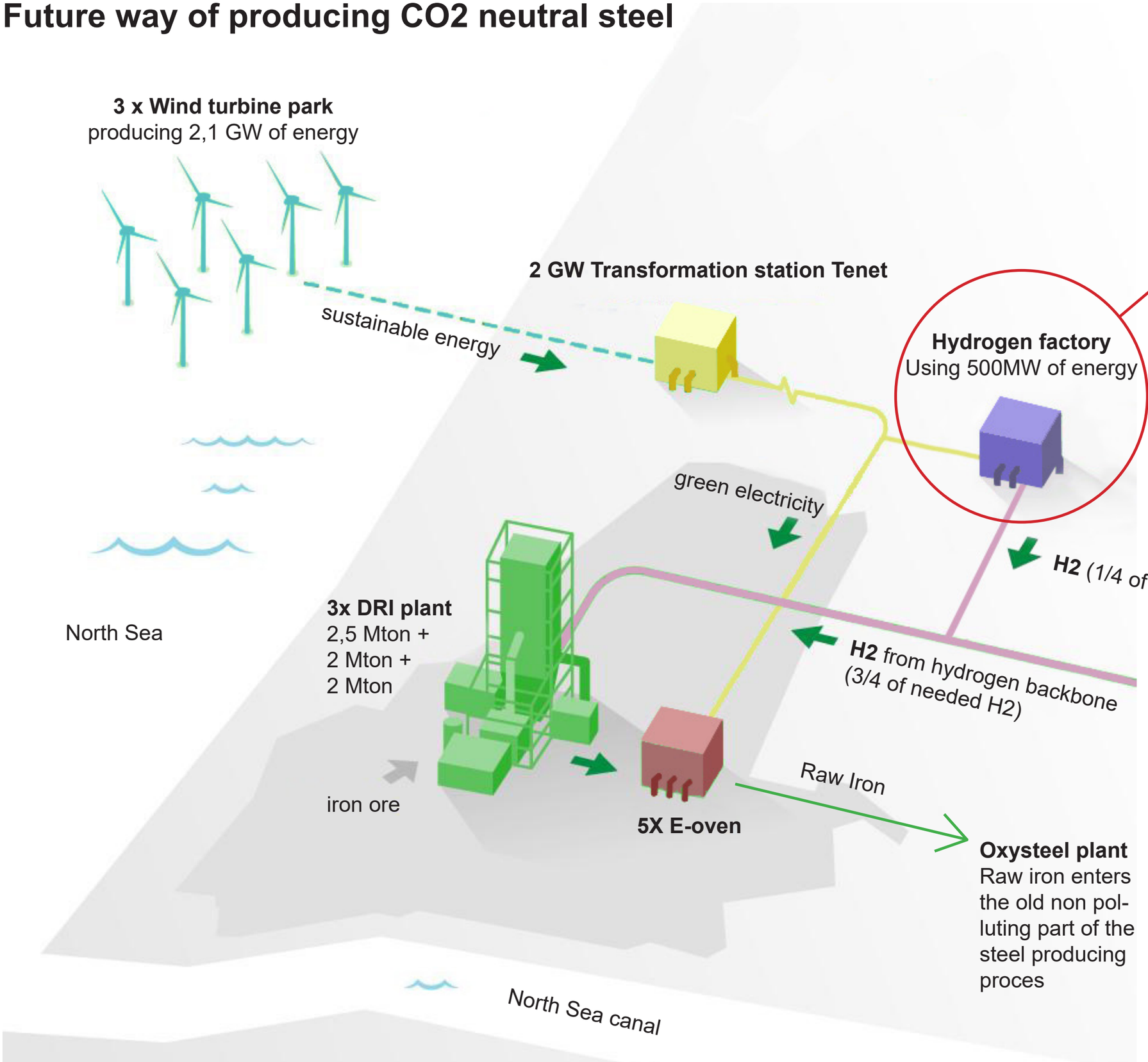
Closed loop

The new way of iron producing uses hydrogen and oxygen (products of the electrolysis of water) to react together with iron ore in the 3 new DRI-plants and 5 electric ovens to form raw iron. The by-product of this reaction is water, which can be used again to repeat the proces.

By using this new CO2 neutral way of steel producing, the old polluting factories can be demolsihed leaving opened up space on the industrial terrain for the development of the new factories of which I'm designing the hydrogen factory!

Stop Tata Steel's point source Pollution

Future way of producing CO2 neutral steel



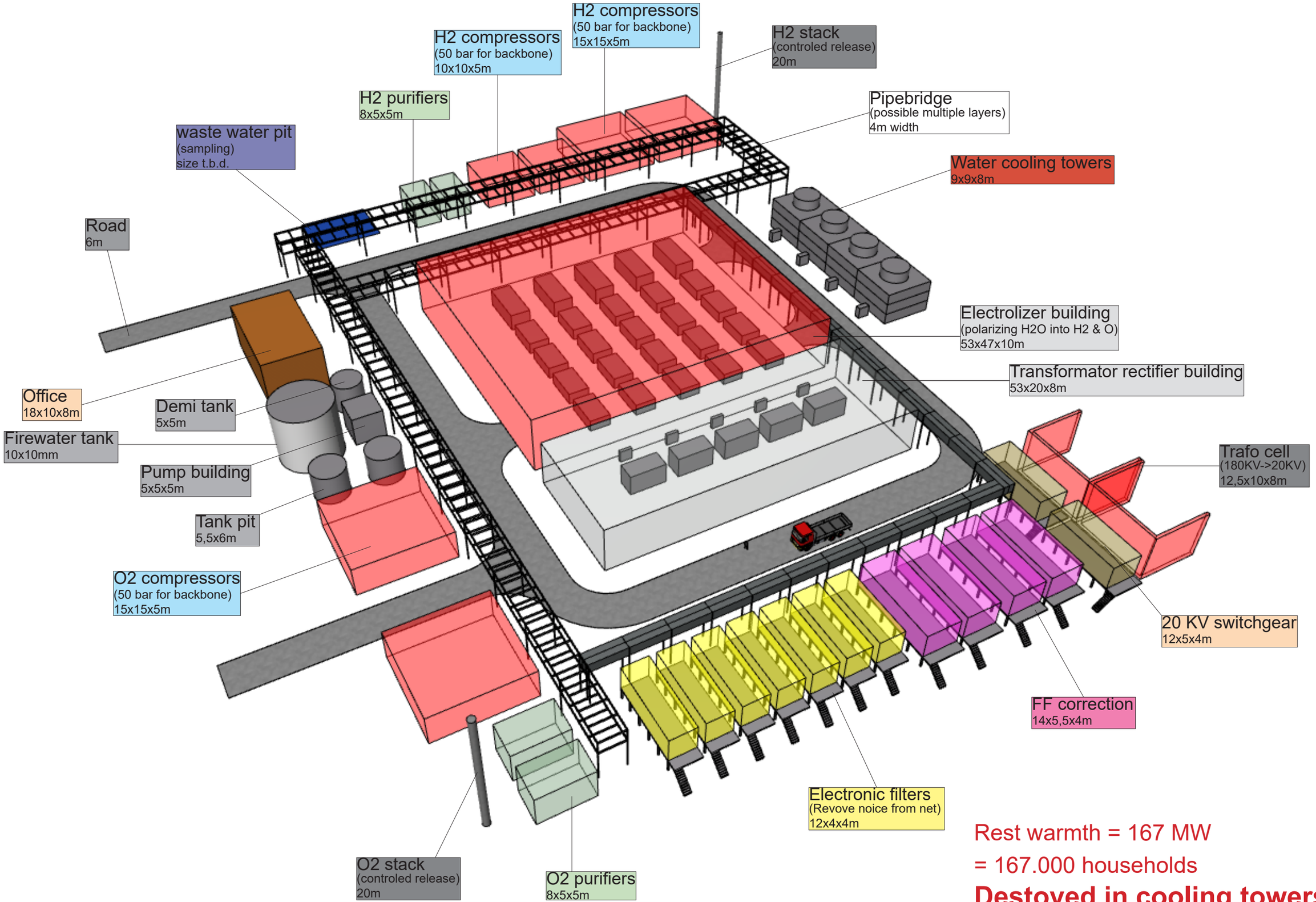
I will design the Biggest Hydrogen factory in the world!

Development plans

Tata Steels 12 million tons of anual CO2 emission is almost twice as much as the 700 million tons of steel they produce each year. In order to become a CO2 neutral steel producing company Tata Steel will have to replace the old blast furnaces with 3 Direct Reduced Iron plants (DRI's) and 5 Electric ovens that run on hydrogen in stead of coal. The byproduct of iron ore converstion to raw iron with hydrogen as the reducing agent is water instead of CO2 in the case of coal usage.

Three wind turbine parks will be build in the North sea that produce 2,1 GW of energy that will be made available in the new Tennet energy plant on site. A new hydrogen factory will be build that needs 500 MW of energy.
This will be the largest hydrogen factory in the world. There is 4 times as much energy available, meaning that the new DRI plants will be connected to an international hydrogen backbone. The old factories, that made up the black (polluting) side of the terrain, can be demolished. This means that the coal fields, the pellet & sinter plants and the cooksfactory will become absolete. This whole terrain can be used to build the new hydrogen factory (see picture below).

Preliminary design of hydrogen factory

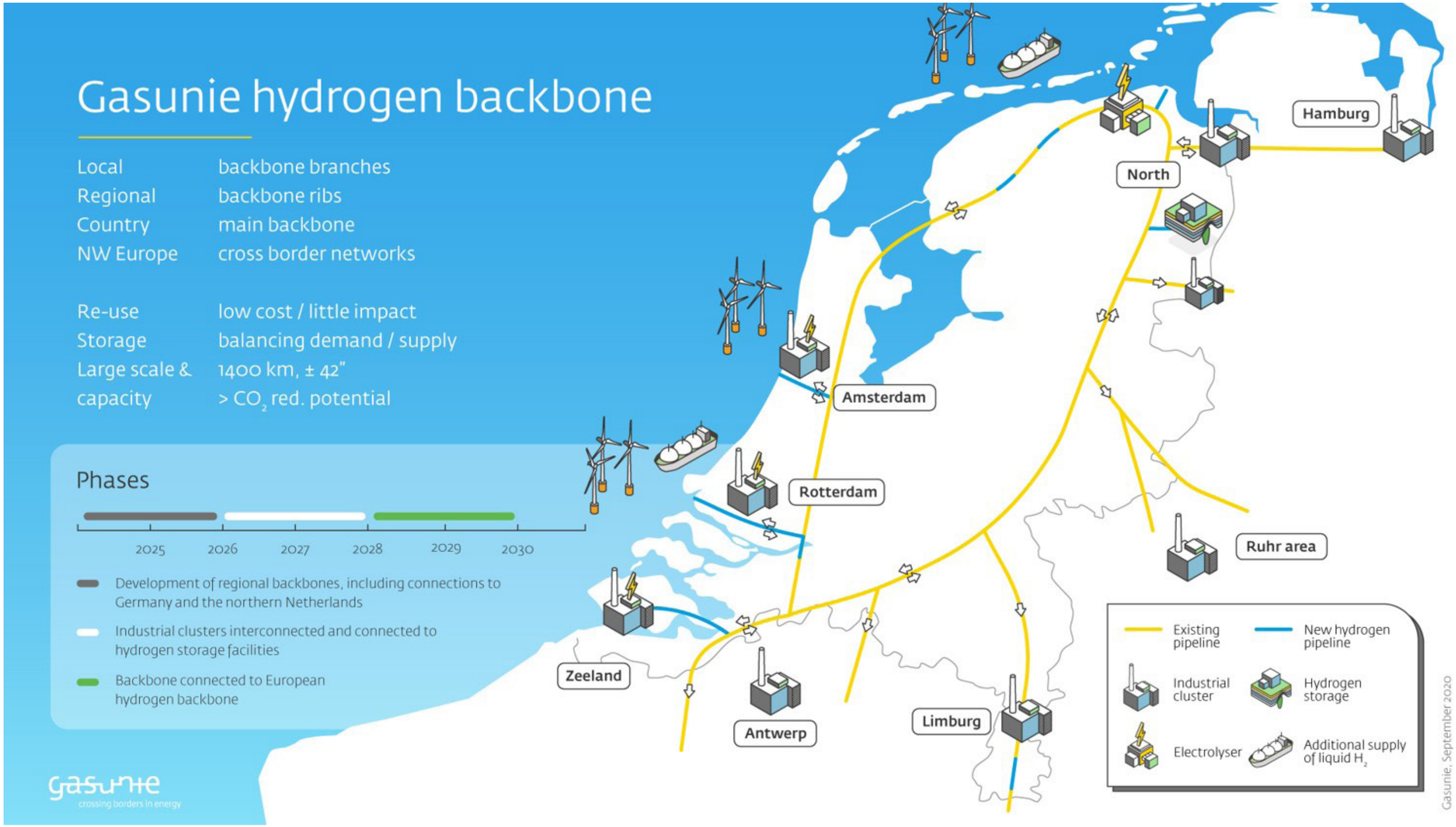


Rest warmth = 167 MW

= 167.000 households

Destoyed in cooling towers!

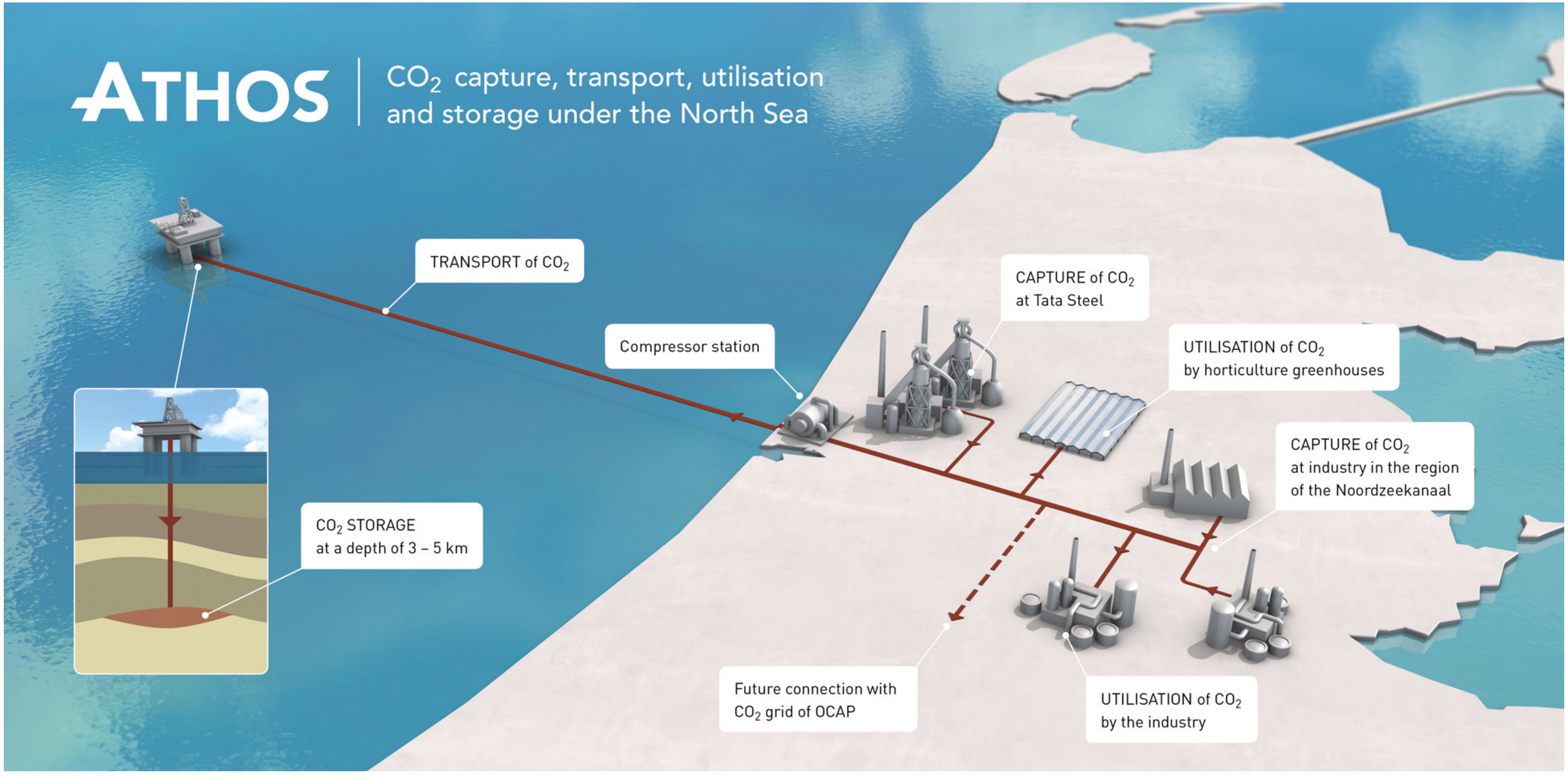
International hydrogen backbone



Page conclusion

Even after construction of the new hydrogen factory, Tata Steel will need to get 3/4 of their hydrogen from an international hydrogen backbone.

CO2 storage



Page conclusion

Tata steel is going to capture, transport and store CO2 in depleted gasfields under the North Sea before the new hydrogen factory runs on full speed. This will start in 2027.

Overview map of terrain layout

- Property land (not in use by Tata Steel)
- Property land in use by Tata Steel
- Ore Preparation, Coke and Gas Plants
- Steel production
- Hot and cold strip rolling mill
- Coated products
- Energy company
- Services
- Steel packaging
- Research, Development & Technology
- Paint line
- Third parties
- Terrain under development
- Storage of raw materials

- Property boundary Tata Steel in IJmuiden
- Limit of use of Tata Steel in IJmuiden
- Municipal boundary

- Overhead Pipe
- Railway track
- Access to Tata Steel terrain

Demolishable ‘black side’ factories and removeable asphalt

- Installations that can be demolished
- Roads & parking lots that become otiose
- Terrain under development
- Obsolete coal storage
- Property land (not in use by Tata Steel)
- Property land in use by Tata Steel

- Steel production
- Hot and cold strip rolling mill
- Coated products
- Services
- Steel packaging
- Research, Development & Technology
- Paint line
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- Property boundary Tata Steel in IJmuiden
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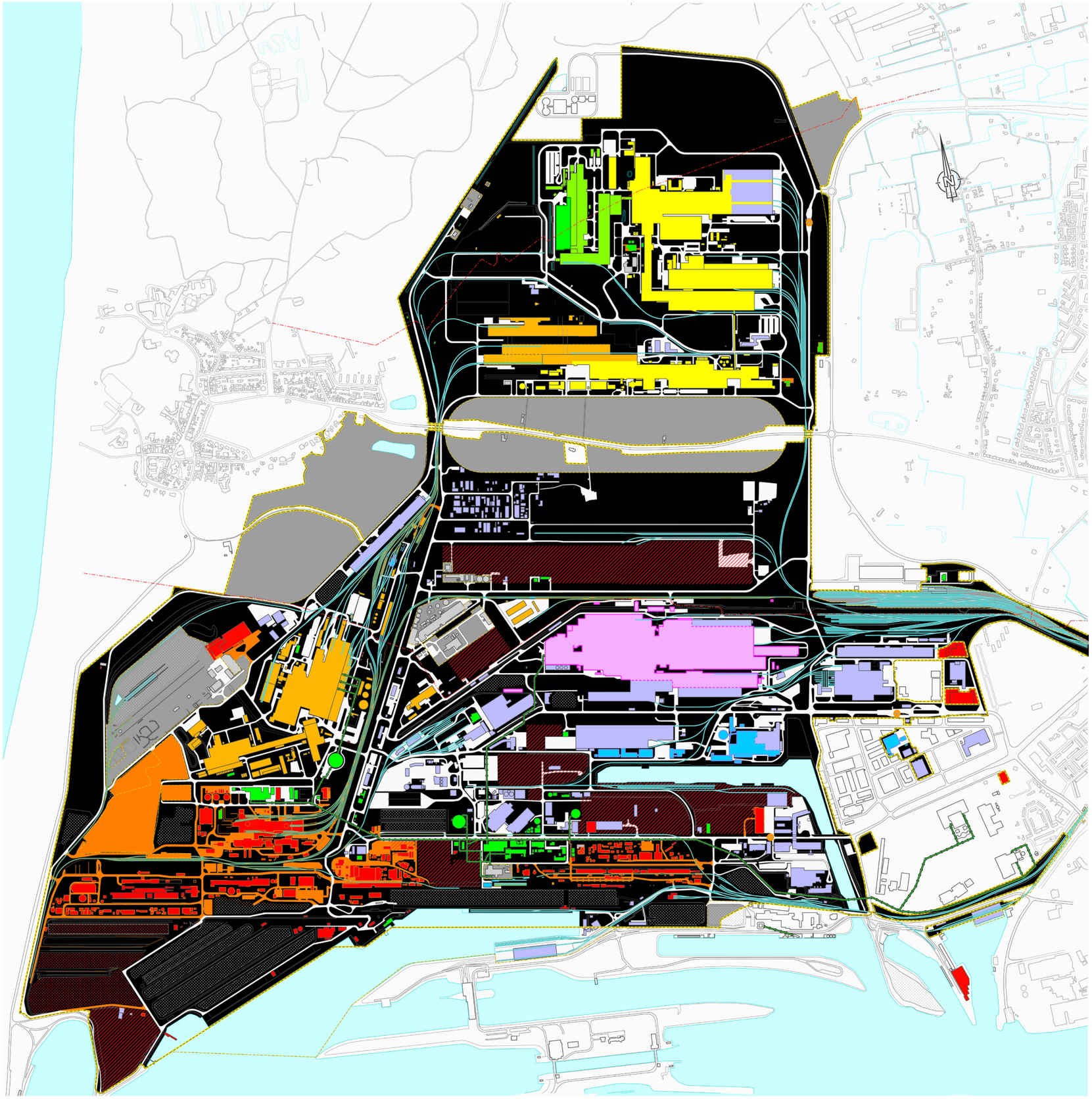
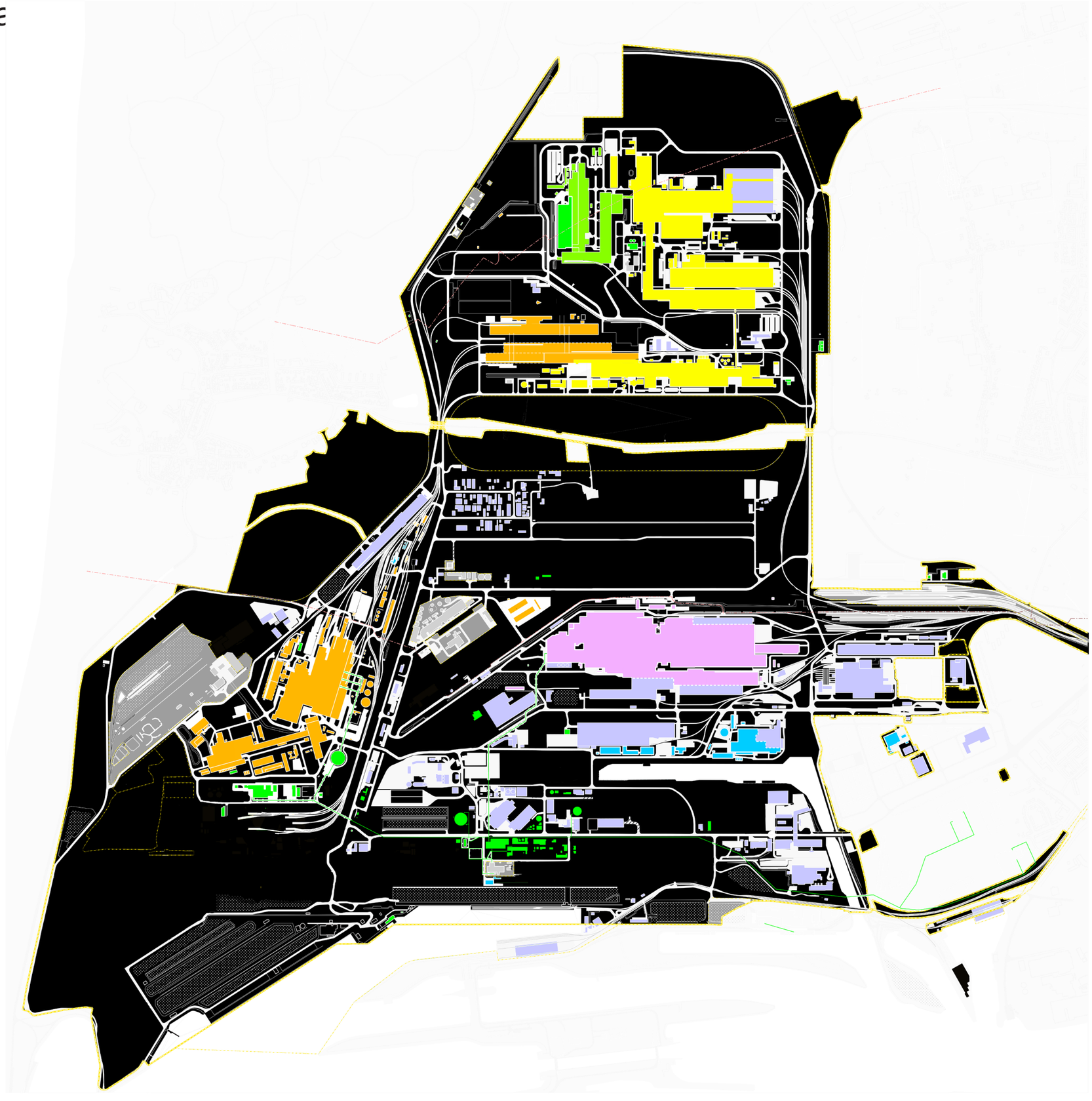


Usable terrain after demolished fa



Freed terrain for my design

Terrain in use by third parties (possibly freed depending on future green Tata Steel deve-lopments)

Property boundary Tata Steel in IJmuiden

Limit of use of Tata Steel in IJmuiden

Height of usable terrain

+ 4m NAP

+ 8m NAP

higher dunes

Low terrain

The harbour area is 4m lower than the rest of the errain

Property land (not in use by Tata Steel)

Empty property land in use by Tata Steel

Steel production

Hot and cold strip rolling mill

Coated products

Energy company

Services

Steel packaging

Research, Development & Technology

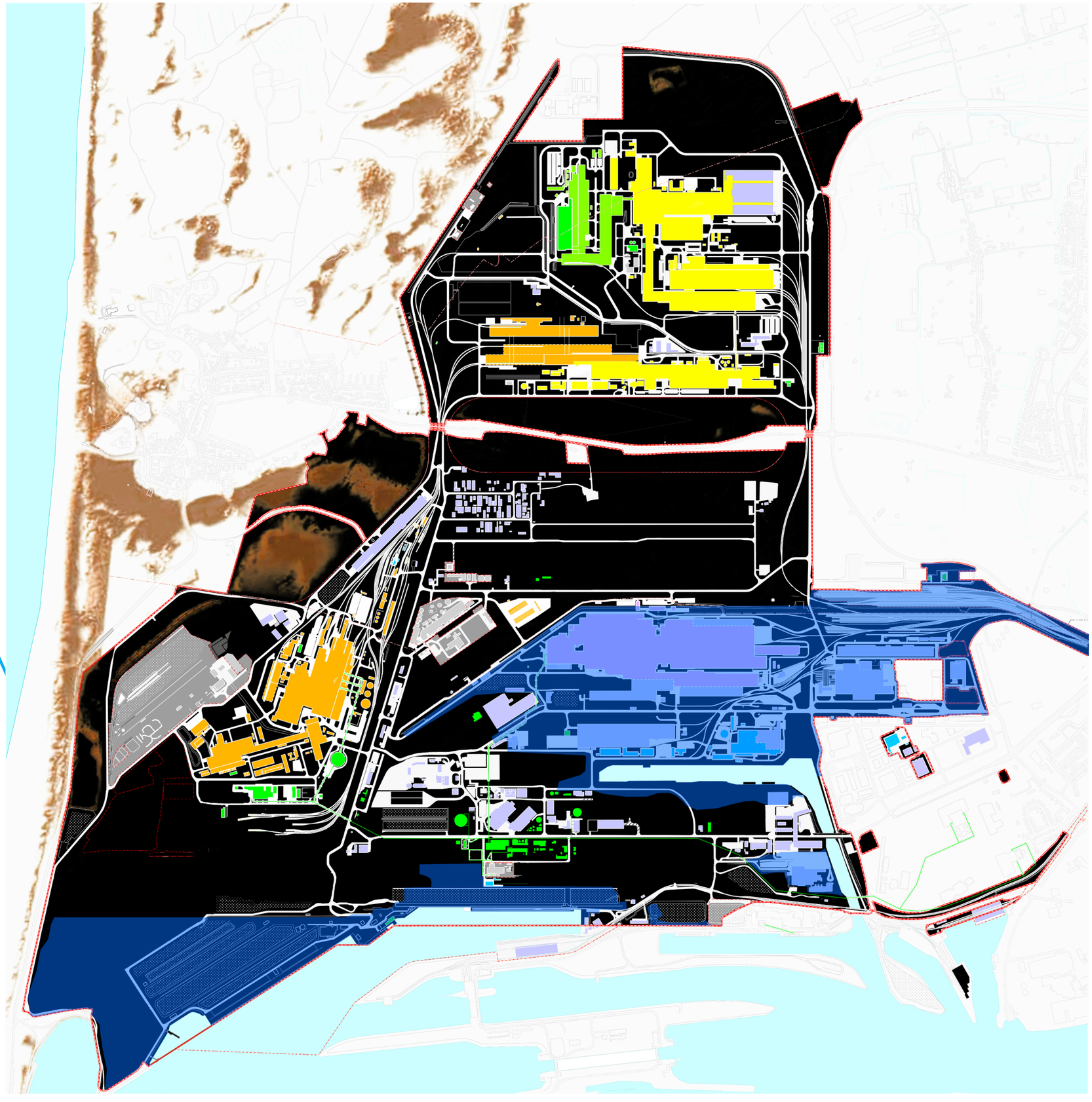
Paint line

Third parties

Terrain under development

Storage of raw materials

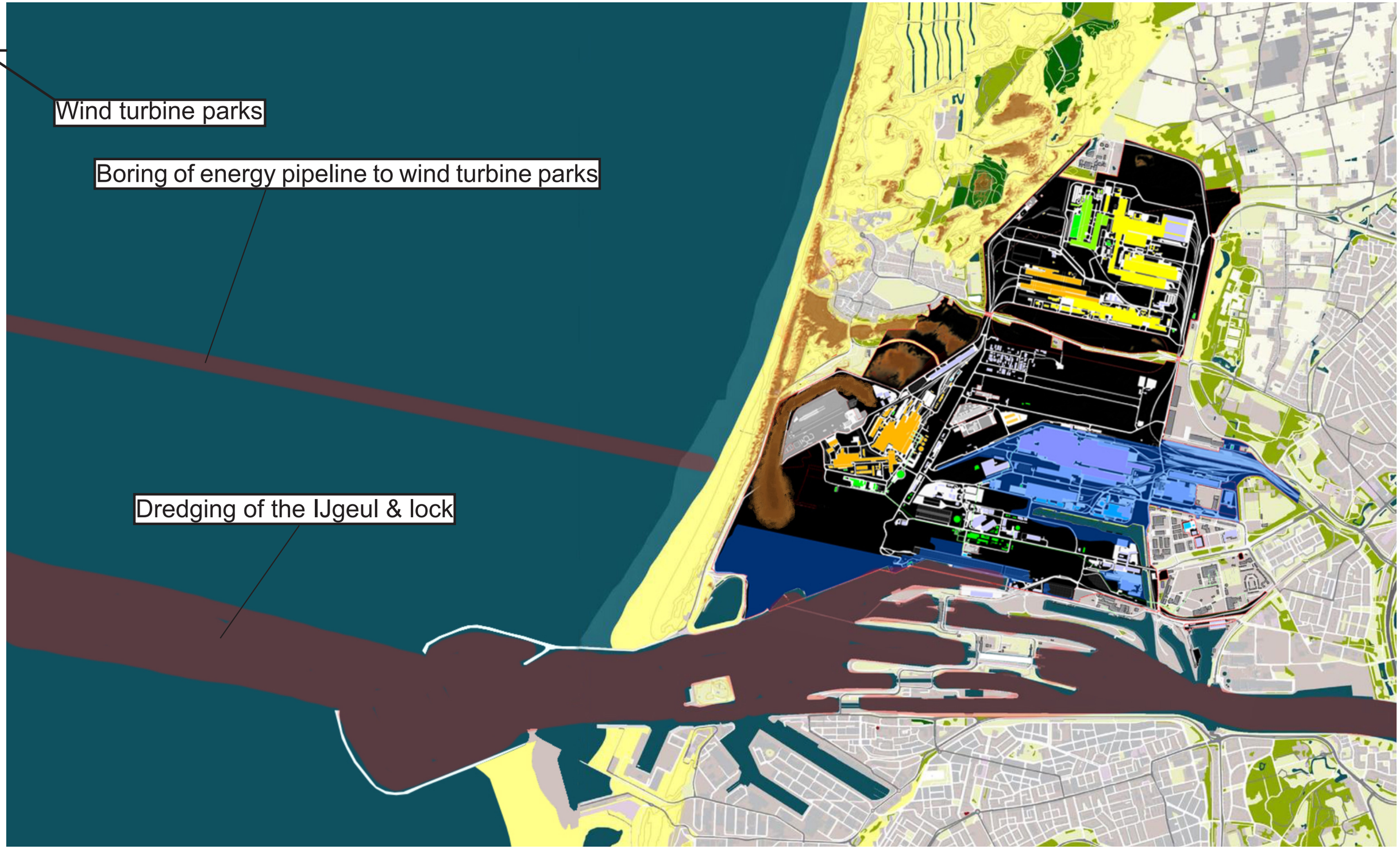
roperty boundary Tata Steel in IJmuiden



Tata’s 45m high dune

3.0 My vison for the site

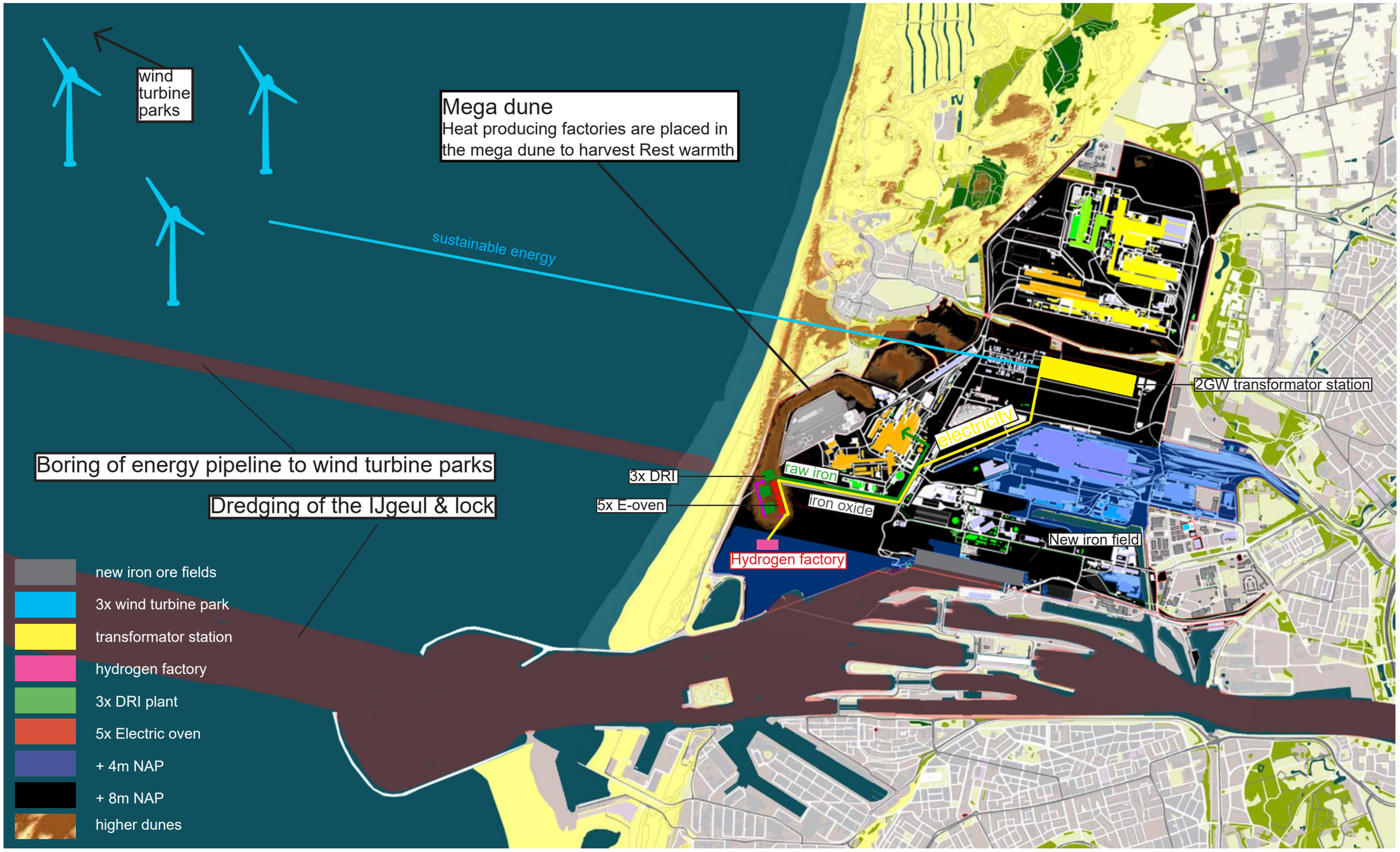
Use excess dredging sands



New dunes

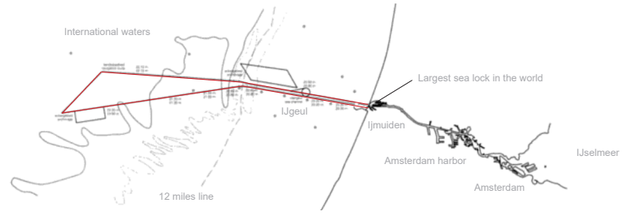
1,3 million m3 of anually dredged sand from the IJgeul & IJmuiden lock can be used in my design.
The top layer can be covered with old clean sand from boring of the energy pipelin.

Placement of new factories



Using exces dredging sand

Where the digging of the North Sea Canal cuts through the landscape above sea level, the IJgeul cuts through it below sea level (see picture to the right). This fairway is just as long as the distance between Amsterdam and IJmuiden, which means that the North Sea Canal is actually twice as long. This channel is continuously dredged to prevent silting. Also the largest sea lock in the world is being build in the North sea canal at this moment. Dredging of this lock complex and the IJgeul produces 1,4 million m3 of excess dredge sand per year. Tata steel plans to build a mega dune of 45m high to block dust and sound nuissance to Wijk aan Zee. I will place all new heat producing factories in this mega dune to harvest their rest warmth and use the opened up terrain (old coal- & iron fields, demolished factories) for the new non polluting, nature inclusive design of the transparent hydrogen factory.



Building the largest hydrogen factory in the world

Going from 100MW to 500 MW

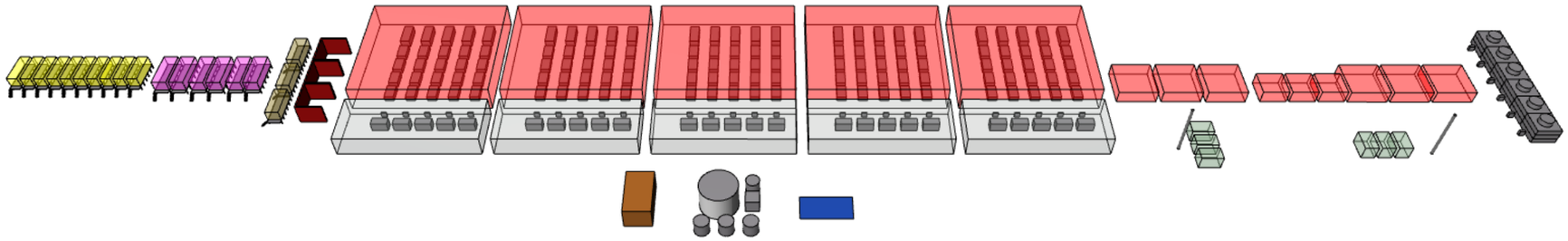
Tata Steel has made a preliminary design for a 100MW hydrogen factory. The whole proces resolves around the electrolizer building in the middle where water gets polarized into hydrogen and oxigen. An industrial road with piperacks surrounds the main components for accesibilty and maintainance purposes. Other installation like transformators, compressors, purifiers, release stacks, electronic filters and watercooling towers can be found in the periphery.

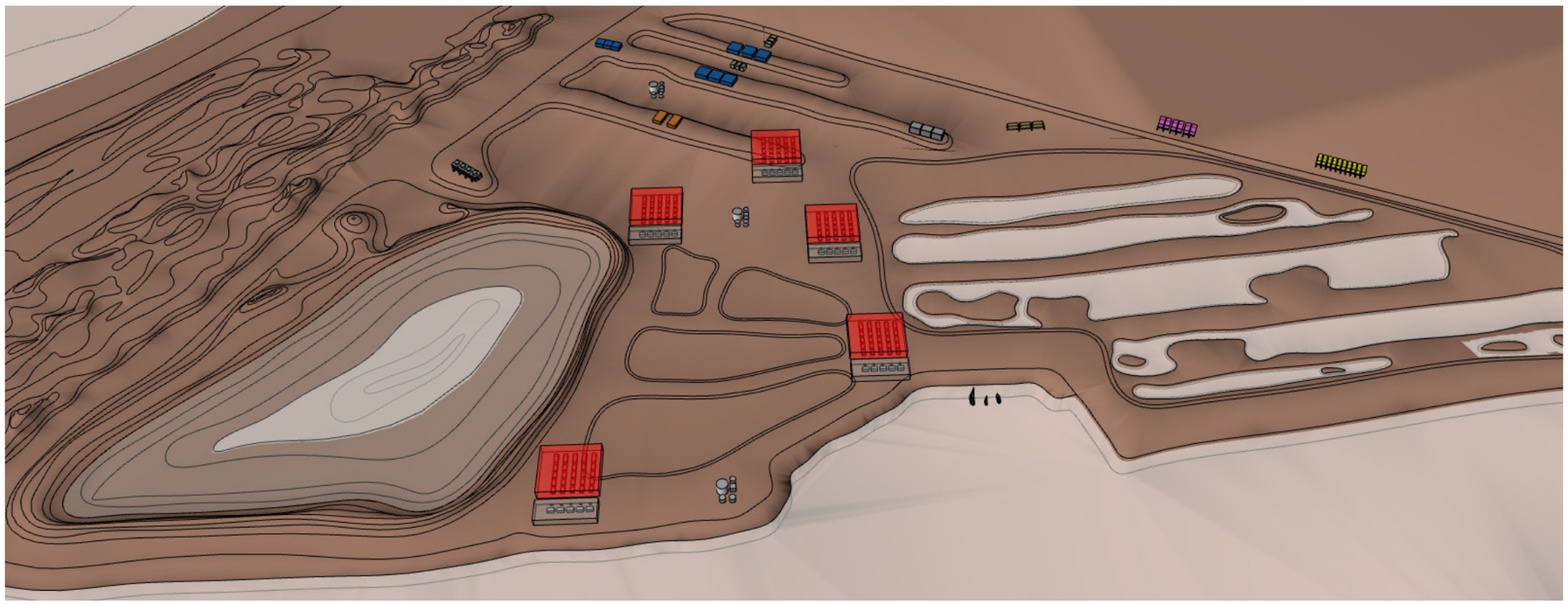
Due to the high hydrogen demand for the future development plans Tata Steel will need a much bigger factory and plans to upgrade it to a 500MW factory (see picture below). this means the core gets multiplied by 5 and the periphery by 1,5.

Rest warmth destruction

The trafo cells, the electrolizers and compressors produce an enormous amount of rest-warmth. One third ot the 500MW input transforms to rest-warmth. This is 167MW! One MW can provide 1000 households with electricity at the same time. Meaning the hydrogen factory could power 167.000 households, but it gets d**estoyed in cooling towers!**
Ofcourse my design is going to harvest this!

Rest warmth producing installations in 5000 MW factory

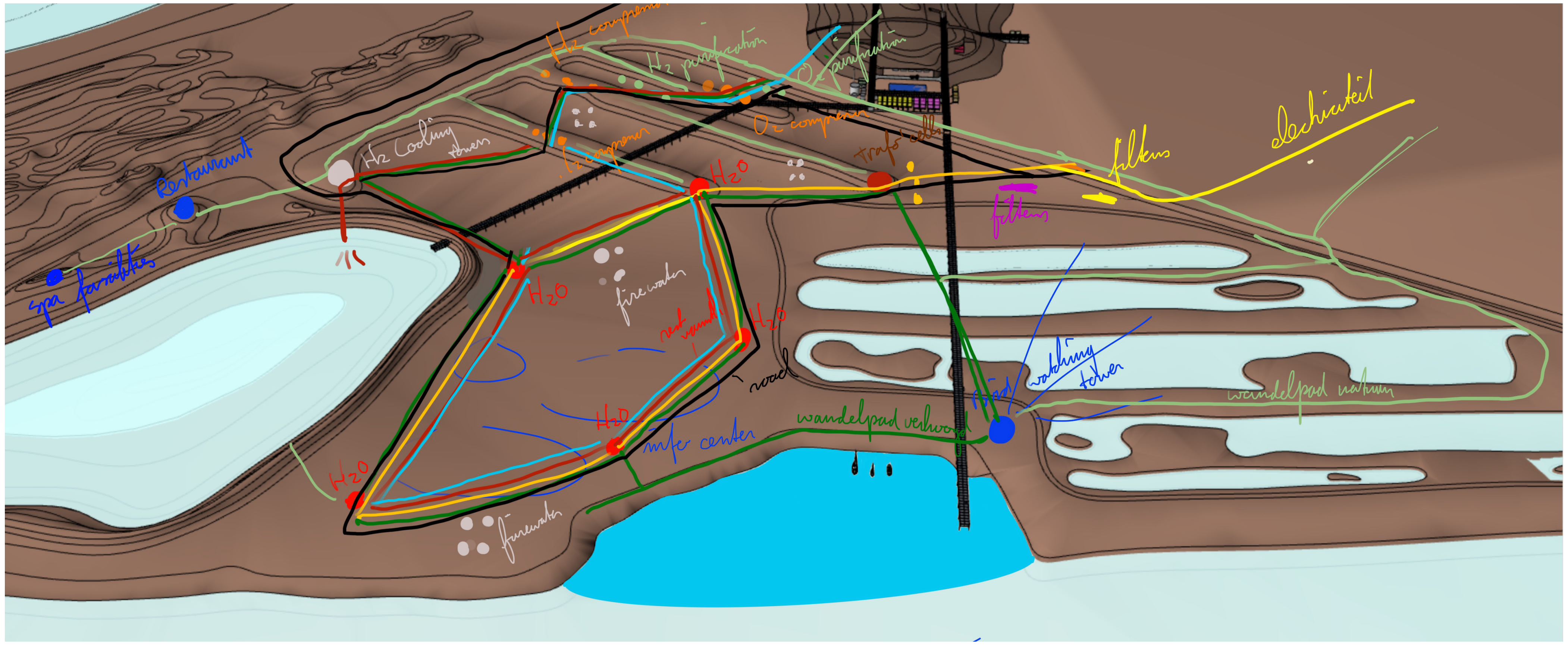




Page conclusion

I will place residual heat producing installation of the hydrogen factory in man made sandstone cavities inside sand drifting dunes to harvest the rest-warmth.

New terrain layout



first idea of installation distribution and road connectivity

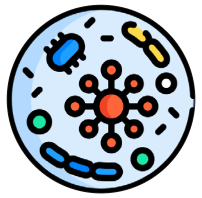
model of terrain height and sand distribution

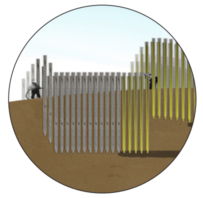
Using exces dredge sands

After demolition of the old factories, I will use the excess dredge sand from the dredging of the IJgeul & lock of IJmuiden to turn the opened up space into a nature reserve and campus for the public to experience the future of green steel producing. The dredging sand will create strategically placed 5-10m high dunes with drifting pits on their S-W side that spray calcereous sands over the rest of the terrain to battle unwanted further nitrofication and accidification of the soil. These dunes will hold man made sandstone cavities inside in which the rest-warmth producing installations of the hydrogen factory are placed. This ensures that the new industrial installations give back space to nature in the form of heat harvesting, sand drifting dunes.

Biogrout technologies of TU Delft

SmartSoils technology applied on loose sand only take days to convert it into sandstone with an unconfined compressive strenght of up to 35 MPa where natural calcareous sandstones need thousands of years for their diagenesis.


bacteria


injecting


hardening


visual effect

To create sandstone bacteria are injected into the sand, followed up by urea and calcium chloride. The bacteria produce carbonate ions from the urea in the soil. The calcium ions immediately bind with it to form the insoluble calcium carbonate or calcite, which cements sand grains together to form porous sand-lime brick.
The more often you rinse, the stronger the material becomes. Rinse twice for sand-lime brick, ten times for concrete strength up to 35MPa. Usually, the compressive strength of concrete varies from 17 MPa to 28 MPa. The whole proces only takes up a few months.

Residual heat harvesting

Unfortunately the 750 hectare industrial terrain is to big and the surrounding villages to small and far away to be heated by the rest warmth, but it can be used to heat up the local old Averijhaven to turn it into a spa! This will turn the industrial site into a touristic hotspot.

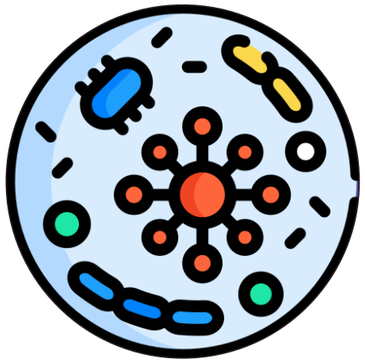
Touristic tour

A touristic tour will lead the visitor from the new touristic harbour (old coal harbour) through the publicly accesible factories and nature reserve to the spa. This will turn the old polluting factory site into a touristic hotspot with the new 'transparent' hydrogen factory as its throbbing heart. The hidden universe of the factory will be opened up to the public without disturbing its fabrication processes, so it remains fully operational. It will invite the visitor with open arms to show the new non polluting way of steel producing. This touristic impulse improves the ecological status of the site through guided participation in maintainance, creates motivation of conservation and improves the economic status of Tata Steels surroundings in the form of spin-off activities for locals. This will not only clean up Tata Steels terrain but also its name!

Smartsoils Technology by GeoDelft/ Deltares

Enhancement and control of natural geological processes in soils by microbiological means

Bacteria + Urea + Calcium chloride

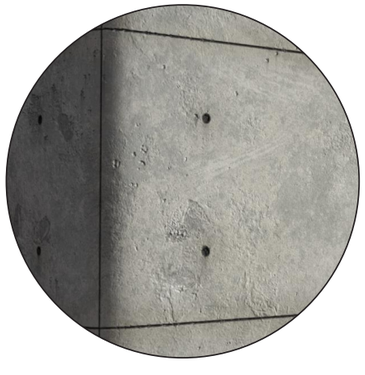


You first inject the bacteria, then the **urea** follows simultaneously with the **calcium chloride** (liquid salt solutions). The calcium ions immediately bind with the carbonate ions produced by the bacteria from urea in the soil to form the insoluble **calcium carbonate or calcite,** which cements sand grains together to form porous sand-lime brick.

Sandstone

The formation of sand-lime bricks normally takes **thousands of years.** Biogrout applied to loose sand speeds up that proces to at most a few months to reach concrete strengt

Concrete



The more often you rinse, the stronger the material becomes. Rinse twice for sand-lime brick, ten times for concrete strength up to 35MPa. Usually, the compressive strength of concrete varies from 17 MPa to 28 MPa.

Turn sand into sandstone with concrete strengt

Where natural calcareous sandstones need thousands of years for their diagenesis, SmartSoils technique like BioGrout applied on loose sand, only take days to convert it into sandstone with an unconfined compressive strenght of up to 35 MPa.

Oyster anchors

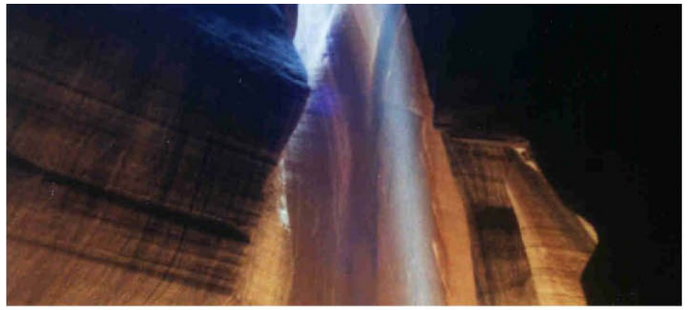
Blocks of one square meter by twenty centimeters high are launched at Yerseke in Zeeland. They serve as anchors for oyster clusters They dampen the waves and trap sand. This can help to maintain sandbanks.

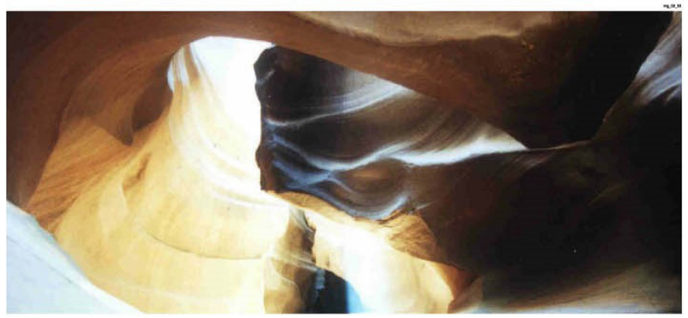
Use in design

man made sandstone

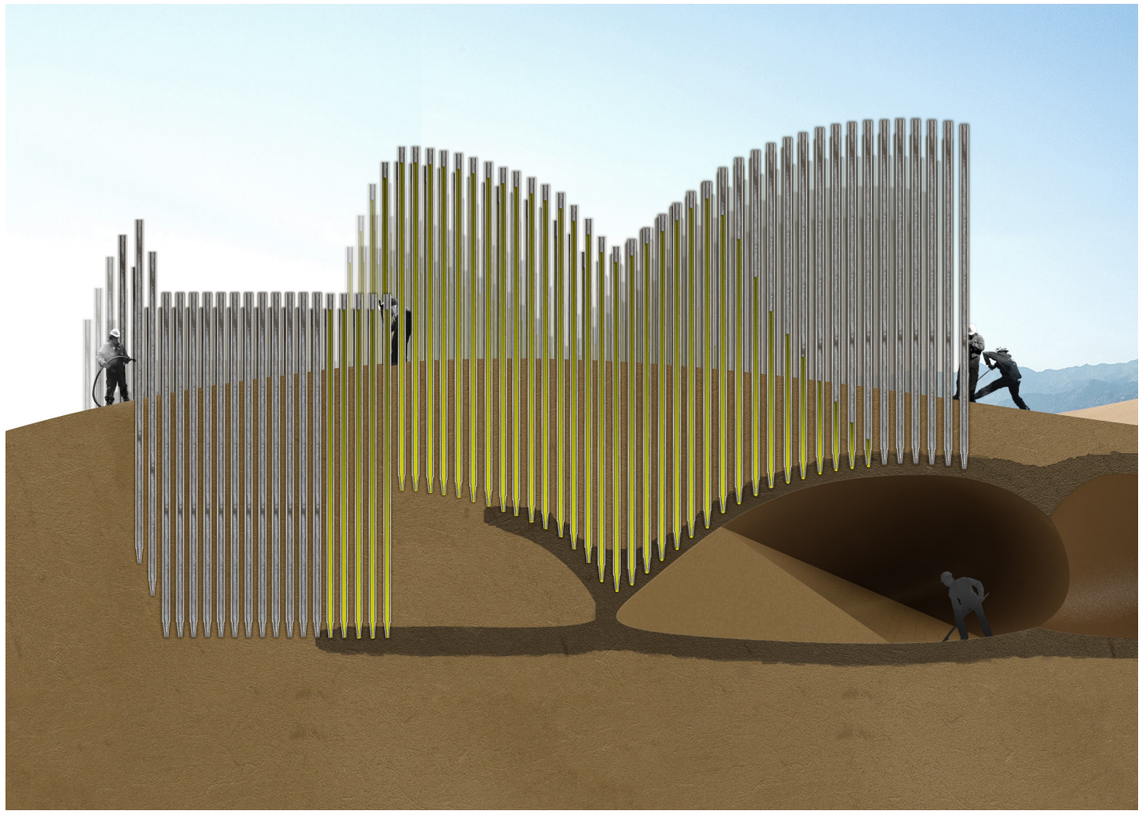
Smartsoils Technology by GeoDelft/ Deltares

Enhancement and control of natural geological processes in soils by microbiological means





inspirational imagery of sunlit sandstone cavities



bacteria can be injected deep into the dune to create any shape

model of possible construction method in sandstone layers of 1m

Dredging of the old harbour

The harbor was converted into a dredging depot in the mid-1980s to store contaminated dredged material from the North Sea Canal. Rijkswaterstaat is currently removing the 85,000 cubic meters of dredging material for permanent storage in the De slufter depot in Rotterdam.

Use Rest-warmth to Turn old harbour into a spa

Kite/ gulf sur-

The beach next to Tata is largely classified as an activity beach for kite surfers

Hot tubs

Use the rest-warmth to heat up hot tubs on the beach to involge the many water sport enthusiast

Thermen

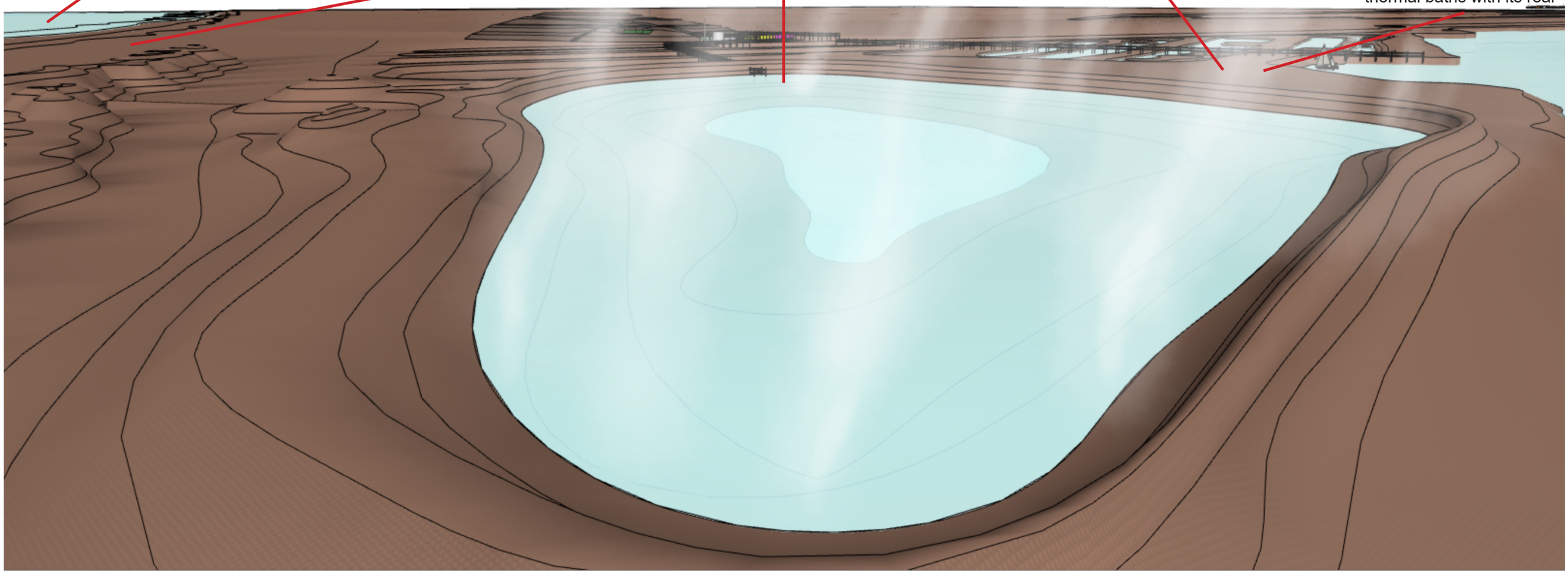
Use the167 KW of rest-warmth from the hydrogen factory to heat up the dredged harbour to turn it into a spa for the public to enjoy.

Moist dune valleys

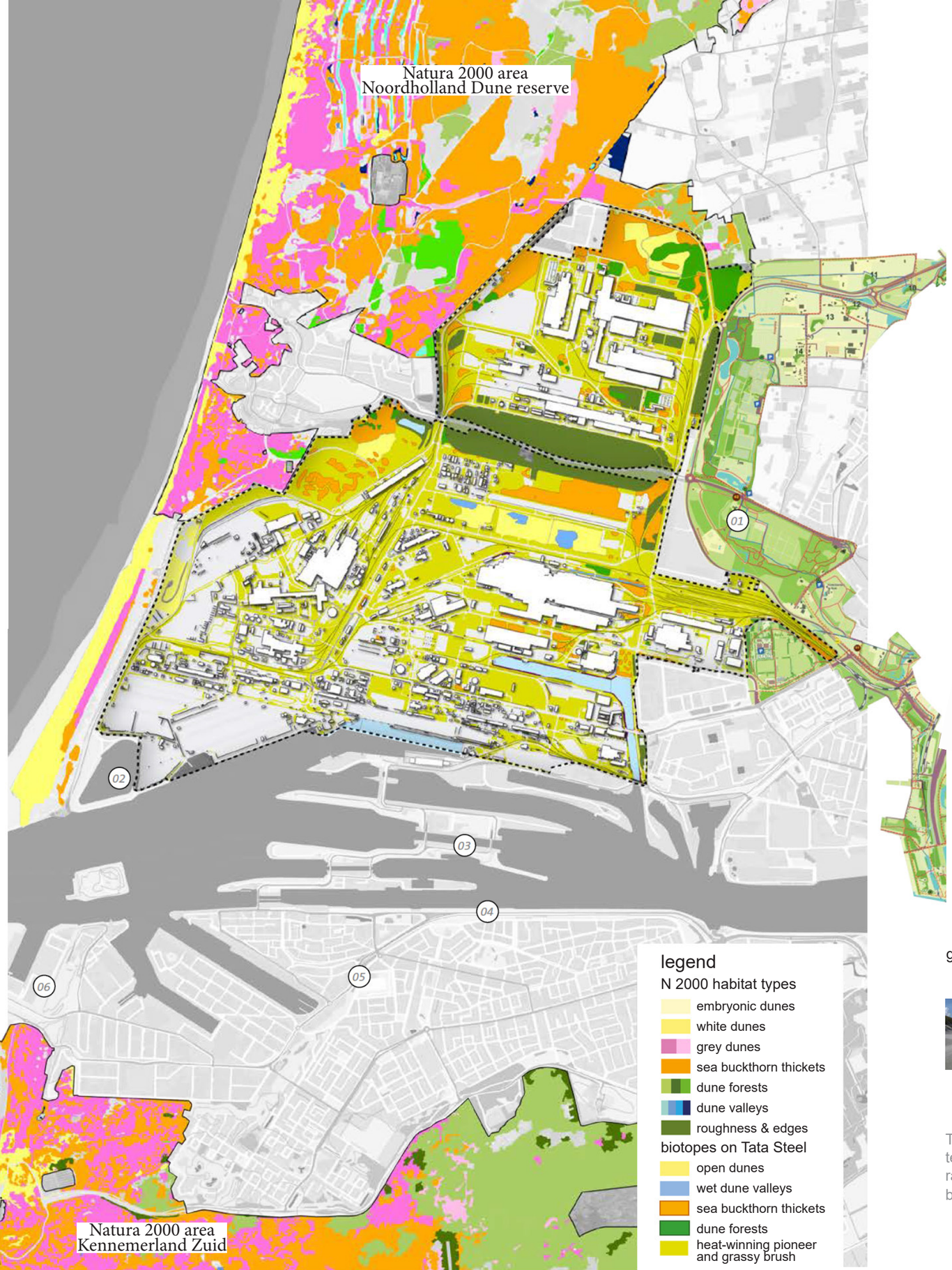
The adjacent old coalfields are perfect terrain to create new dunes with drifts and wet dune valleys

Spa mascot

The wet dune valley specific natterjack toad becomes the mascot of the thermal baths with its roar



Bringing back original flora and fauna



gradient from primary dunes to dune forests

embryonic dunes | white dunes | grey dunes | sea buckthorn | dune valleys | dune grassland | dune forests

The Tata Steel site now consists of biotopes that are uncommonly monotonous, disproportioned and distributed in comparison to the natura 2000 nature reserves surrounding it. My new design will bring back the natural balance which is so characteristic of the original dune landscape to restore the threatened flora and fauna by claining up and maintaining the grounds on the undustrial terrain (see diagram in upper right corner).

Use Tourism to improve ecology

Tourism

Motivation of conservation

Taking people along in the change of the landscape

Give tour over Tata terrain by forrester

Employ local people & turn them into long term stakeholders

Use tourists to maintain the nature

Teaching tourists about dune specific flora & fauna and let them pick exotics

Training people in battling nitrofication and accidification of the ground on the newly designed industrial site to turn in back into the original dune landscape

Create drift pits

Creating annually rotating drift pits on the 5-10m high (new) dunes to be able to spread calcareous sand up to 500m to battle acidification of the grounds

New seedbank

Placement of annually harvested hay from Natura 2000 area Kennemerland South as a new seed bank on terrain from which the contaminated top layer (0.5 -1m) has been removed

Cleaning & maintaining the industrial grounds

Cleaning

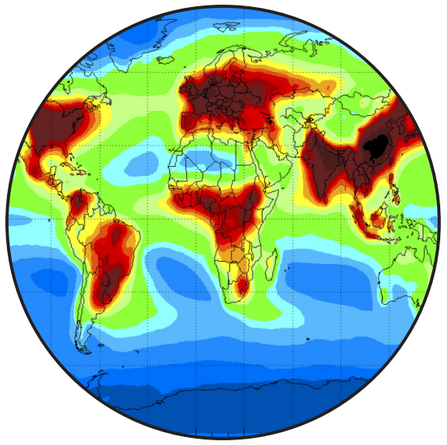
After demolishion of the old factories the contaminated top layer of the ground (0,5-1m) needs to be removed to reach the old firtile ground layers. New dunes can de formed with the 1,3 million m3 of anually dredged sand from the IJgeul & IJmuiden lock that follow the geomorphology of the old coal- and ironfields to create dune strips of 5-10m high with valleys inbetween. The top layer of these new dunes can be covered with sand from the digging of the energy pipeline deep in the North sea that has no PFAS (Poly- and perfluoroalkyl substances). This forms the perfect substrate for dune specific flore species to grow on!

Maintaining & hypothesis

This perfect substrate needs to be maintained as long as the global nitrogen deposition and accidic rains are still going on. One of the main pillars of my design for the hydrogen factory is tourism, because I believe motivation of conservation starts with getting the public involved. I want Tata steel to become sustainable, non pollutive, eco friendly, entertaining, involving and educative by turning its opened up terrain into a campus and nature reserve for the public to experience the new sustainable ways of steel producing and the revived dune landscape. The public will help themselves with battling the ongoing nitrification and accidification of the new grounds by creating anually rotating drift pits on the new dunes that spread calcerous sand, pick exotics and place new seedbanks (picture to the right).

Use Tourism to improve ecology

Global nitrogen deposition



Within a few years, nitrogen will start to accumulate in the clean soil again due to the global nitrogen crisis and acid rain will acidify the dunes again

Nitrogen-loving plants take over

Nitrogen loving plants like grass, scrubs, trees and sea buckthorn will take over

Use Tourists

Training the public to battle acidification of the ground and nitrogen deposition

Sand drift pits

Let tourists dig sand drift pits on the SW side of 5-10m high dunes before the storm season begins

Reviving the open dunes & moist valleys

Old coal fields

Coal is out of use due to new hydrogen factory

coal out of use

Remove top layer

Scrape away the top layer of contaminated ground from the old coal-fields.

remove 0,5-1m sand

Use dredge sand

Bring in exces dredge sand from the IJgeul & IJmuiden lock to cover the old coalfields with a subtrate layer.

1,3 million kg/ year

Create new dunes + wet dune valleys

Use the geomorpho-logy of the old coalfields to create dune strips of 5-10m high with valleys inbetween. Cover them with old clean sand from digging of energy pipeline deep in the North Sea

5-10m high dunes

No PFAS (Poly- and perfluoroalkyl substan-ces) in old sand layers

Let nature take over

The fertile clean subsoil ensures that dune speci-fic species start to grow on the nitrogen-poor soil

nitrogen poor

not accidic

+ dune specific species

Use Tourism to maintain the dunes

Blue winged grasshopper

Little mother-of-pearl butterfly

Sand drift pits

Let tourists dig sand drift pits on the SW side of 5-10m high dunes before the storm season begins

The contaminated soil from the dust pits must be washed. This can be used to make fake dunes that serve as a sea barrier or be put under highways

Sand drift

Sand pits spray chalky sand over the acidified grasslands behind the dunes up to 500m away

Dune specific flora returns

Within a year, these dust pits grow half closed with dune-specific species

Sand lizard

Natterjack toad

Repeat

Within a few years, the pits will be filled with dune-specific species. Repeating this process routinely ensures that all dune soil will be re-covered with original species and that all grassland behind receives calcareous sandy soil.

Reviving the dune grasslands

Black side factories

These higher grounds (+8m NAP) are the former ‘black side’ of the estate where the old polluting factories stood. This becomes vacant flat ground.

Removing old foundations

We find clean sand with old shell layers under the foundations. This is perfect drifting sand and has enormous potential, but there is no seed bank available.

Remove top layer

We scrape off the top 0,5-1m of contaminated soil from the orhter vacant ground.

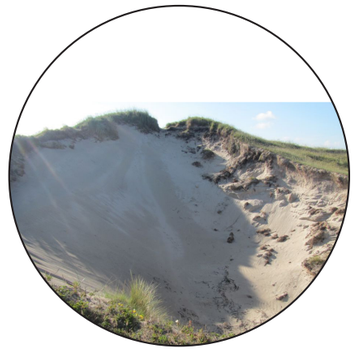
Tourists place hay as new seedbank

Tourists place annually harvested hay from the adjacent Kennemerland South dune valleys to act as a new seed bank.

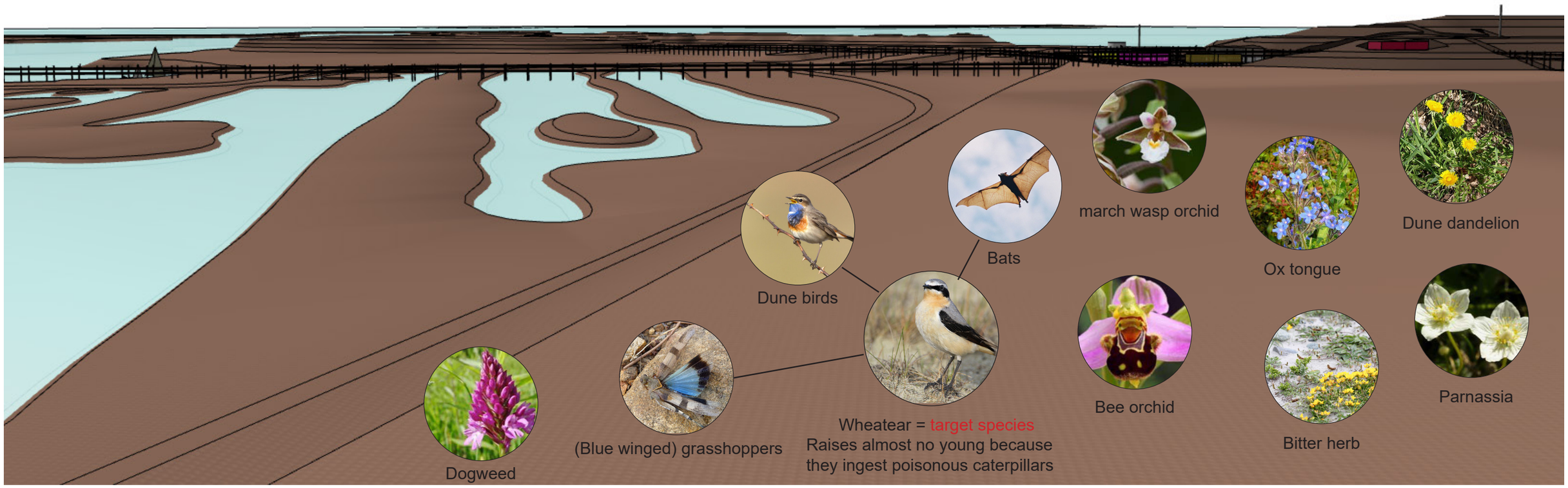
Flower fields & butterflies

The hay ensures that the flower seeds come up before the grass can and makes soil fungi return. We mow only once a year instead of 15 times like Tata Steel does now. This creates a flowery area that attracts butterflies from South Kennemerland.

Calcereous drifting sand



The drifting pits made by the tourists spread calcareous sand up to 500m to battle acidification of the grassland. We let groups of tourists pick exotics from among the dune-specific species during information tours.



Slufter

Remove Iron ore

Iron ore will be shipped to the new iron ore deposit

Remove top layer

Scrape away the top layer of contaminated ground from the old iron fields

Break quey

Break through harbor quay to let seawater in

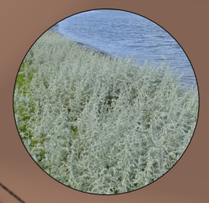
Let sea in

Under the influence of spring tides and strong winds from sea, allow salt water to enter the tidal area through the gully

Creek system

The old iron harbor becomes a creek system. The dunes receive a supply of fresh sand and nutrients

Sea wormwood



samphire

Sea lavender

Zoutmelde

salt tolerant plants

New iron ore fields

Bird breeding area

Avocet

Eider duck

Shelduck