Ana da Fonseca

The *Port* and the Automaton

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North Sea: Landscapes of Coexistence
Transitional Territories Studio 2018-2019

MSc3 Research Report

Index

Abstract

This project initiates by looking at the space as a territory (Raffestin, 2012), constructed through social interactions and networks. I believe the design project must anticipate the global social and economic shifts that are present within the territory of the North Sea and must be shaped in relation to the effects of these changes on local societal level. Mapping is used as a tool of associating, ordering and projecting the changes in the qualities (territorialities) of the space rather then a mere visualisation tool (Corner,1999). Equally important, The scripting of scenarios based on literature and statistical data allows for the depiction of the alternate realities that the societal shifts could produce.

Taking Port Landscapes, Automation and the energy transition as drivers of change, the project aims at redesigning an automated infrastructure for windblade production, storage and maintanance, and with that reshaping the coastal form based on this process. The aim is in determining the relationship between automation, form and the port landscape. Taking both automated and natural processes into account when designing, the project is inspired by the writings of Martin Pawley, in his work Terminal Architecture (Pawley, 1998) he writes:

" The real barometer of the value of buildings today is not their aesthetic pedigree, but rather their usefullness as terminals in the maze of networks that sustain modern life.Authentic Architecture has been disurbanised. It survives only in the shape of building like distribution centers, factories, petrol stations, **that are designed as instruments not monuments**."

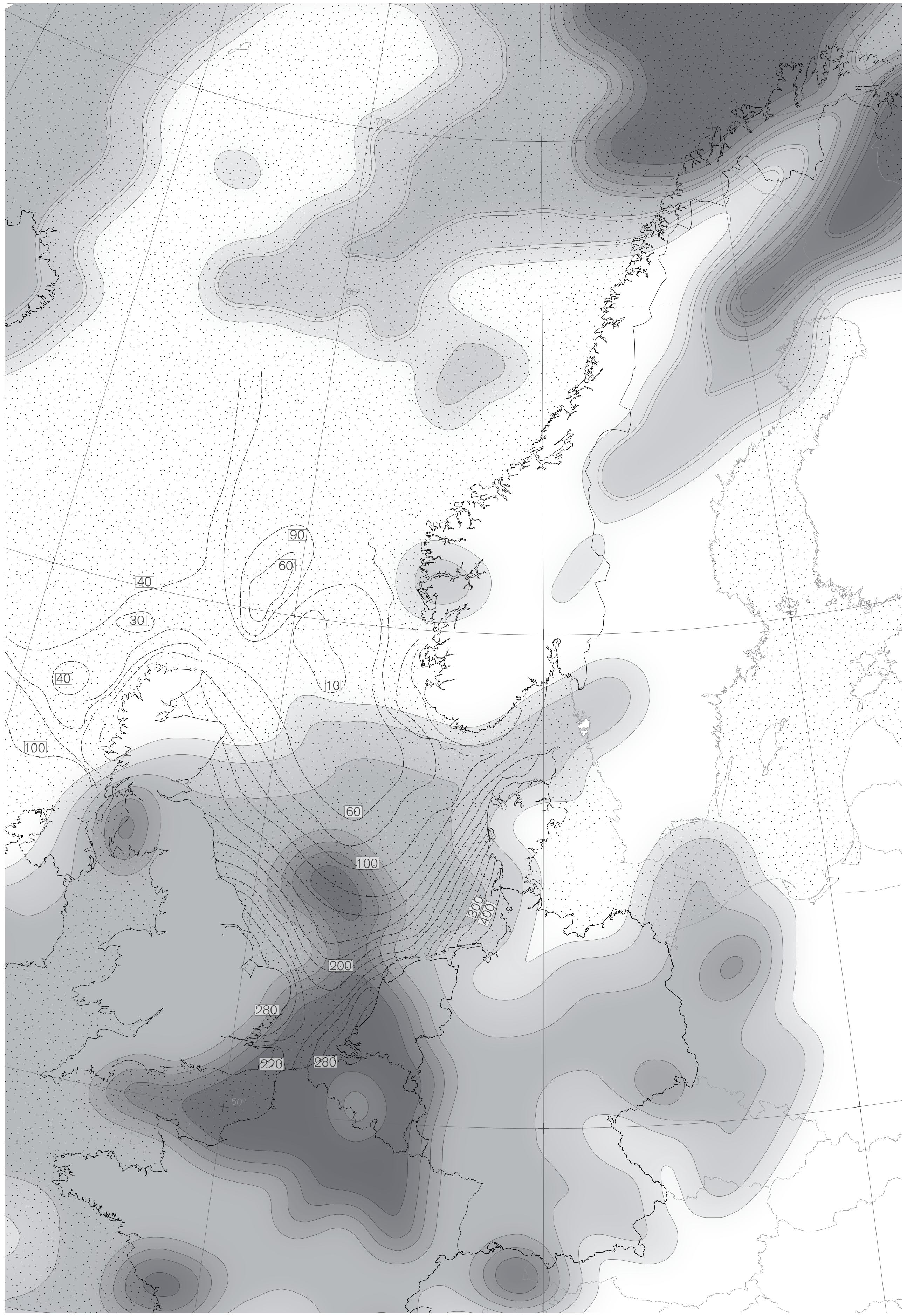
The design depicts the process and actions of the machine. An automated line, hatched by the elements involved in the different processes along it. An attempt of containment and exposure of the ever expanding developments in automation and production. Human actors are no longer present within the confinement of the interior space, and instead as automation is pushed further out to sea due to increasing vessel size and production capacity, the Human remains on the coastline, to bear witness to this new separation between themselves and production. The human is now the spectator of this ever ending automated line.

Key words: North Sea, Ports, Infrastructure, Automation

Territory

1. 1 Territorial Analysis

North Sea



Storm Surges

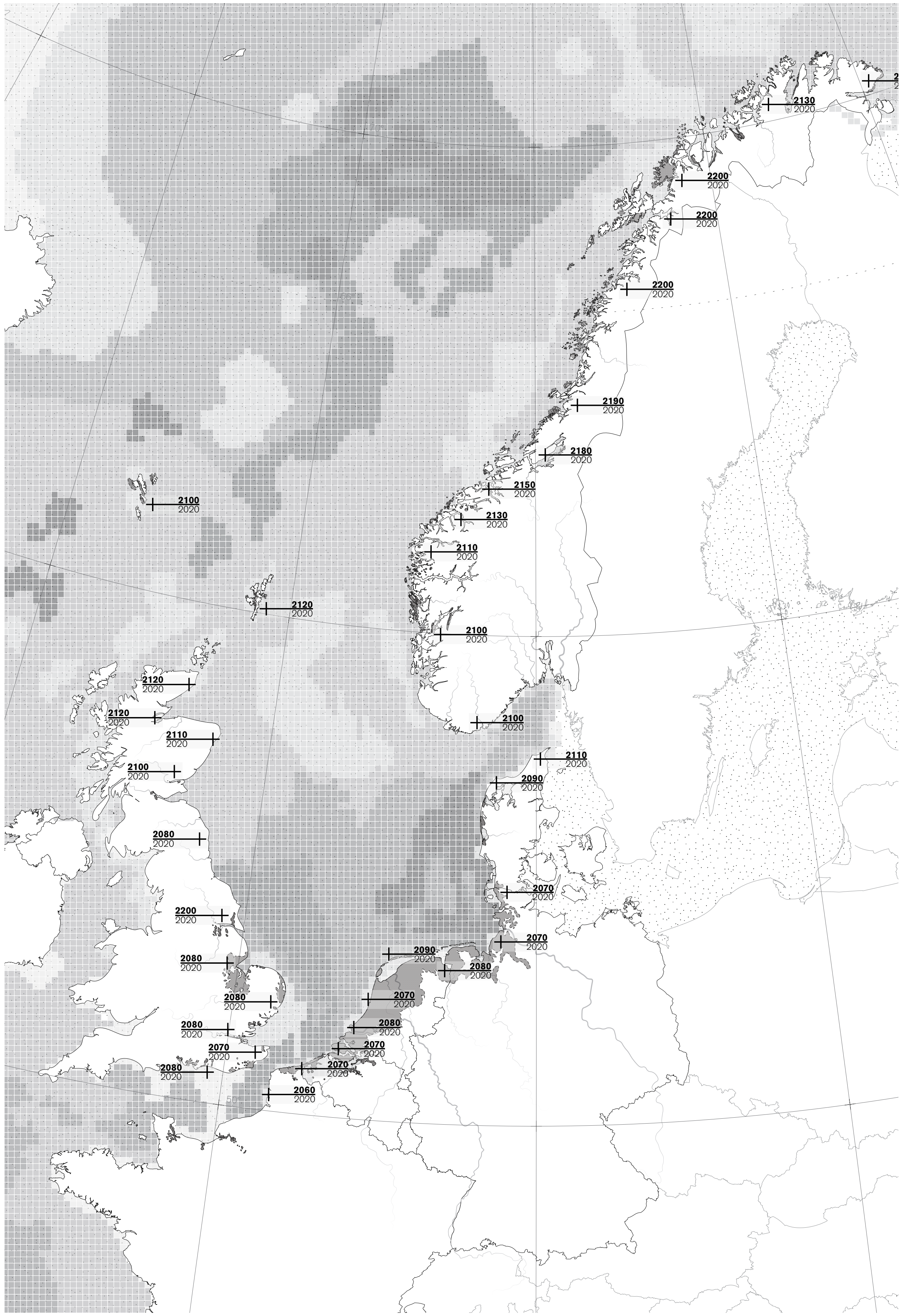
This map represents the extreme scenario for wind speed and air pressure in the future, during winter time. The frequency of winds will increase up to 7% in North West (Martin Beniston, 2007). These conditions will create more storms along the coastal regions of Holland, Germany and Denmark, leading to storm surges, wind will push water towards the coast, it accumulate in a storm surge (Martin Beniston,2007) and will transport moisture on northern Europe and Scandinavia. That determines the excess of precipitation over evaporation (Hurrell, 1995; Sündermann, 1981)

Daily Maximum
Wind Speed

+20.0
+10.0
+5.0
+2.5
-2.5
-5.0
-10.0
-20.0

Long Term
Extreme Surge Prediction

60 Surge height and the uniform wind/ pressure field



Sea Level Rise

This maps illustrates the extreme effect of the climate change in case of +1m sea level rise (SLR) in regard to 8.5 RCP scenario and in the absence of action. The sea projection depicts a prediction for the relative sea level rise in the period 2081-2100.The map renders the flood risk areas in the North Sea region and provides information about when those events are expected to be formalised: as extream event (Flood) or constant condition (Sea Level Rise). In the aftermath of relative sea level rise, the huge part of the coastline shall be reconsidered in terms of water defence systems and urban strategy.
The entire seascape is expected to fully reshape, where most vulnerable countries to those changes are Netherlands, Germany, Denmark, but also part of England. The increasing amount of sea water will affect many aspects of the human habitat, like for instance the entire primary sector of the economy, the appearance of the wide maritime areas etc.

- 0,5 - 0,6 meters
- 0,4 - 0,5 meters
- 0,3 - 0,4 meters
- 0,2 - 0,3 meters
- 0,1 - 0,2 meters
- 0,0 - 0,1 meters

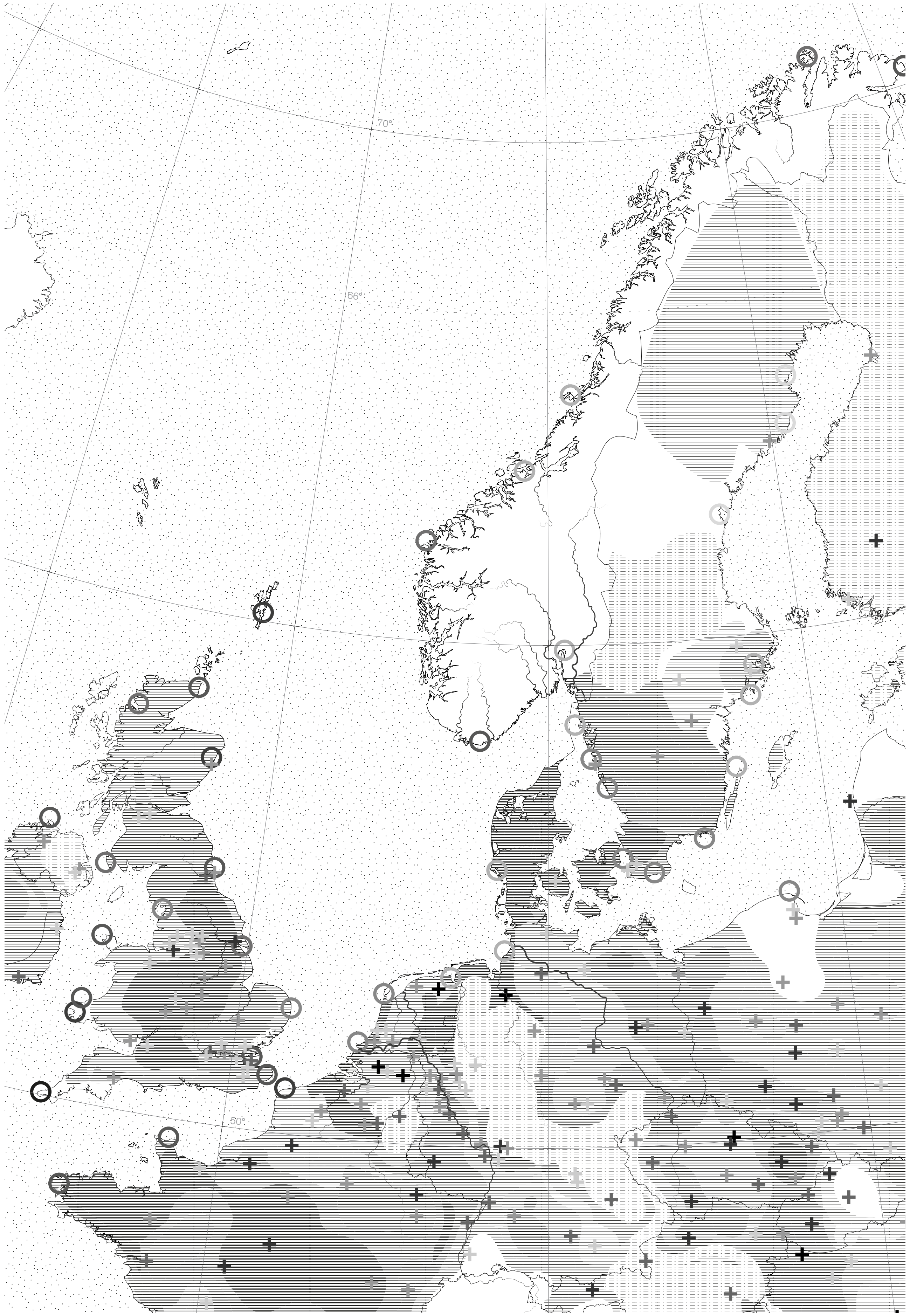
- Land
- Sea
- Flooded areas (1mSLR)

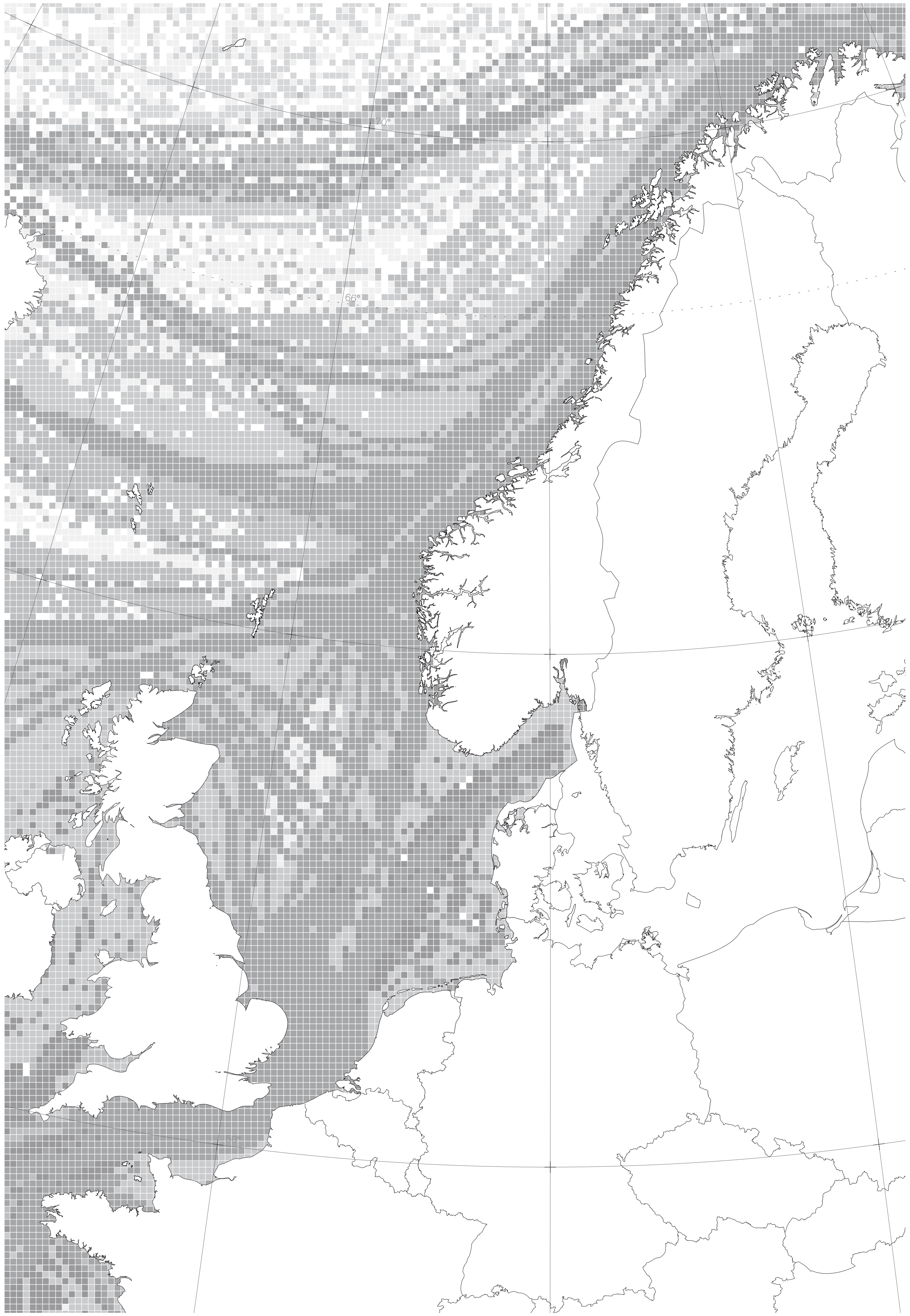
Year / SLR
Year / Flood

Flood Risk

This map reveals the relative change in expected annual damage between the periods of 2071 to 2100 and 1961 to 1990 as a result of flooding events under the RCP 4.5 scenario. What can be gathered from this mapping is that France, UK, Denmark, and the Netherlands
will experience the most increase in annual damage, whilst Portugal, Romania, Finland, and Estonia will experience the most decrease in flooding. Additionally, this conclusion has been correlated with other sources, that project an increase in costal and river floodings in the same areas aforementioned, to reveal a similar pattern.

- Water
- Rivers
- Expected Annual Damage Change >400%
- Expected Annual Damage Change 151 to 400%
- Expected Annual Damage Change 51 to 151%
- Expected Annual Damage Change 26 to 50%
- Expected Annual Damage Change 11 to 25%
- Expected Annual Damage Change -9 to 10%
- Expected Annual Damage Change -24 to -10%
- Expected Annual Damage Change -49 to -25%
- Expected Annual Damage Change -74 to -50%
- Expected Annual Damage Change < -75%
- Chance of River Flooding in Urban Area >30%
- Chance of River Flooding in Urban Area 15-30%
- Chance of River Flooding in Urban Area 10-15%
- Chance of River Flooding in Urban Area 5-10%
- Chance of River Flooding in Urban Area 0.01-5%
- Frequency of Coastal Flooding by Multiplication Factor >100
- Frequency of Coastal Flooding by Multiplication Factor 50-100
- Frequency of Coastal Flooding by Multiplication Factor 25-50
- Frequency of Coastal Flooding by Multiplication Factor 10-25
- Frequency of Coastal Flooding by Multiplication Factor 5-10
- Frequency of Coastal Flooding by Multiplication Factor 1-5
- Frequency of Coastal Flooding by Multiplication Factor 0-1





NOx Emission

This map depicts the NOx emissions concentration (due primarily to shipping) in 2100 under the IPCC Relative Concentration Pathway 8.5 scenario.
The RCP scenarios are four greenhouse gas concentration pathways based on anthropogenic emissions. The most extremescenario (RCP 8.5) assumes high population and relatively slow income growth leading in the long term to high energy demand and GHG emissions in absence of climate change policies. This map is under the scenario in which the radiative forcing (the rate of energy change per m2 of area) is 8.5 W/m2. Overlaying the main shipping routes,
major ports and the NOx concentration allows for a projection that sees the emissions levels significantly increase along the norwegian coastheading to the artic. As the polar ice caps melt, a pathway is open for new shipping routes and by default the nitrogen concentration in the air is likely to increase significantly.

- 3.55 E-11 kg m-2 sec -1
- 2.04 E-12 kg m-2 sec -1
- 1.18 E-13 kg m-2 sec -1
- 4.22 E-15 kg m-2 sec -1
- 44.15 E-15 kg m-2 sec -1
- Shipping Ports
- Shipping Routes

Shipping Routes

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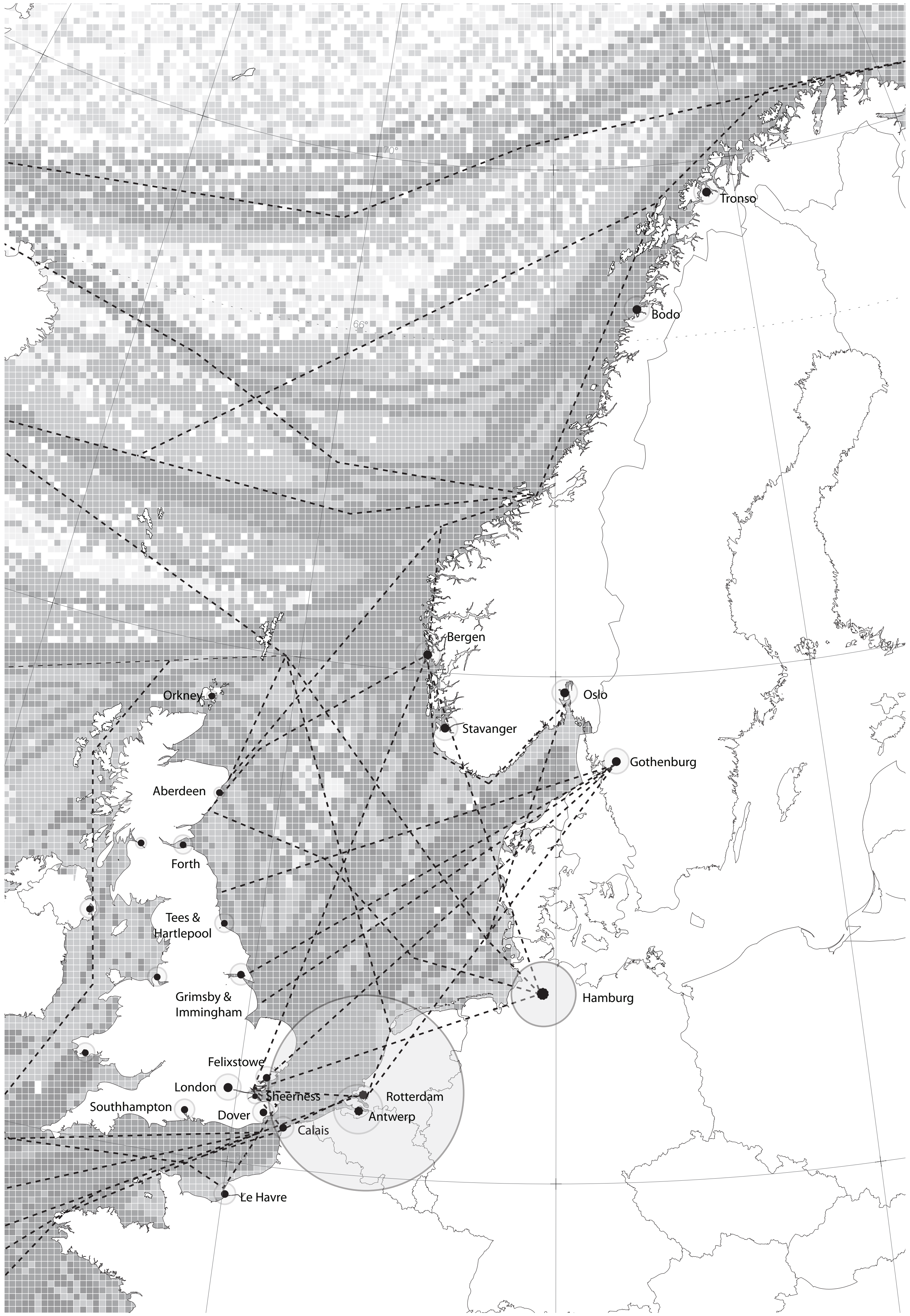

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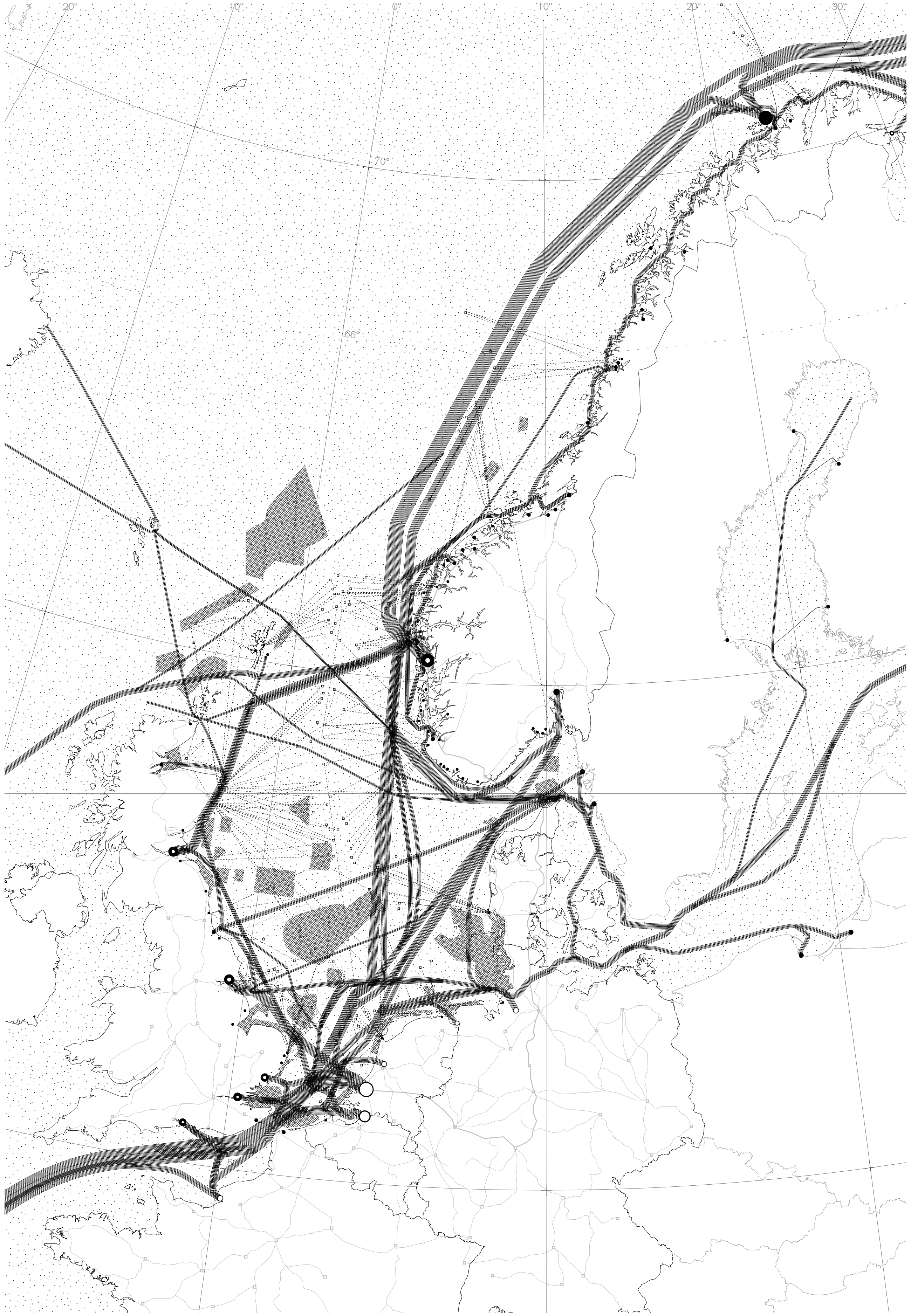
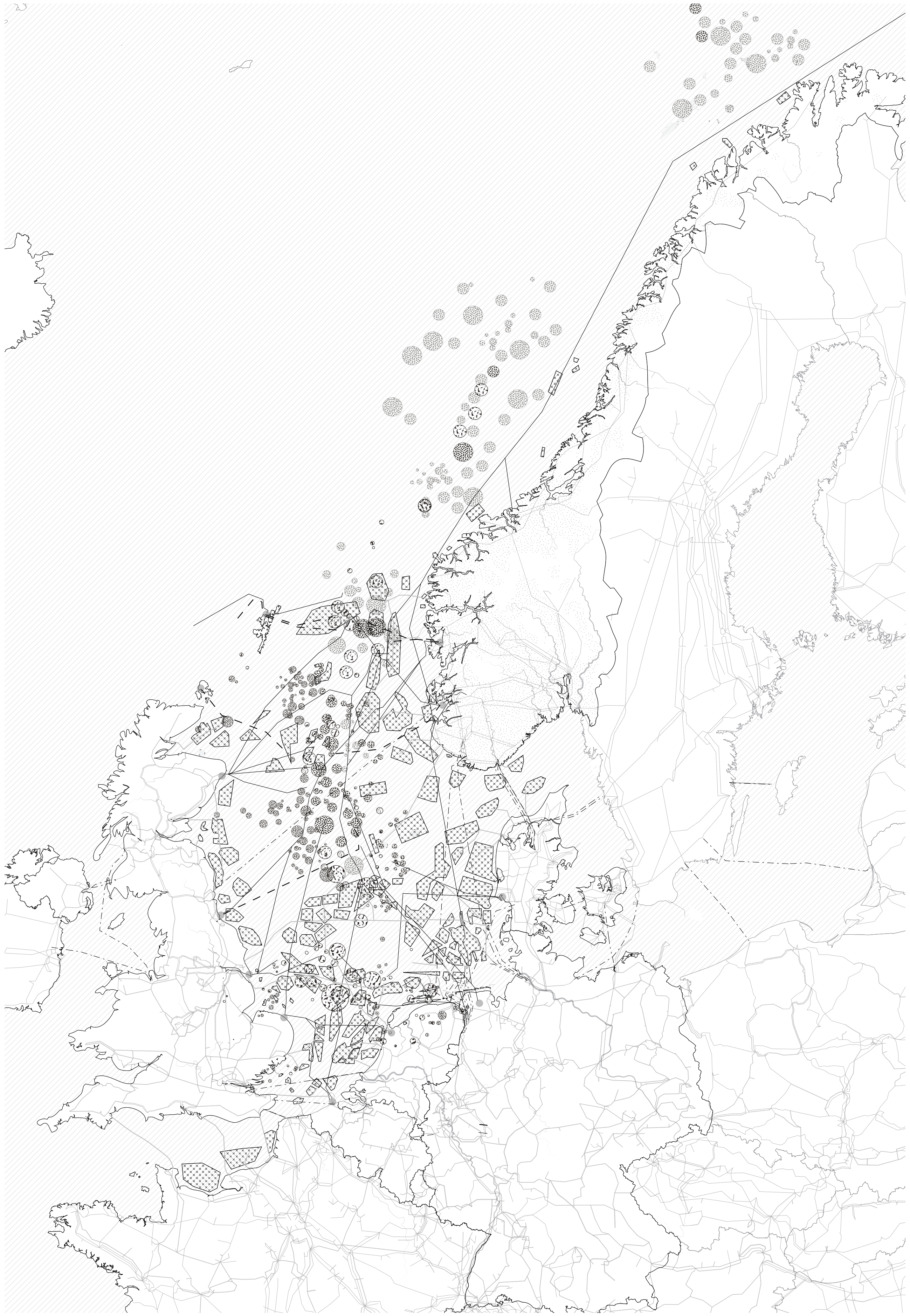


Changes In Flows

The map shows the projection model for logistic flows in 2150 in the North Sea. Dredging of the major harbors in the South is not feasible anymore. New cargo and vessel transfer ports are now located towards the North in Norway. With the opening of the North Arctic Sea route, new ports were openend into the sea on the edge of the fjords where the waterbed is deep enough for future ships. Due to the hard Brexit, the United Kingdom was forced to increase their port capacities across the island. Most distribution enters from the Norwegian ports.

- harbor growth (fast)
- harbor growth (slow)
- shipping flows - density
- small harbor
- oil/gas platform
- service harbor - platforms
- service routes - platforms
- protected areas
- train infrastructure
- train stations



Energy Transition

With the energy transition coming a new time of cultivation of the North Sea will start. The change to renewables and the opportunities for wind energy on the sea will translate in the form of huge wind farms accounting for our energy need. Gas pipelines are reused to connect the offshore windfarms with the onshore power facilities.

fossil fuels

- oil platforms
- gas fields
- gas and oil fields
- potential oil fields

renewables

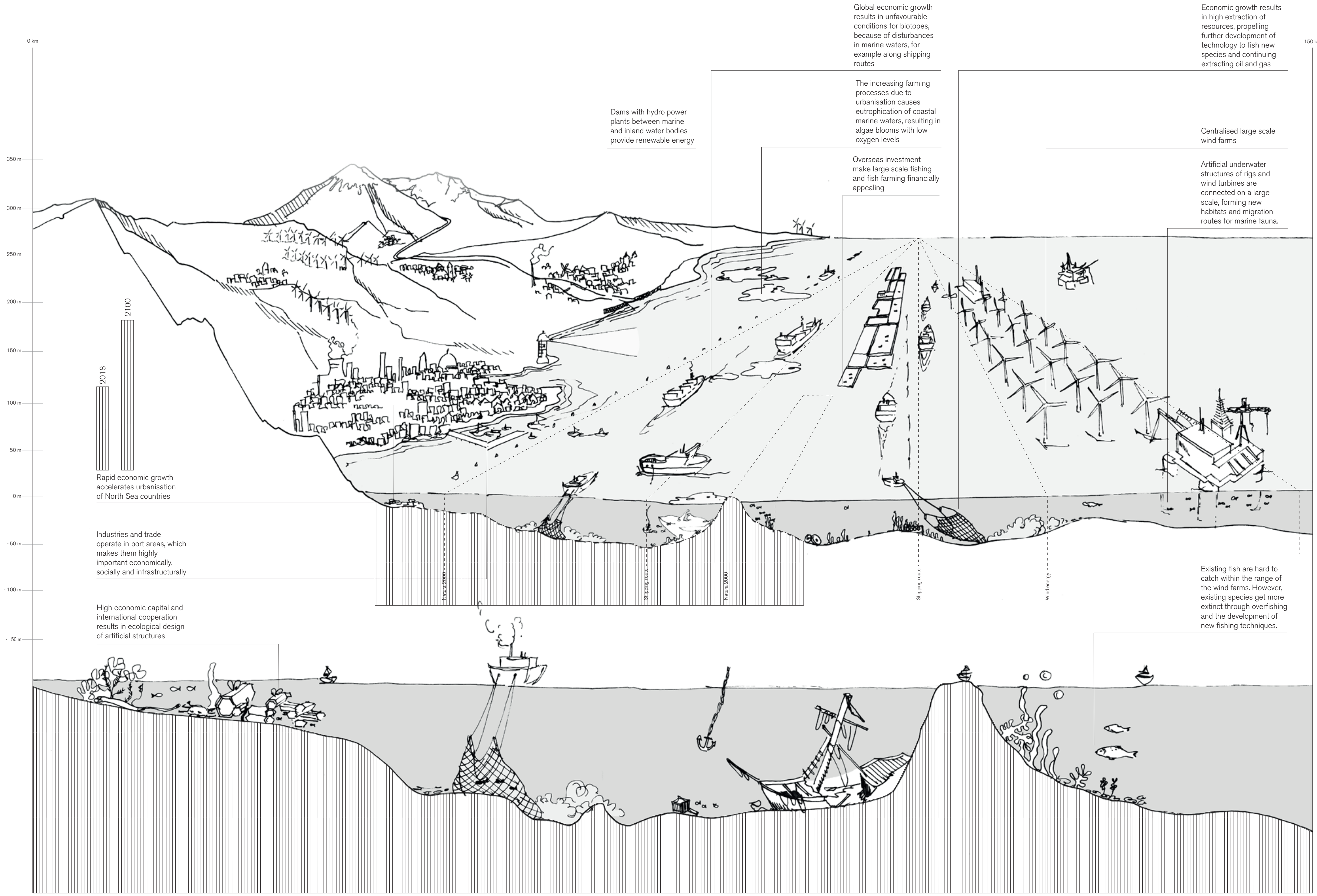
- wind farms
- hydropower
- DC lines
- powerlines

Scenarios

Analysis was done into the projection of 4 scenarios onto the coastlines of the north sea. The scenarios were based on High or Low levels of Co-operation between Nations and High or Low levels of ecological policies. What is projected is the effect on the coastline of the combination of High co-operation and a lot of ecological policies and on the other end of the spectrum, Low level of Co-operation and an extravist agends.

Scenarios - Crowd

This scenario is characterised by 1.5°C sea temperature rise and an increasingly globalised and growing economy, propelling continued North Sea urbanisation. The ecological climate does not change drastically, whilst anthropomorphic factors are in flux, with high global investment. Economic interests are in tension with ecological legislation and action.The modest sea temperature rise has limited impact on current biotope composition. Therefore, existing infrastructures are capitalised upon, expanding current fishing practices and retaining fossil fuel extraction for non-energy sectors; new technologies are developed to exploit deeper locations. Investment in large, centralised wind farms is prevalent. While all these structures act as artificial reefs and create fishing-free zones, their numbers heavily impact the seabed. As such, artificial connection interventions between these structures are required to recreate reef habitats - attracting molluscs, crustaceans and starfish. Coastal ports, harbours and processing plants expand to support industry growth, increasing coastal urbanisation. Combined with a booming tourist industry and new trade routes, there is extreme pressure on coastal habitats that leads to their collapse. Furthermore, the high urbanisation creates an imbalance of nutrients; high nitrate and phosphate levels result in chlorophyll development. Consequently, algae blooms develop, blocking sunlight penetration in the sea's subsurface, resulting in lower oxygen levels and 'dead zones'.The imbalance of nutrients and economically-driven overfishing has the most significant impact on the sea's biodiversity. The artificial reef biotopes increase in limited areas but the sea suffers an overall collapse of biodiversity in coastal areas and open waters.



1.2 Problem Statement

1.3. Problem Statement

The problem was identified during the first stage of the research. To understand the relationship between different scales, from the territory of the North Sea to the people who inhabit it, several initial studies were done on climate and societal trends and projections. This initial research led to the identification of British sea ports as an area of great risk but also great opportunity. The different scales each have their own areas of concern and accompanying research questions.

At the territorial scale the scope of action covers the expected changes in the British port infrastructure due mainly to Brexit, containerisation and automation. The ports must expand in order to compete on a global scale, but this expansion is currently eroding much of the natural coastline and alienating the surrounding settlements.

The research uncovers the Eastern seabord of the UK as one of the nodes with greatest climate risks such as sea level rise, combined with increased flows of shipping due to the need to expand its ports to a competitive level with other North sea ports. As the port expands and automates, it becomes increasingly land intensive and decreasingly labour intensive. As the port expands further out to sea, the human is further baricated from the coastline and the production process. This problem lead to the following research question at the territorial scale:

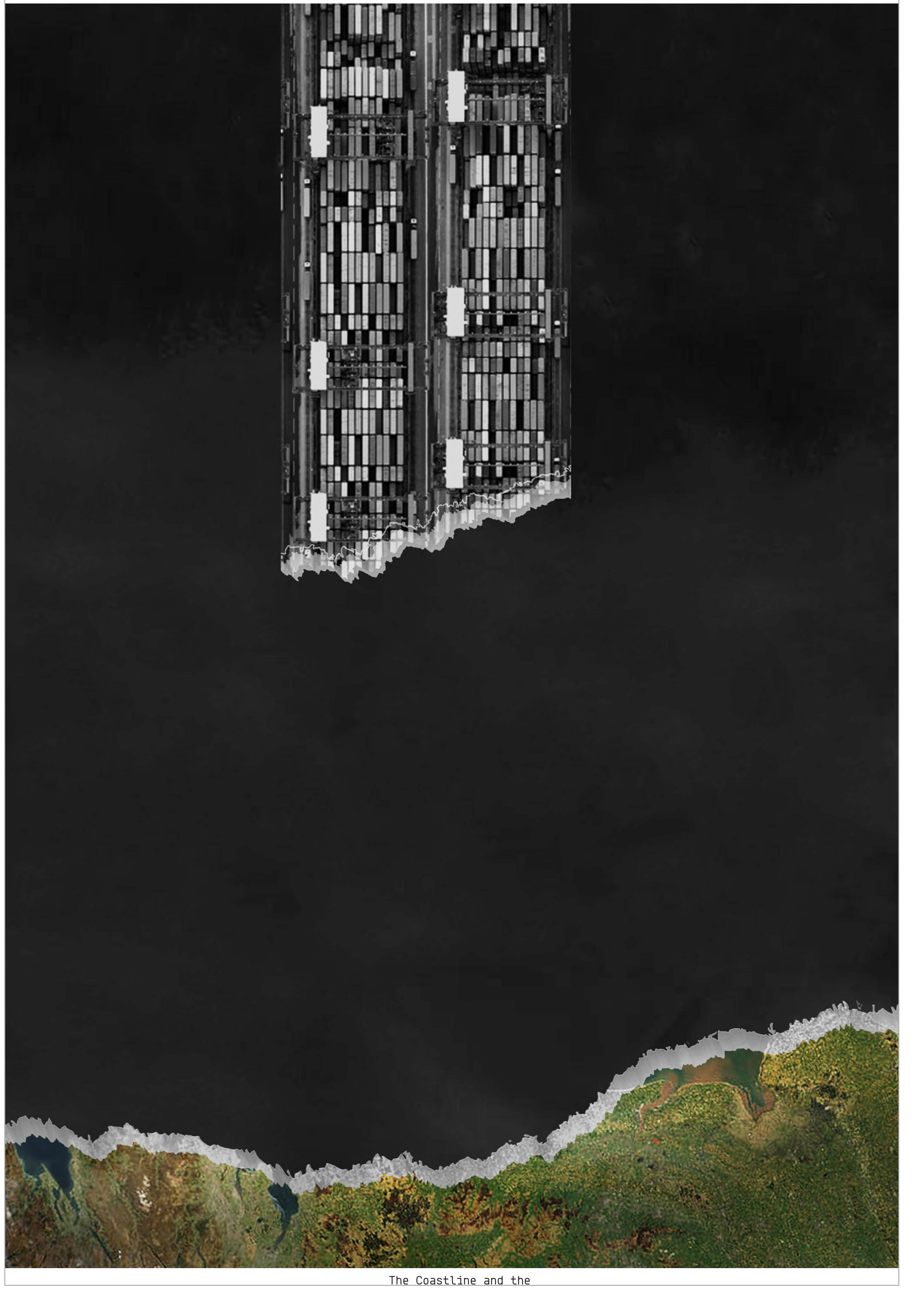
1.4. Research Question

An Investigating the relationship between Infrastructural form, function and automation

Sub-questions

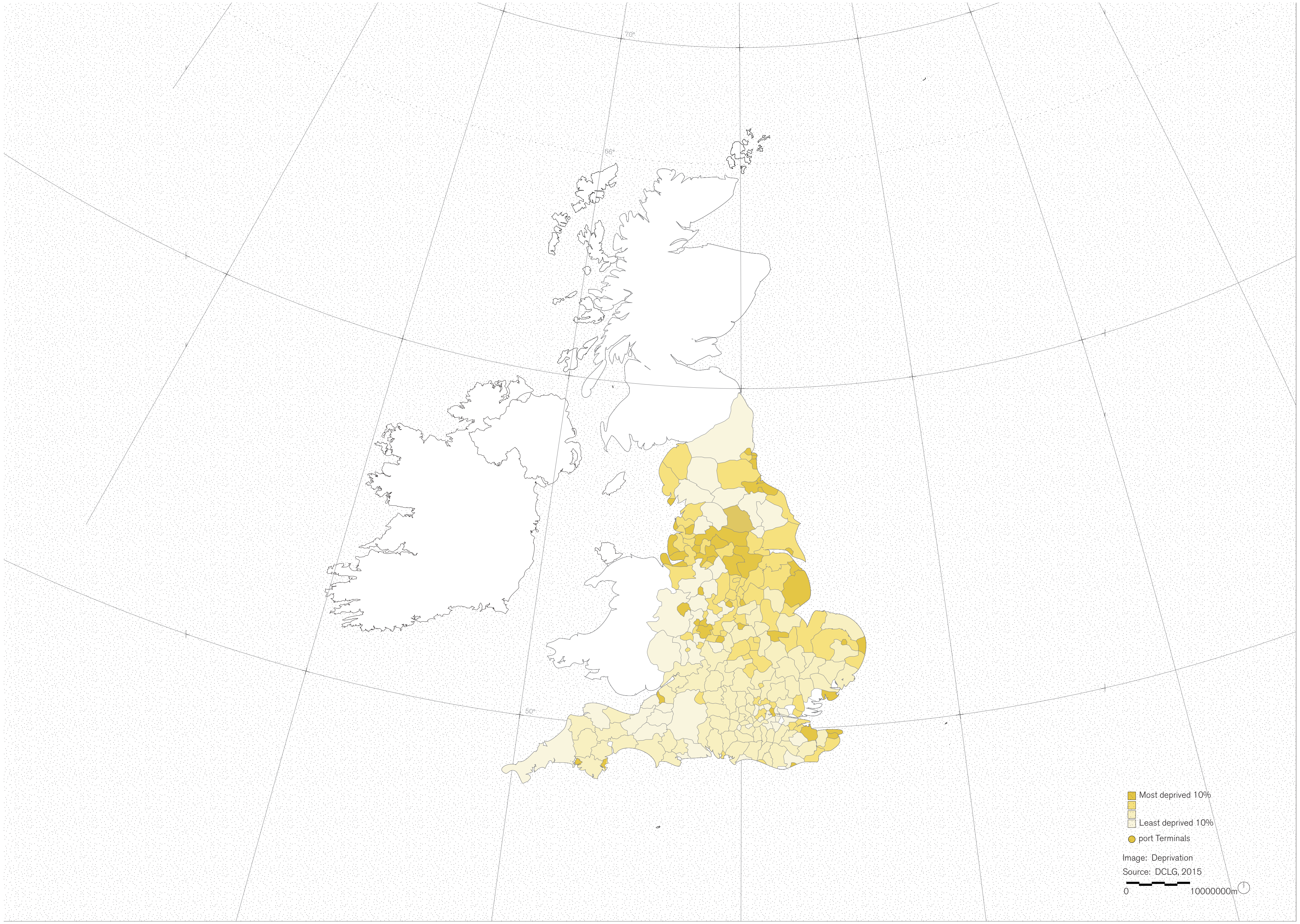
How has the Port infrastructure evolved throughout history?

What are the main issues facing ports and its surrounding settlements?



The Coastline and the

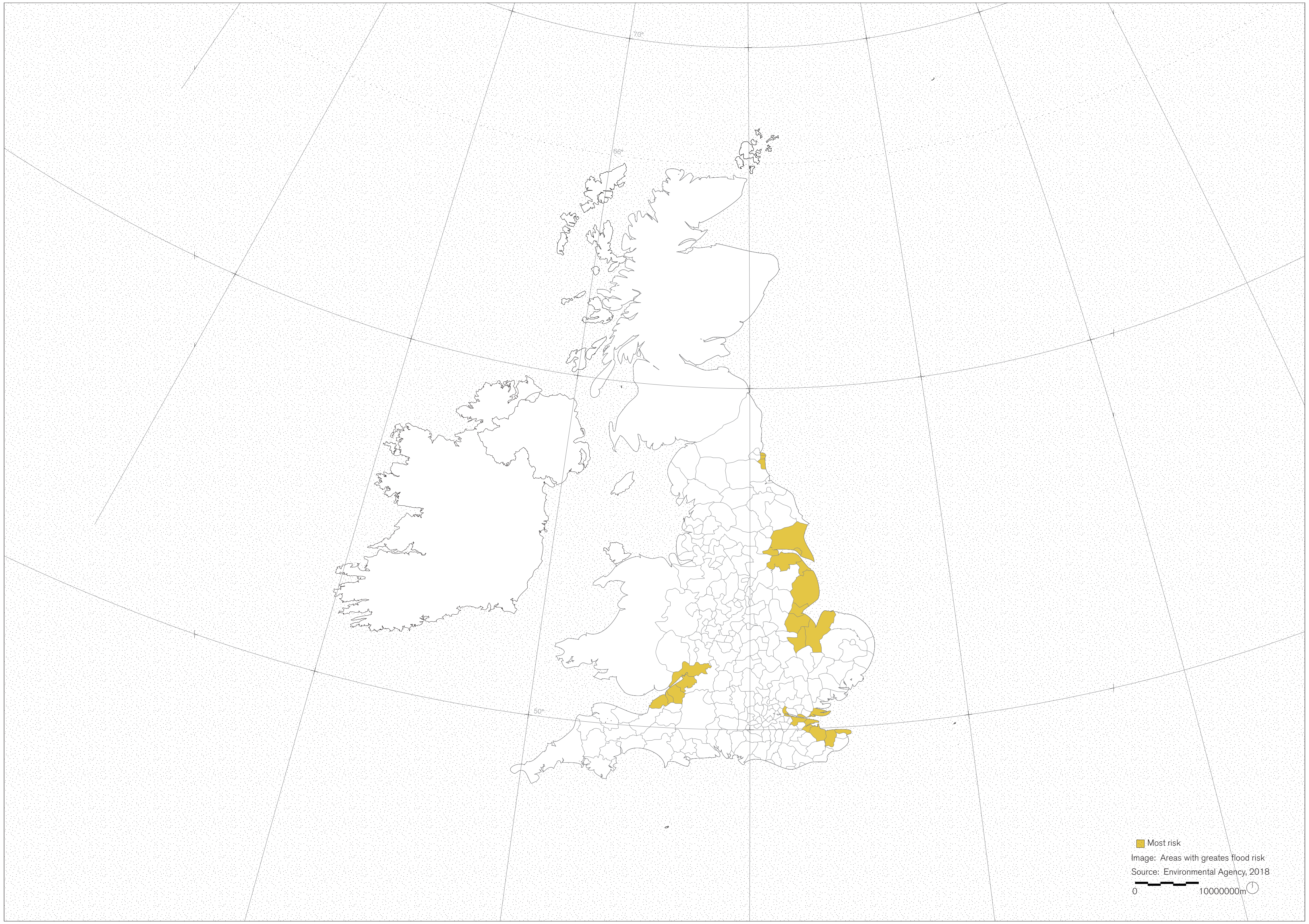
1.3 Regional Analysis



Social Deprivation Index

According to the Deprivation index, based on social factors and environment, the middle of the UK, in Particular the eastern seabord is in the 10% most drprived in the Nation. This includes Kingston upon Hull and the areas surrounding the Humber estuary in particular.

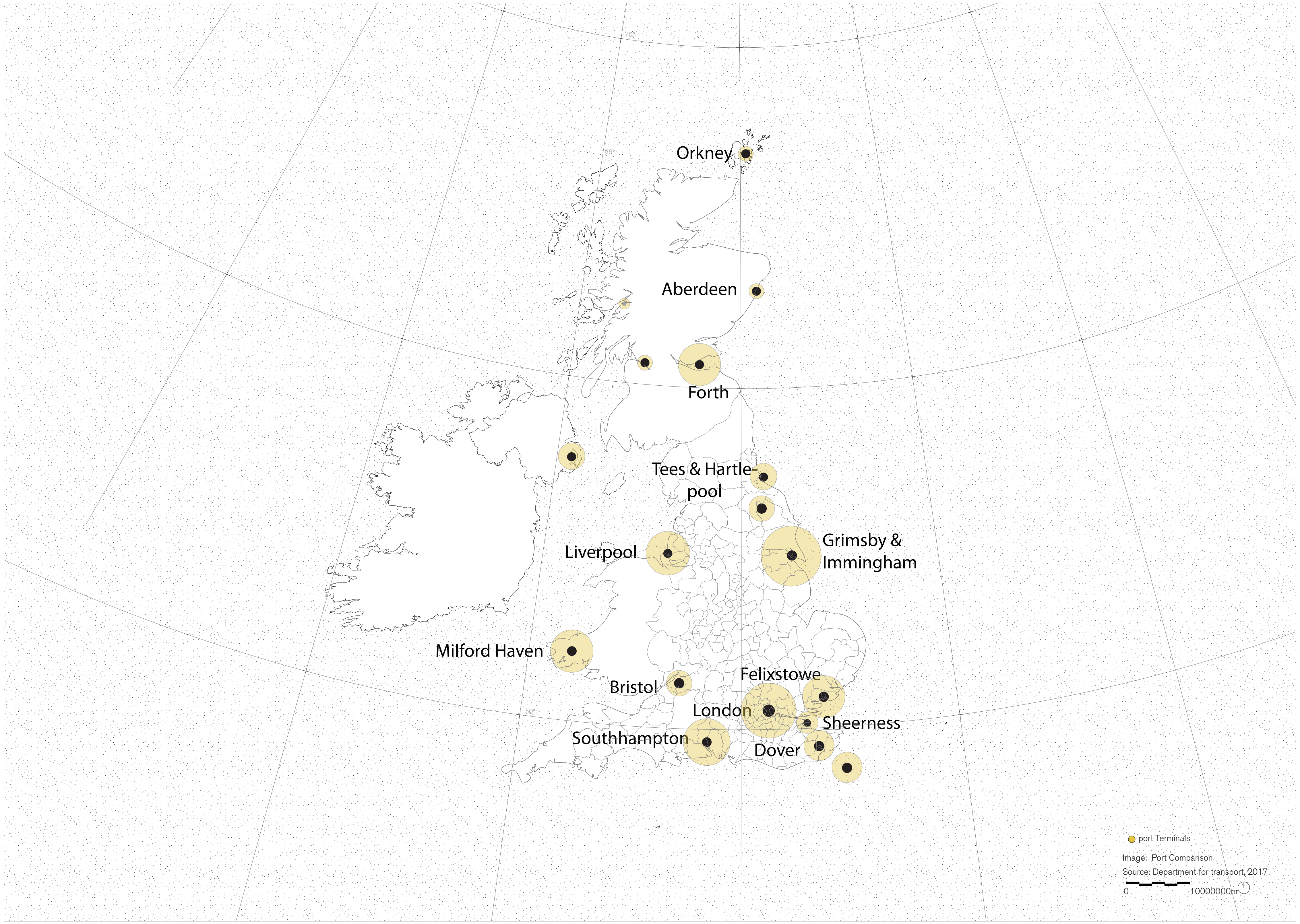
1.3 Regional Analysis



Economic Deprivation

Kingston upon Hull and the areas surrounding the Humber estuary in particular are also in the top 10% most economically deprived. Grimsby in Particular has an unemployment rate of 13.9%, double the national average of 7.4%.

1.3 Regional Analysis



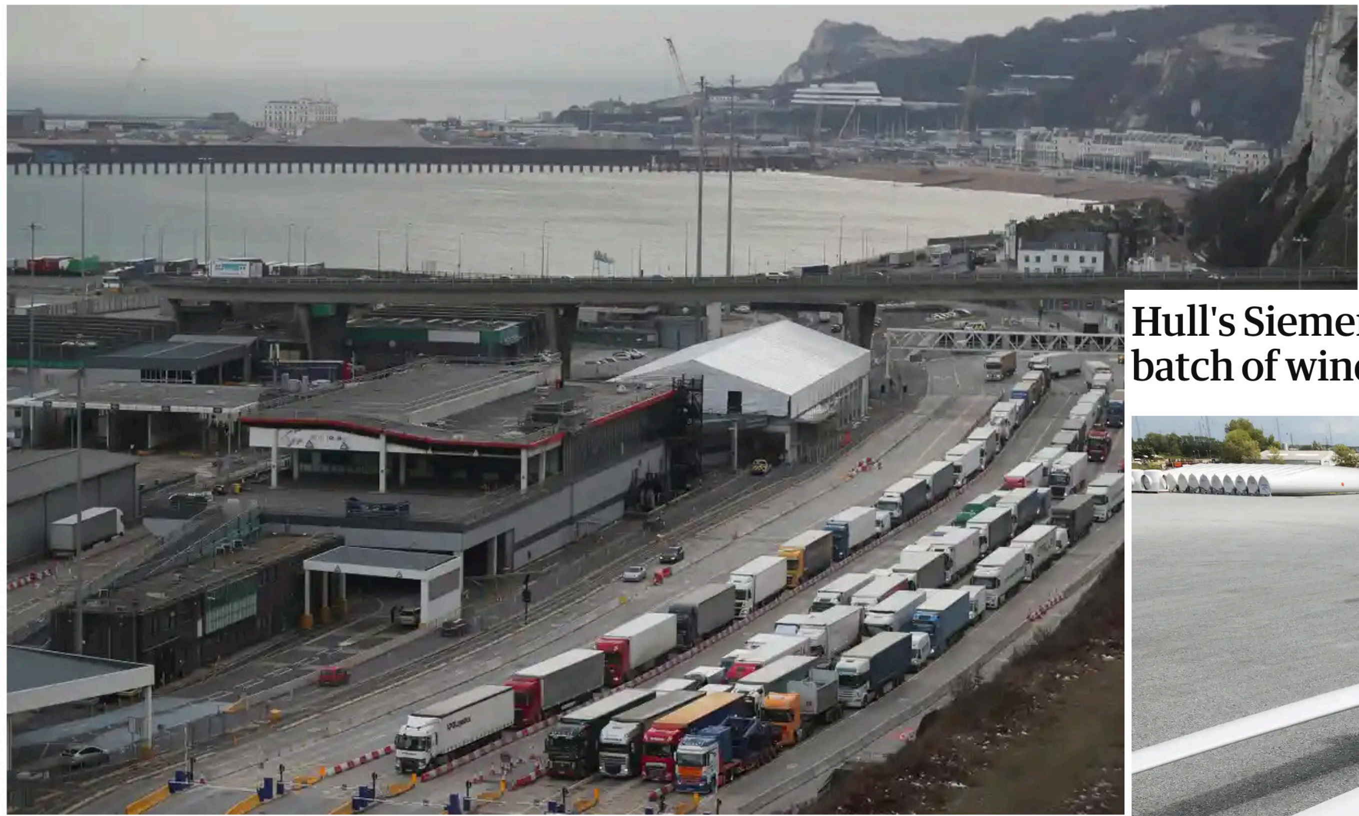
British Ports

The UK has several Ports, with the biggest consisting of Grimsby and Immingham, Felixstowe, London, Dover, Southhampton and Milford Haven.

Felixstowe is currently the largest container port, however Grimsby and Immingham are the largest port handling everything from liquid bulk, to containers, to offshore windturbines as of recent. It handled 54.4 million tons in 2016 (Department of transport,

Dover-Calais 'facing economic catastrophe' due to Brexit

President of French region calls on Macron to break EU ban on bilateral talks with UK



▲ Lorries queue at the port of Dover. Photograph: Daniel Leal-Olivas/AFP/Getty Images

Hull's Siemens factory produces first batch of wind turbine blades

▲ Each wind turbine blade weighs 28 tonnes and is made of balsa wood and fibreglass. Photograph: Paul Langrock/Agentur Zenit/Siemens AG

New £310m plant hailed as positive 'perfect storm' for port area with one of Britain's highest unemployment rates

Port Opportunities and Threats

Ports within the UK face increasing threat due to Brexit, that will cause unknown economical consequences (Expansion or Decomissioning). At the same time however ports in the UK are at a prime location for windblade production and manufacturing, being close to major UK windfarms The humber esturary will see great economic shifts in the area of production and maintance of offshore wind turbines.

Port

2. Port Research

2.1. Identity - Historical Precedents Port

Port of London

Romans arrived in Kent in England and built a walled settlement on the northern bank of the river thames, later to be known as London. The port, Londinium developed on the north bank and became the capital of the roman colony (Milne, 2016). Two factors were vital to its success, the Tides which brought enough depth at high tide to allow for ships to come and go, even though its location was not at the river mouth. Its position on the river, like many other ports was very strategic, as the romans controlled with that vantage point, land, river and sea in all of Southern Britain. The key difference between now and then were that ships would be anchored to the river as far as the depth would allow it to travel, and the goods would be carried onto shore by smaller boats. This gave rise to lighterage (Brigham, 1990), a constant bustling of ships from river to shore that provided many more jobs and allowed from a constant interaction between people and harbour.

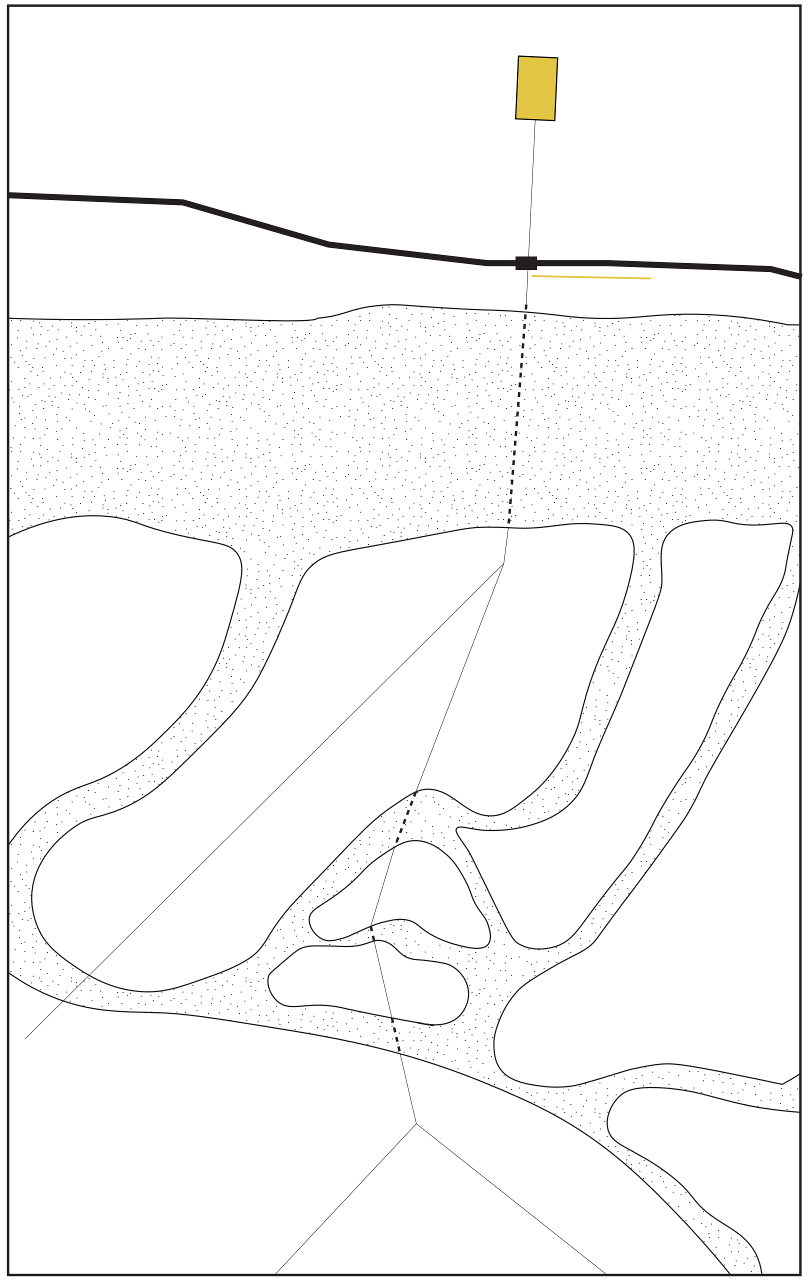
In the 3rd and 4th century, due to political shifts such as the naming of York and the capital for the North and tidal shifts in which the tidal range decreased, the port was abandoned.

During 700 AD, the Saxons settled next to the abandoned London settlement and set up their own quay on the river bank. Due to several raids, the settlement was moved into the old roman walls oncemore, and from there expanded along the roman roads to the size of London today. During the medieval period, the first signs of the docks appeared near the now known London Bridge and billingsgate. The building of the bridge not only stopped war fleets getting upstream, it also prevented sea going traffic to go any further up the river, subsequently making London the main trade hub of south east england, the nodal point of transit.

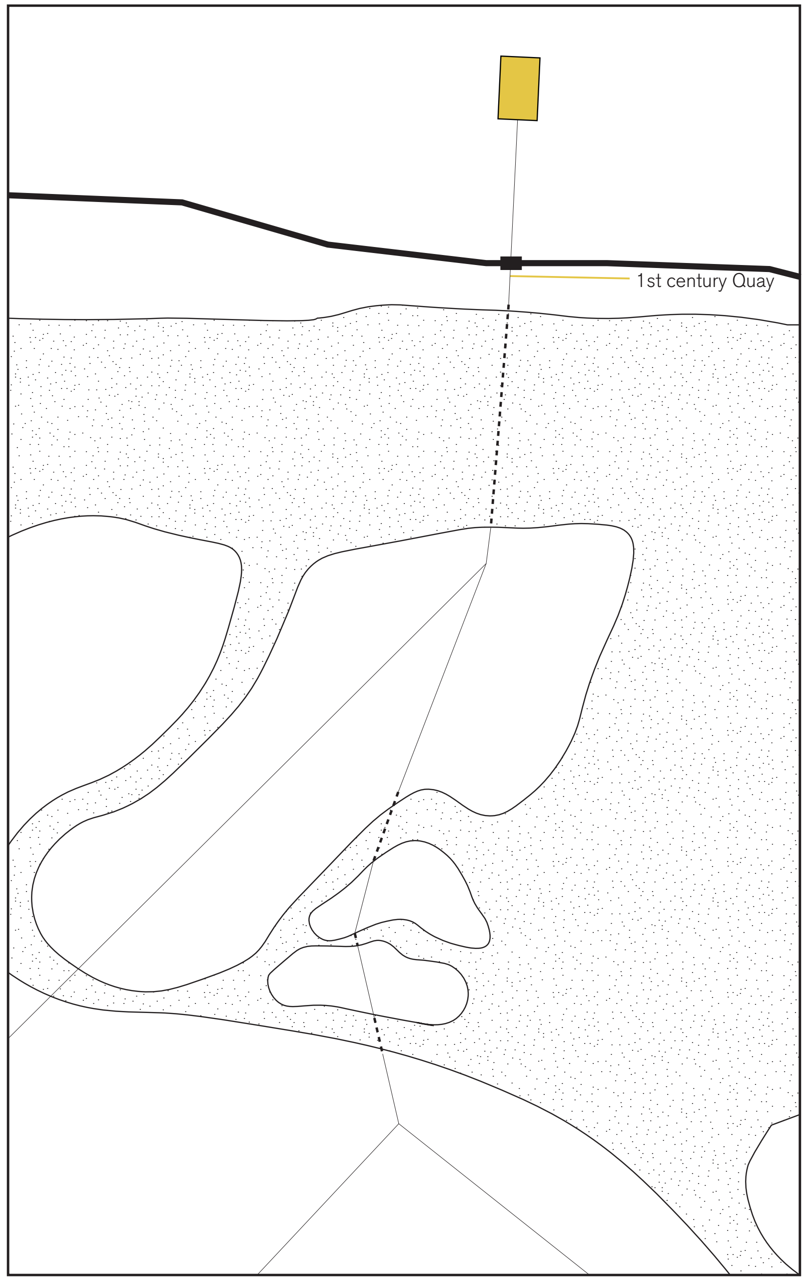
The 12th century saw the change from beach market port ,in which cargos are sold on board to consumers, to the merchant port. The merchant port was also were we see the first appearances of warehouses once more.

In 1802 the docklands project was made , in order to account for the increase in trade. Several docks were built along the river from 1802 to 1912, and the change in ownership from the former West Indies trading company to the London Port authority had no impact on this. The docks were being built further out towards sea, and the river was being dredged deeper. Around this time, port industries were also being introduced, sugar refining, vehicle manufacturing and lead smelting were amongst some of these (PLA,2018).

In the 1960's, with the start of containerisation, the port moved even further out towards the sea, requiring deeper waters and more land for container ships. The tillbury dock was the main container terminal, only to be recently overtaken by London gateway the latest development within the port (PLA 2018).



Low Tide



High Tide

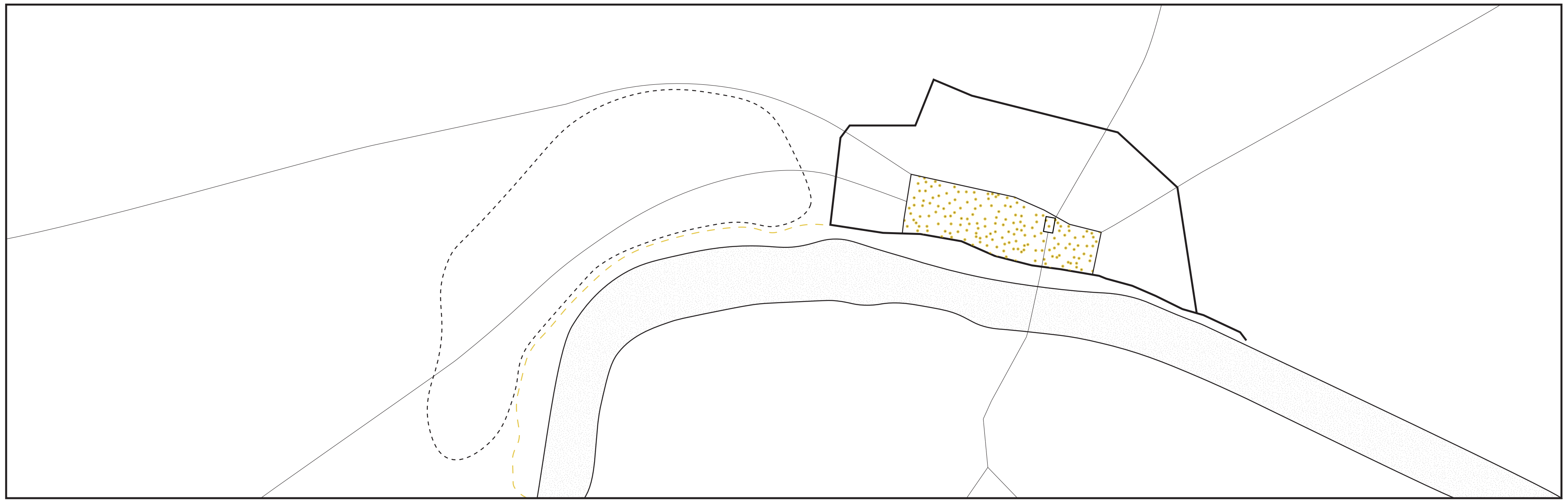
- Quays
- Wall
- bridges
- Settlement
- roads
- river

Image: Roman port London

Source: Milne, 2016

0 250m

700 AD



900AD

- - Saxon Waterfront
— Wall
--- Saxon Settlement
Settlements
roman roads
river

Image: Saxon port London

Source: Milne, 2016

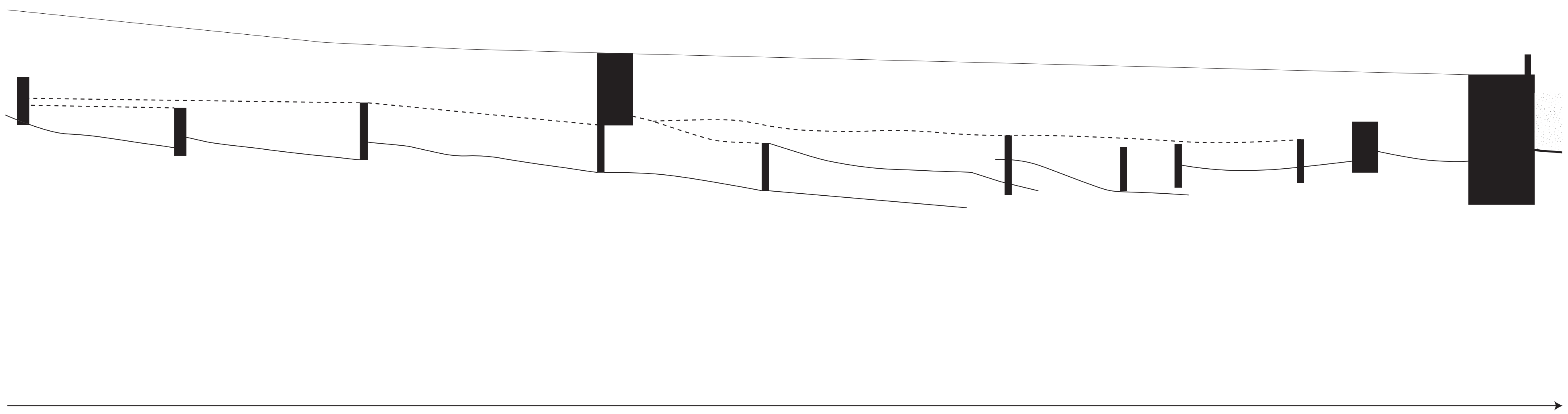
0 500m

Medieval Port of London

- - Saxon London
— Wall
--- London Bridge
● Billingsgate
— roman roads
○ river
● Port Terminals

Image: Medieval London
Source: Milne, 2016

0 250m



`Expansion London Ports

Quay Structure
Old river banks
river

Image: Roman London Quay Sections
Source: Milne, 2016

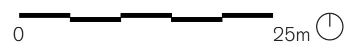


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Image: Port of London Map
Source: PLA , 2014

Goole is the Humber rivers inland port, established in 1826 mainly for the transport of coal. The settlement went from 450 people to the 18,000 people it is today (Porteous, 1969). The floating docks take up an area of around 150,000m2 and after the demise of the mining industry, containers, steel exporting and timber are what its main cargo handling is composed of.

Hull is one of the oldest ports on the humber, it is a strategic location at a confluence of two rivers, the river hull and the humber estuary. In the 13th century it became the only port for import and export of good in yorkshire, mainly cotton. Later the harbour became a major cloth exporter as the British garment industry grew. But it the 18th century the harbour became unsuitable for the amount of trade and several docks were built, adjacent to railway lines that could support intermodal transport of goods (HHC,2018) . Currently Hull is the site of the 310 million pound investment with Siemens for a wind turbine blade manufacturing, assembling and servicing facility on one of its docks. Hull, like most of the humber ports has also switched to containers and other types of cargo handling.

Immingham was constructed in 1906, mainly to handle coal transport, but in the 1980's the construction of the Lindsey Oil refinery and the Continental oil refineries spurred the construction of the Immingham oil terminal. This new site led to the propelling of Immingham to one of the main import and export hubs of fuel in the UK. Recently the owners, ABP have began developing the renewable fuels terminal, to supply biomass to the powerplant.

Grimsby is the port furthest up river on the humber estuary, It was constructed initially between 1797 and 1800. With a depth of 5,5 m it was opened in 1811. It only expanded once the rail connection was made in 1840. In 1846 land was reclaimed, and the royal dock was built, which handled mainly fishing, both trade and import/export. In 1869 the west side of the docks were then allowed to be developed, and connected by a bridge. Shortly after in 1880 the dock was further extended to the west forming the Alexandra dock. In 1950s after the demise of coal, the dock shifted to timber exporting, and in 1975 the UK selected grimsby for importation of Volkswagen cars, and so the Alexandra dock transformed into a car terminal, further land was given to increase the capacity for importation of cars from 800 to 3000 cars at a time. Currently, with the decrease in the fishing industry within grimsby, many of its fishing dock has been left derelict, and so the buildings that are associated with it. The eastern side of the docks now sees a shift into offshore wind energy management centres, in keeping with the overall vision for the humber estuary.

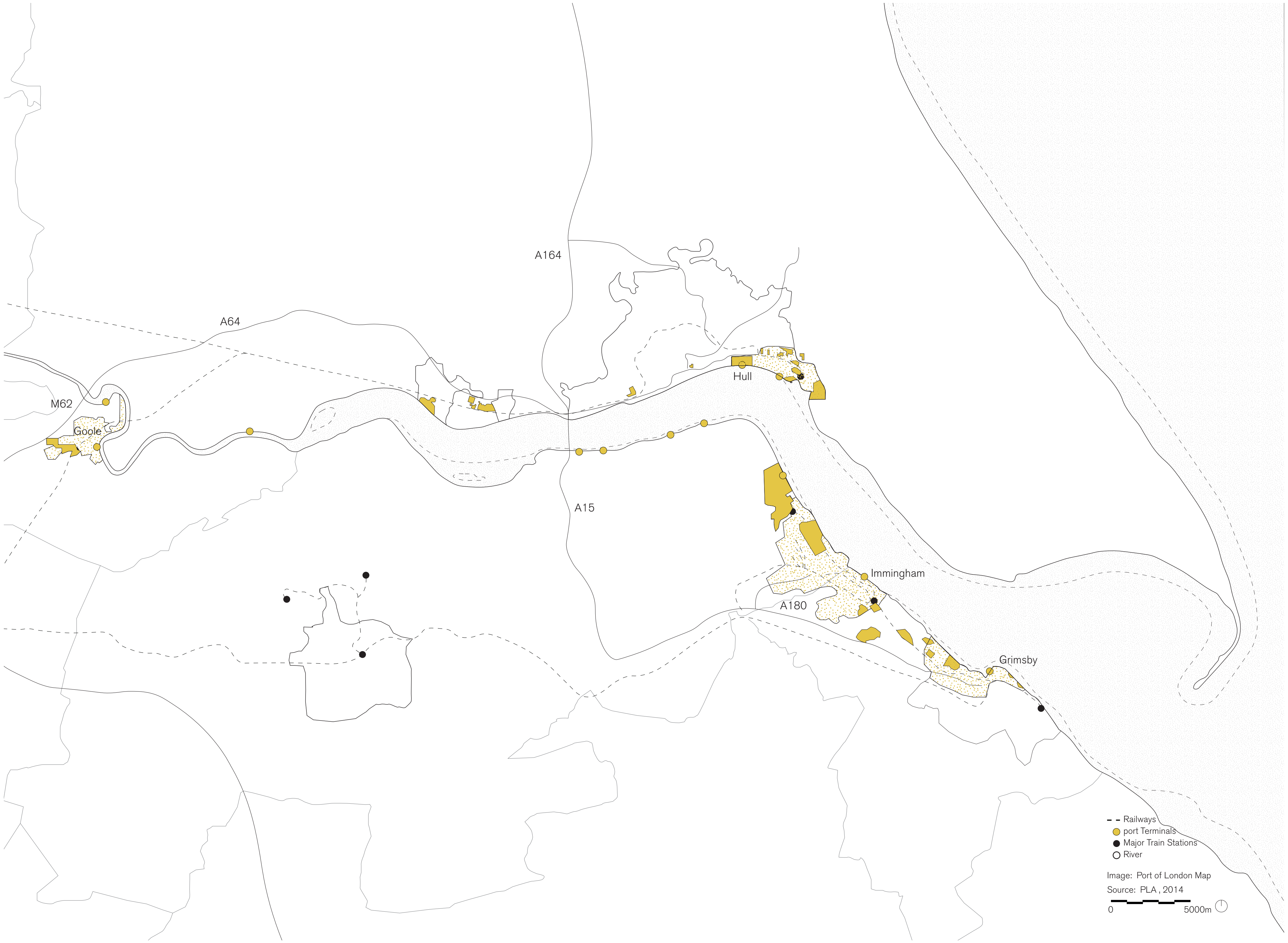
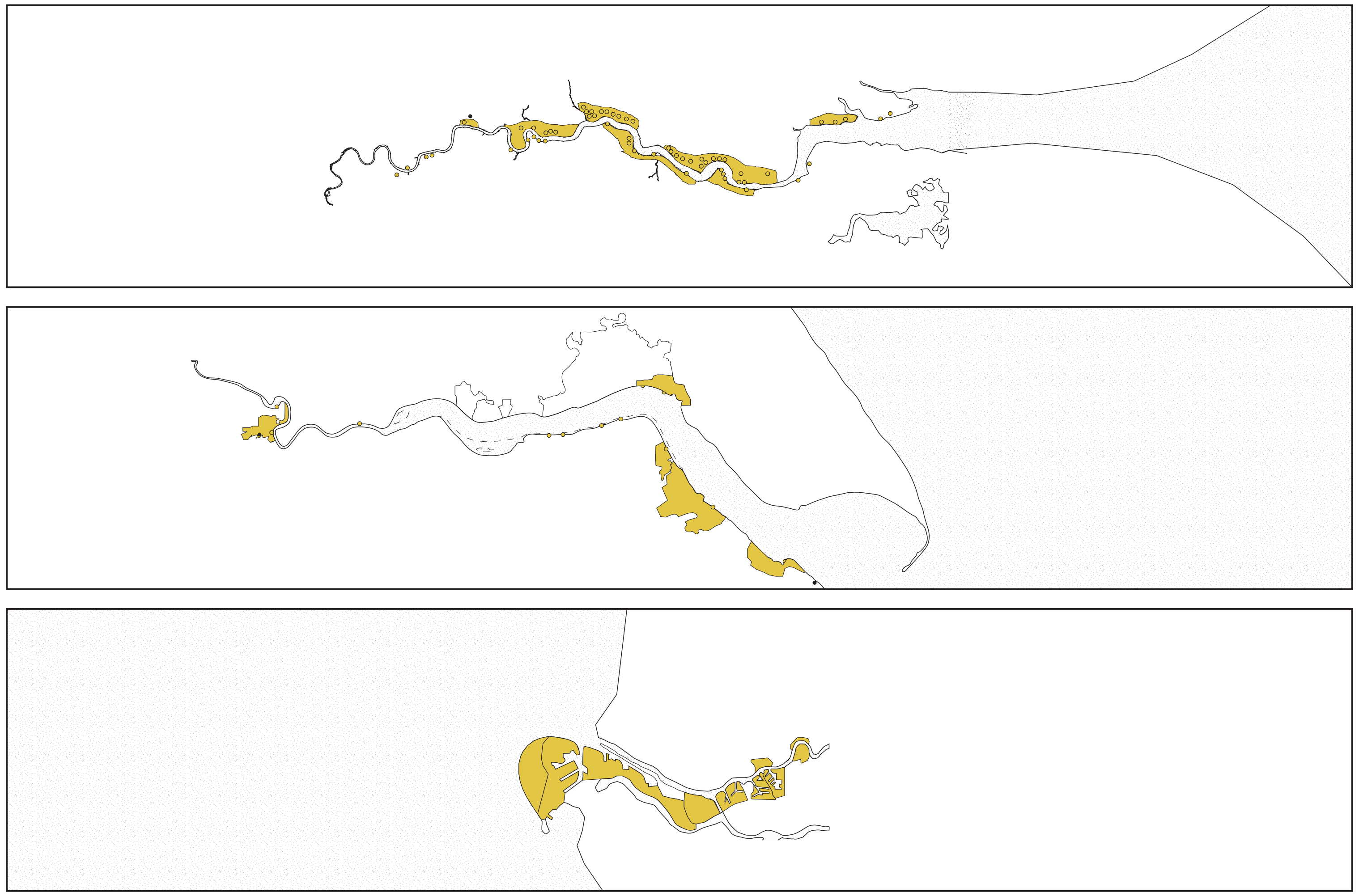


Image: Port of London Map
Source: PLA , 2014



Although all ports have a different history, the growth of all ports has been constantly up river. The ports have increased not only in size of terminals, but they have also subsequently needed more land for port related activities and industries, as well as distribution parks. Overall, the largest port on the north sea, Rotterdam has seen its latests extension even further outside de coast, reclaiming land and creating an almost fully automated port for container handling and liquid bulk storage.

- - Railways
port Terminals
Major Train Stations
River

Image: Port Comparison
Source: PLA , 2014 and Port of Rotterdam
0 5000m

2.2 Developments

Ports are expanding and becoming encreasingly automated. Taking up much of the coastline for storage and movements of the larger machines and vessels. They are also seeking deeper waters, requiring more dredging or moving further out to sea, to accomodate for larger ships.

Image: Green Port Hull

Source: Guardian, 2016

3. Problem Analysis

Problem Statement/ Letter to Parliament

7 December 2018

Dear Members of Parliament,

I am writing to you in regards to the current developments within the seaport industry. In a world of hyper mobility and political instability coupled with the looming rise in sea levels, ports have become a global trading gateway whilst the coastline on which they are located has become vulnerable. Brexit is inevitable, and although the impacts on trade are not yet quantifiable, we can assume that the U.K. must prepare for an increase in trade in some ports, whilst others become obsolete. In order to remain competitive within the dynamics of maritime trade, ports will turn to containerisation and automation, becoming increasingly capital, and land, intensive and decreasingly labour intensive. The power relation between ports and humans has changed, as settlements have been barricaded from the coast by walls of containers, they remain economically dependent on the port. Whilst I agree that port expansion is necessary, The UK's eastern coastline has become a landscape of advantages and disadvantages which are often only a security wall apart, reliant on the will of a few global private entities. I believe that extensive research must be done on ways of physically decoupling a port and a coastline.

I would like to draw your attention to the port of Grimsby in particular, one of the largest in the UK combined with Immingham, that together with Four others along the humber estuary are owned by ABP ports. It dominates the town's economy and land use, taking up 3,383 ha and employing aroun 1000 people. With this in mind however, As the port expands and automates, jobs are becoming scarcer whilst most of the natural coast is being consumed. Another issue is the decreasing fishing trade, which is seeing its oldest terminal become derrilict. I propose to shift the ports focus to clean offshore energy production, detach the port from its shore, and analyse the ways in which port functions can be arranged in order to allow for growth but also re-engage with the human societal scale of the city. This allows for expansion whilst freeing the coastline for diversified use.

Although competing globally, major ports are still serving producers and consumers in widely dispersed hinterlands, requiring strong land connectivity. The infrastructure, although partially detached from the shore, must therefore have a land connection, making the connection between marine and land systems. The automated object will allow space for expansion and changes in the production line, whilst the coastline will be freed for the reintroduction of the human to the port In this way, the expansion of the port is also preparing its hinterland for a future in which the two are completely detached. The final purpose is to determine what legacy will remain with this detachment.

I hope you, members of the parliament, agree on the necessity of this proposal and I look forward to your opinions.

Sincerely,

Ana da Fonseca

Design Question

How can a port remain competitive without compromising the local environment around it?

Sub-questions

Regional Scale:

How can the design of a port island extension of the humber river strategically contribute to its regeneration?

What is the relationship between logistics and clean energy production?

Urban Scale:

What is the ideal morphology for a port island and factory that will allow for expansion with minimal environmental impact? How can it be adaptable to future scenarios?

Architectural Scale:

How can the logistical typology of a offshore wind factory and its components be redesigned (perhaps with added functions) in order to provide an architecture with quality and local engagement? How can it be adaptable to future scenarios?

All of these question take into account the temporality of space as a territory and therefore will be tested against two main scenarios, one with High automation and Growth, and one with degrowth, in order to show its adaptability and therefore its sustainability.

Problem Analysis

4. Problem Analysis

Research Framework
Research Methods - Analysis Methods

As the graduation studio is a multi-scalar design process, each phase of the research contains a combination of methodologies that are carried out on different scales; Territorial, Urban/Regional and Architectural. A mixed method approach was determined better suited to allow for research to be represented by different tools based on its suitability to portray the essence of the project at a given scale and scenario.

At the territorial scale mapping was chosen as a main method of research. The mapping focused on six main themes, mapping the current state and the projections with data gathered from literature. These six themes were Climate, Flows, Geomorphology, Biotope, Politics, Social. With the help of mapping an initial conclusion could be made on the future trends relating both to physical shifts and socio-economic shifts, identifying problem fields such as Brexit, sea level rise and the increase of shipping routes due to the artic corridor. This allowed me to determine my problem field at a territorial scale and the temporality involved in the fast pace changes of territorial networks. To link what was mapped to possible physical implications of social change a combination of scenarios and projections was used for a better determination of the problem field.

At the regional and urban scale Typo-morphological research is used. This was essential in determining my hypothesis, which suggests that ports are constantly seeking deeper water and expanding further from the city. This allowed me to abstract the physical manifestation of port structures in order to suggest a new one based on projections. The main tool at this stage was analytical drawing and historical case studies of port expansions.

At the architectural scale, the step still to be carried out, I will focus mainly on Typology as a method that interprets basic building configurations from both historical and contemporary paradigms. By Understanding the historical transformation of certain architectural typologies, in this case ports , I am able to gain insight on how to manipulate, reuse, recombine and transform these typologies. The aim is to redesign certain elements of the port focusing on the ways in which to combine distribution with societal engagement in an architectural type. Plan analysis of the port components will further aid this phase of the process.

The research through the design is ultimately to determine the relationship between automation and form on the landscape/coastline of the port, and then to determine what the role/place of the human is when he is expelled from the interior space of production.

Research Framework
Research Methods

thematic research

Port Termi-

Production
Storage (L + R + MC)
Maintanance (L + R + MC)
Societal engagement (L + R + MC)

Climate

Floodprone design (L + R + MC)
Sustainable materiality (L + R + MC)
waste reuse/ Dredging (L + R + MC)
functional adaptability (L + R + MC)

integration

Automated Port Infrastructure

An automated infrastructure of Production and its relation to the coastline.

projection and design

Territorial Ap-

Looking at the introduction of offshore wind as an industry of the port. A scenario based approach with growth, and degrowth scenarios

Architectural Design

Design of a wind blade factory and the functions attached to it. The re-introduction of the public into the large scale port system.

MSc 3
research

MSc 4
design (+research)

L	Literature Study
MC	Mapping Current State
MP	Mapping Projections
S	Scenario Planning
R	Reference Analysis
V	Visit
I	Interview
D	Research by Design

Site: Regional

Image: Port Comparison

Source: Department for transport, 2017

Image: Estuary Flood Risks
Source: Environmental Agency, 2018

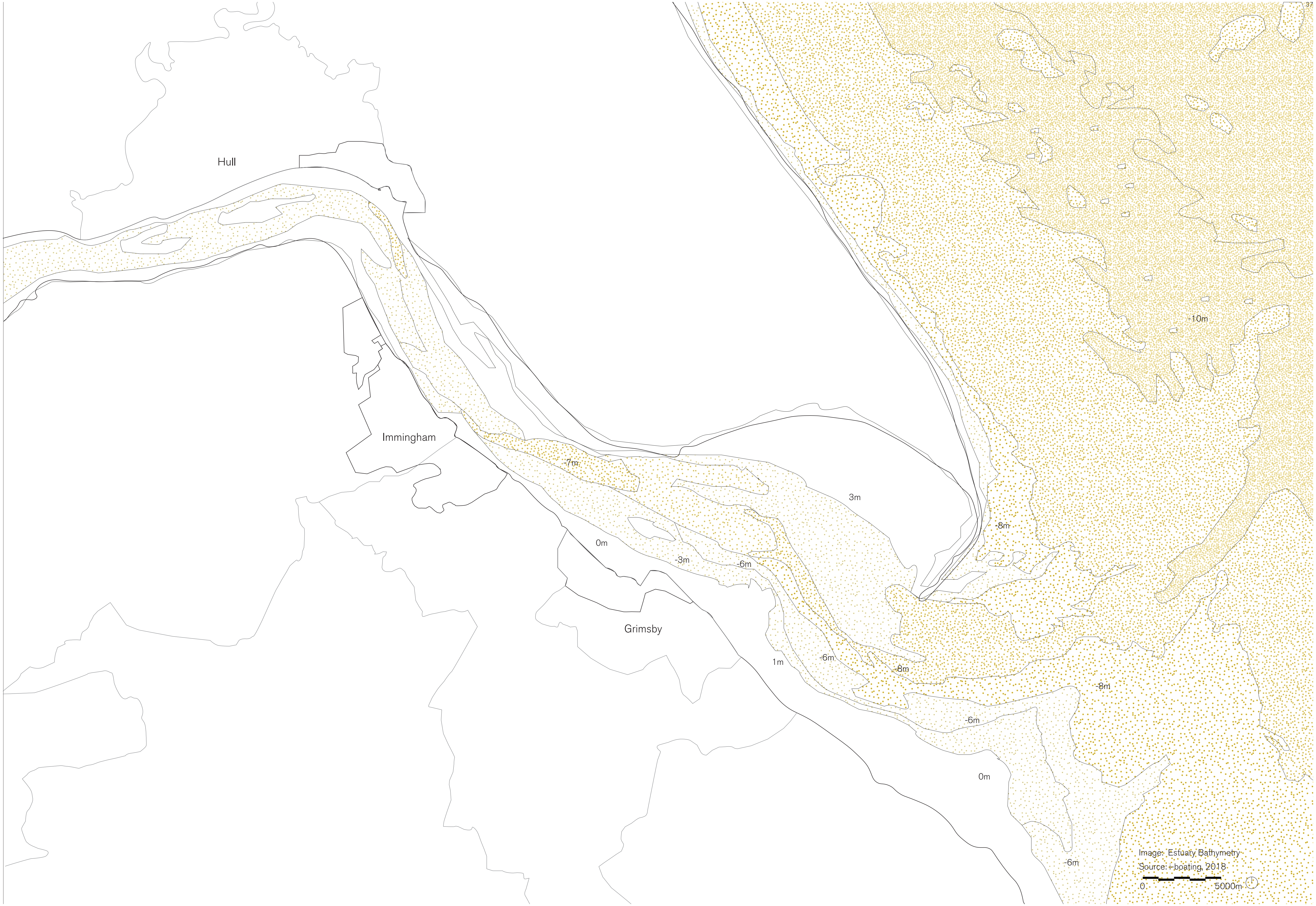


Image: Estuary Bathymetry
Source: i-boating, 2018

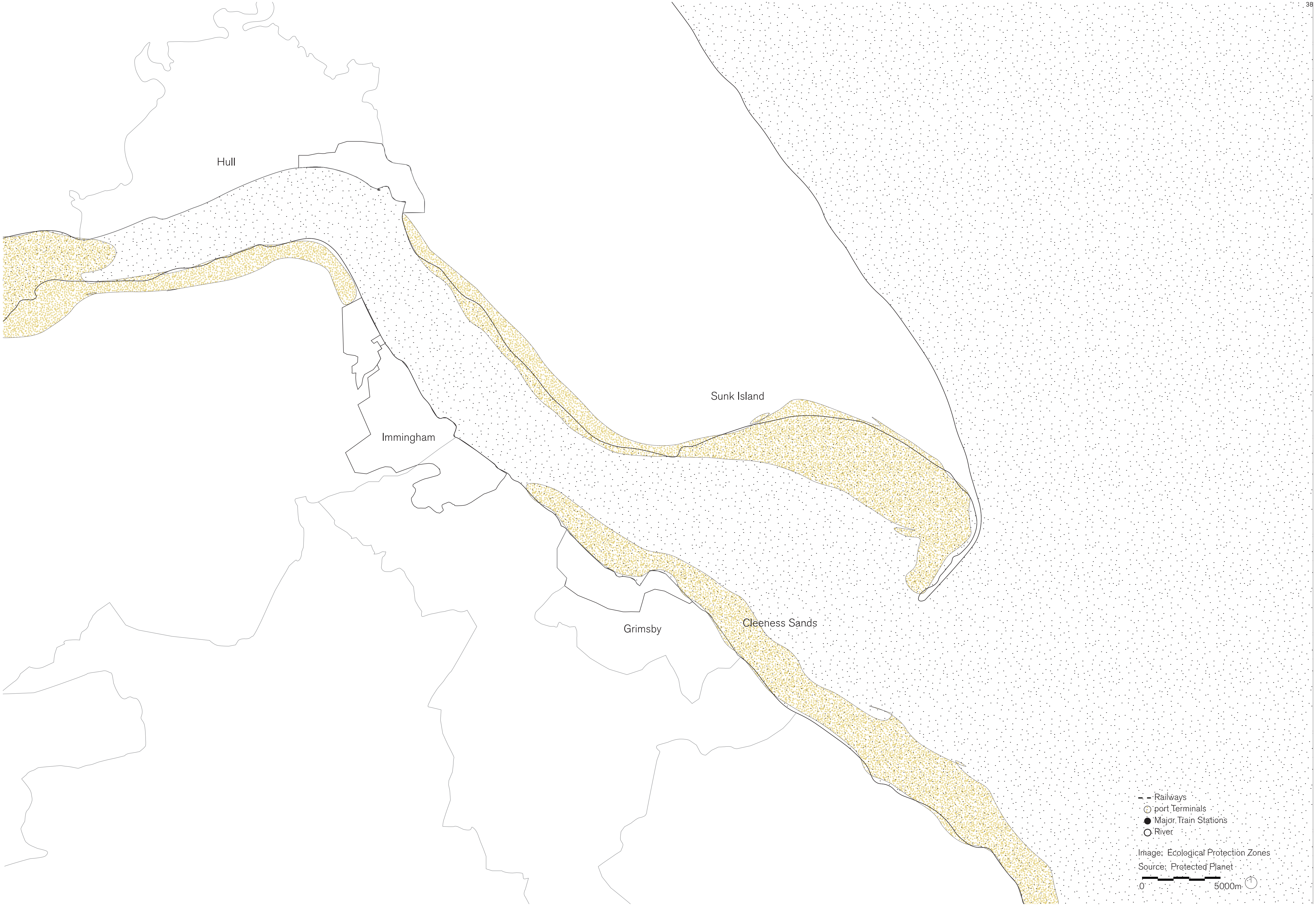


Image: Ecological Protection Zones

Source: Protected Planet

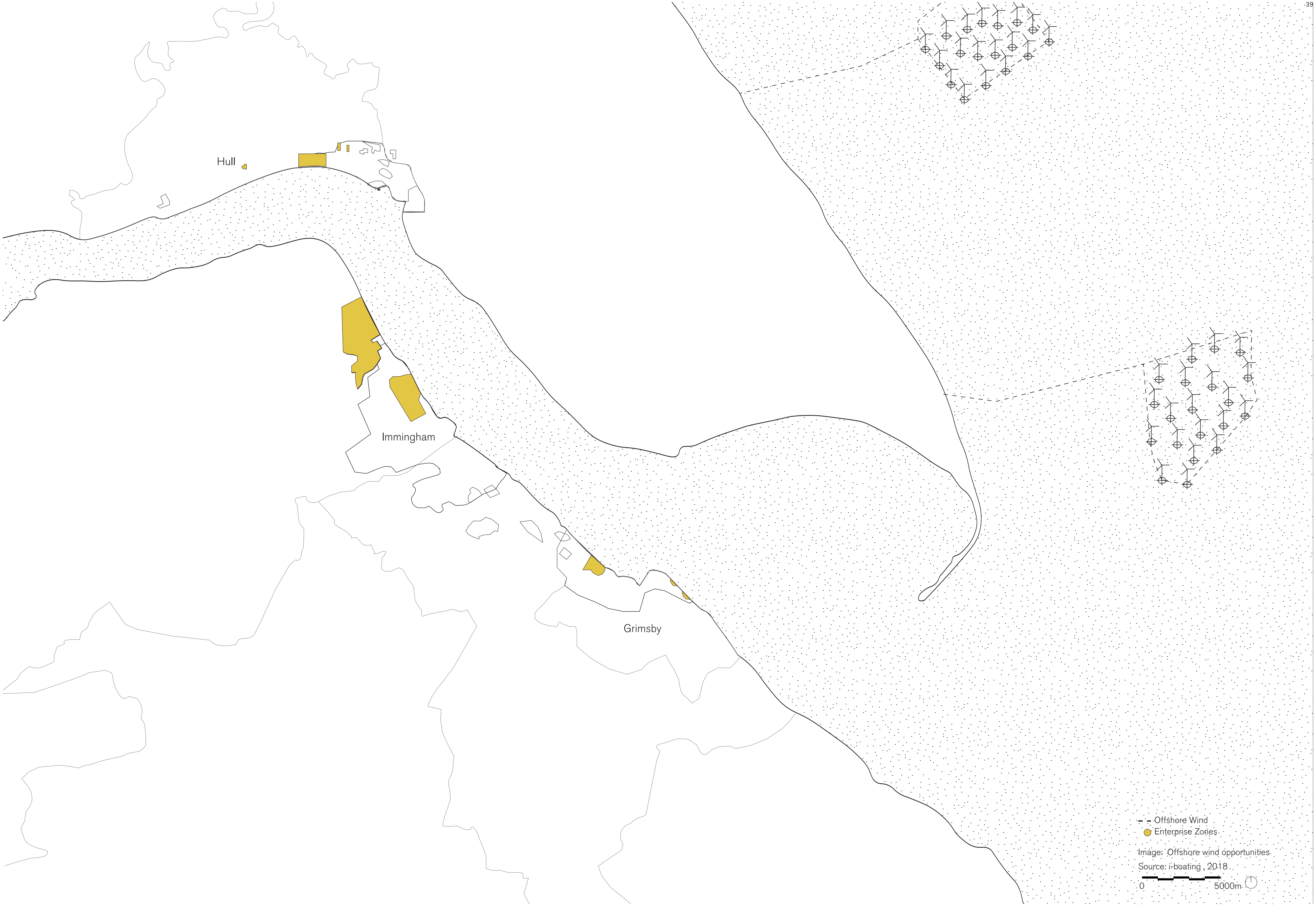
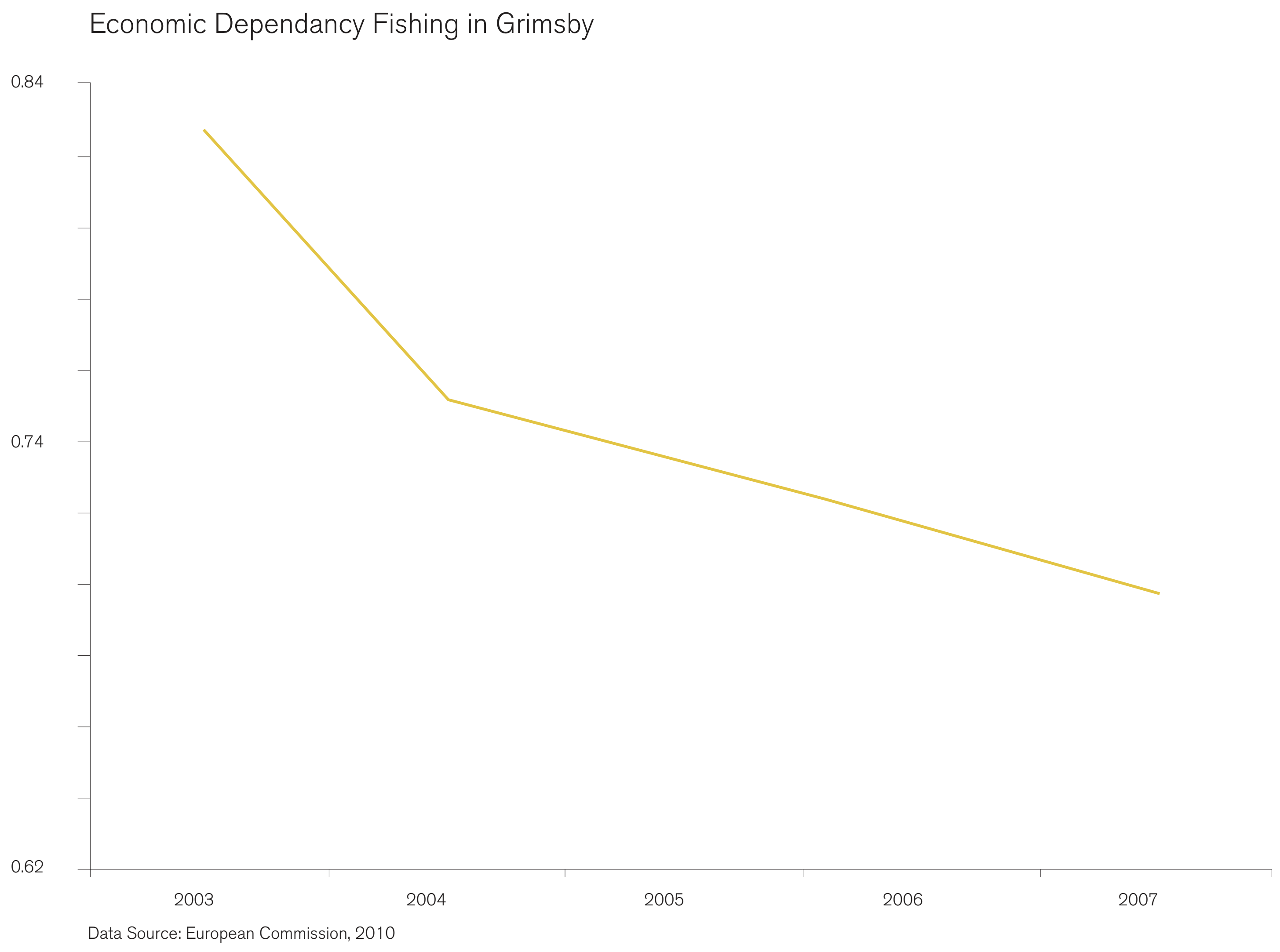


Image: Offshore wind opportunities
Source: i-boating, 2018

Site: Urban Scale

Image: Port of Grimsby



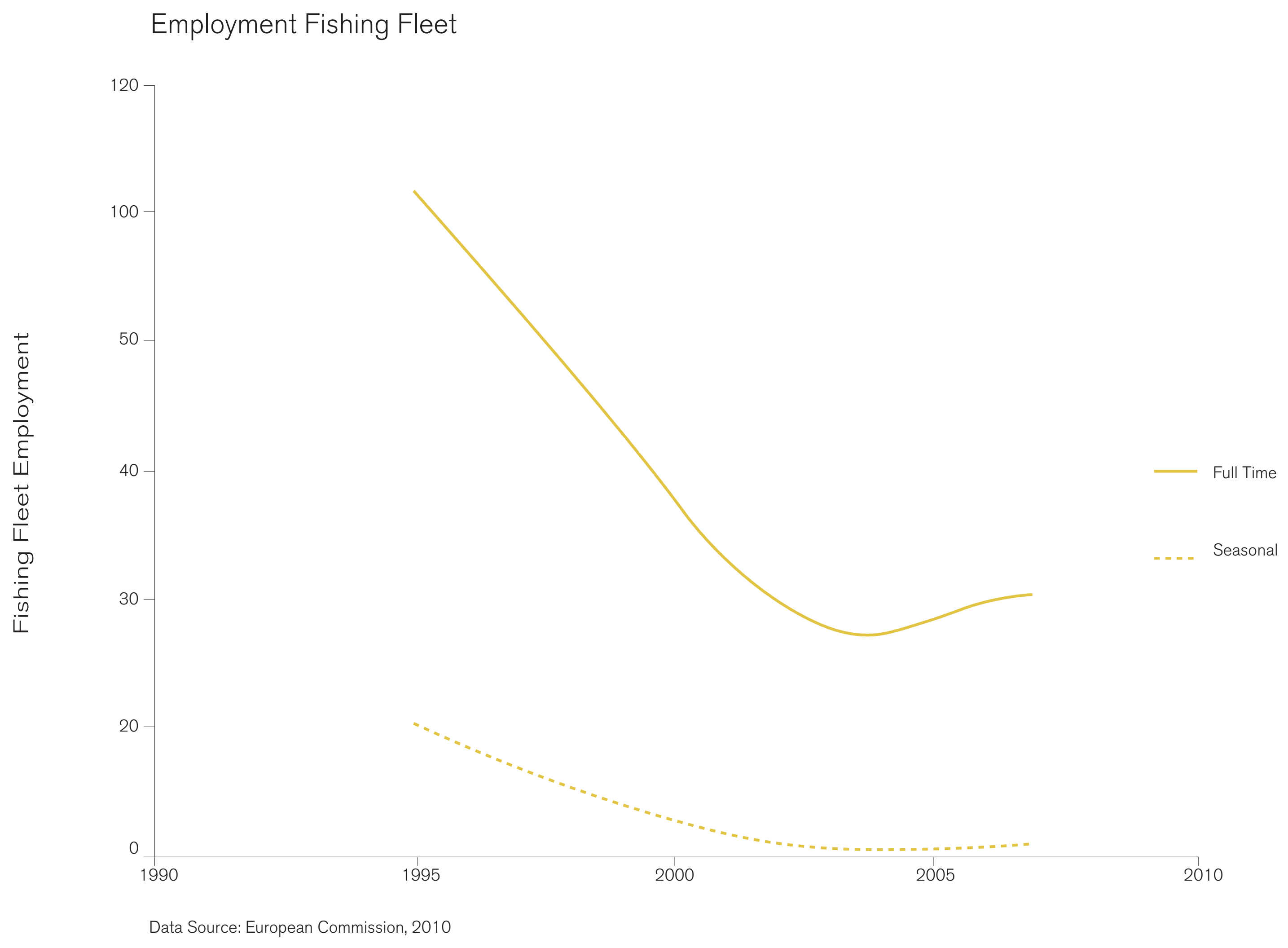
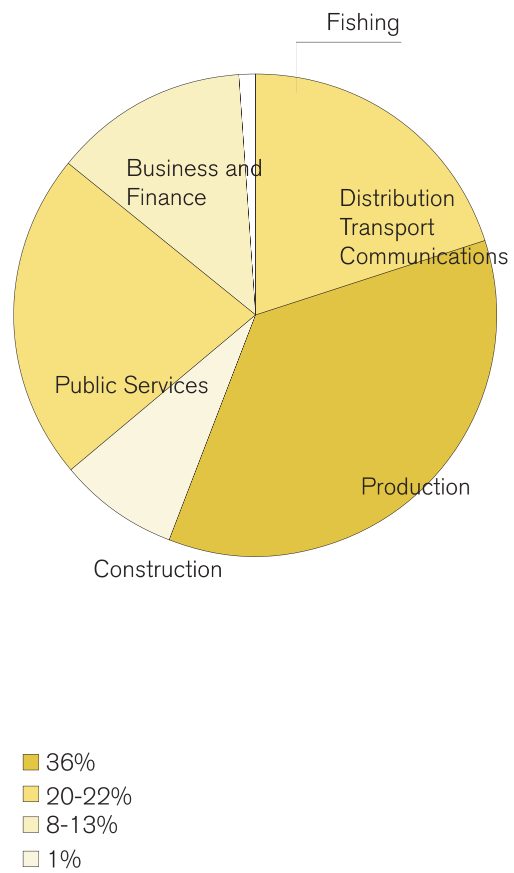


Image: Economic Statistics
Source: European Commission, 2010

Contribution of Different Sectors to the Economy Grimsby (2007)

Data Source: European Commission, 2010

Contribution of Different Sectors to the Economy Grimsby (2007)



Data Source: European Commission, 2010

Image: Economic Statistics
Source: European Commission, 2010

Image: Food Terminal Grimsby

Information Source: ABP ports

Image: Car Terminal Grimsby

Information Source: ABP ports

Image: Clean Energy Terminal Grimsby
Information Source : ABP ports, 2018

Image: Future Enterprise Zones

Information Source : Humber LEP.

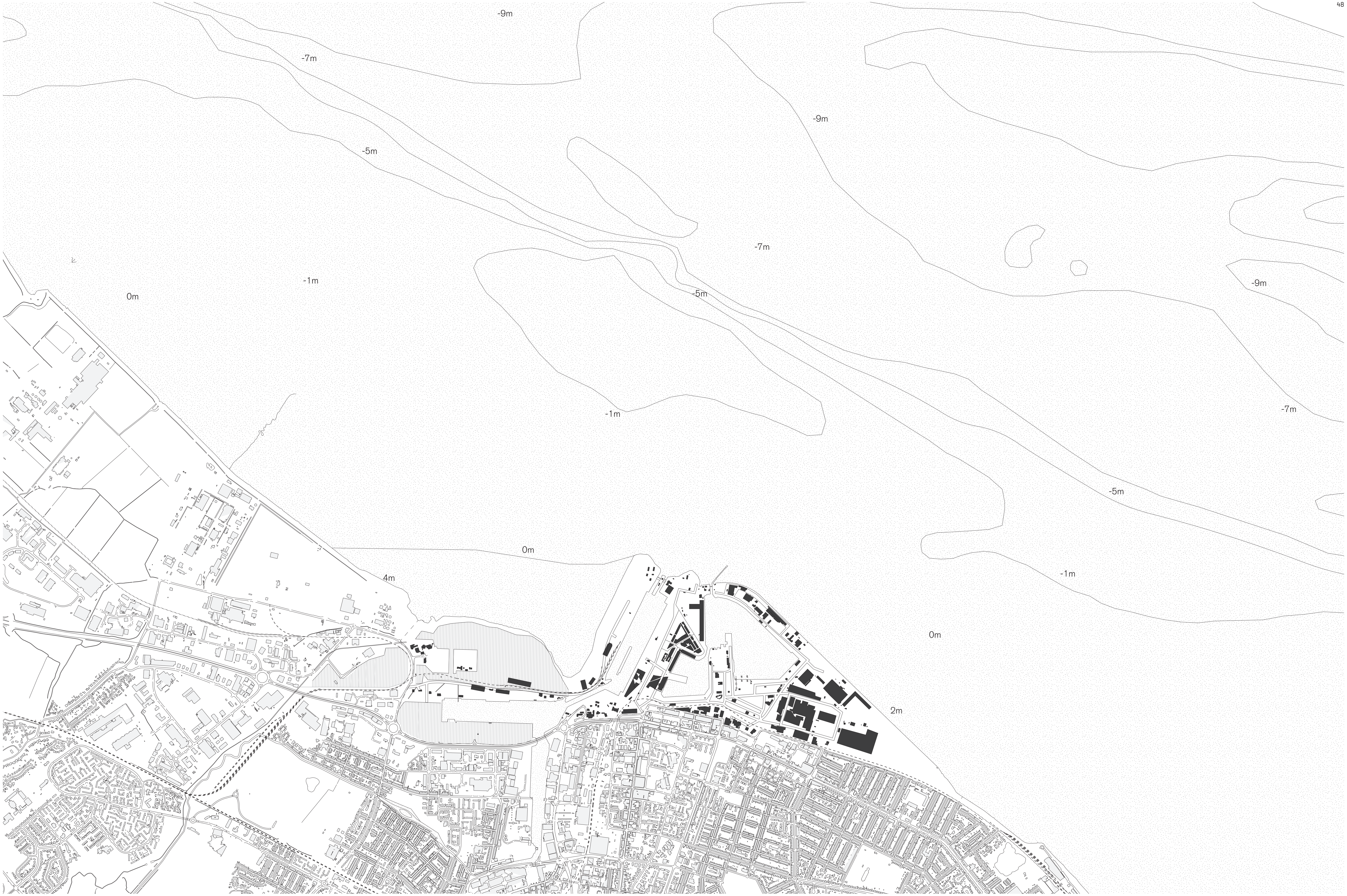


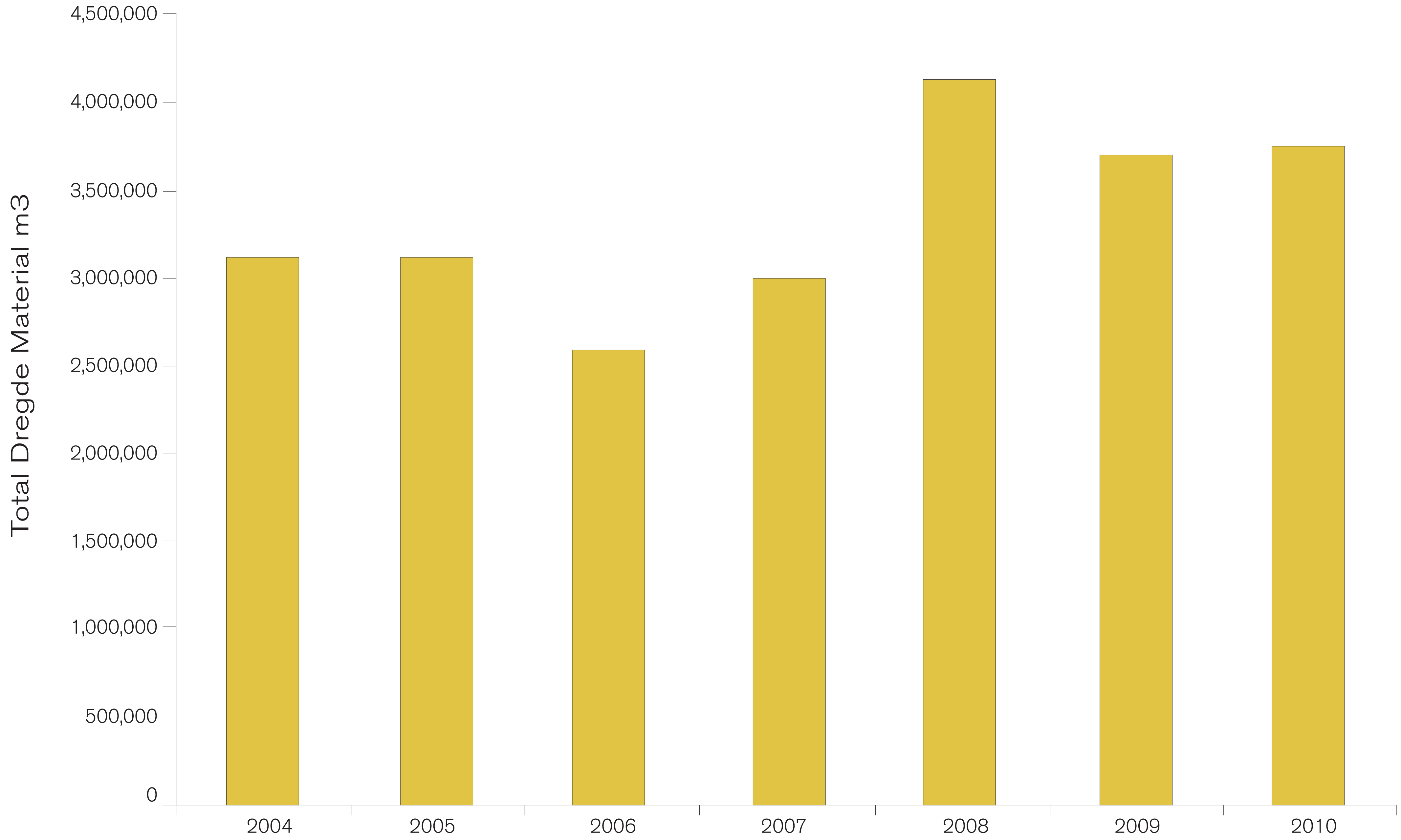
Image: Bathymetry Heights
Information Source: Edina,2018

Image: Sediment Flows Humber Estuary

Information Source : Vermeulen, 2003

Image: Flood Line sea level
Information Source: Environmental Agency.

Dredging Volume Humber Channel



Data Source: TIDE, 2013

Image: Dredging Statistics
Information Source : TIDE,2013

Dredging Volumes Grimsby Port

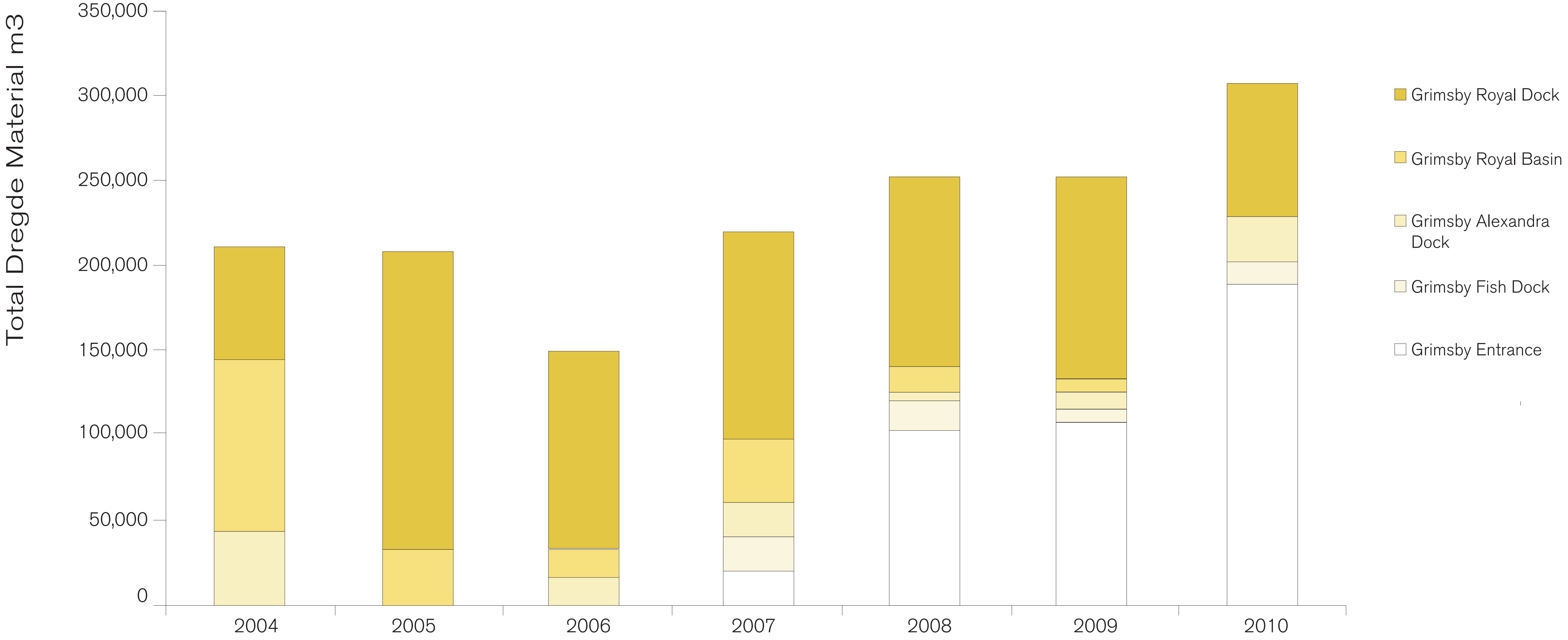


Image: Dredging Statistics
Information Source: TIDE,2013

Site: Determining the Port
Casco

Image: Port Areas and Program requirements
Information Source: ABP port, 2018

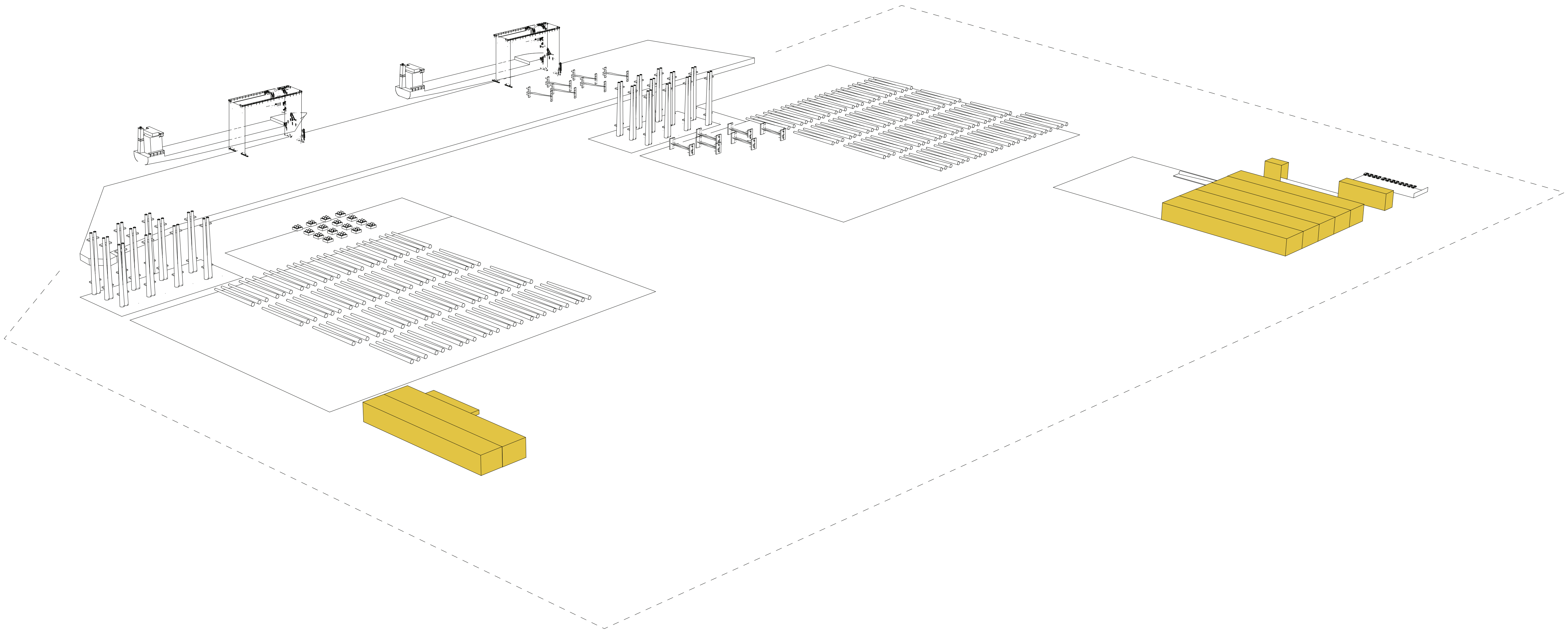


Image: Port function placement and relations
Information Source: ABP port, 2018

Based on Dirk Sijmons Casco Concept, the ordering of the functions is based on process characteristics, in this case the production and reparation of offshore wind turbines. There are both highly dynamic processes (change fast) which relates to the port industry itself, and there are low dynamic processes (change slower), which would the the ecological impacts of the creation of the island and the social and ecological regeneration of the city. Spatial versus ecological dynamics are relevant at this stage.

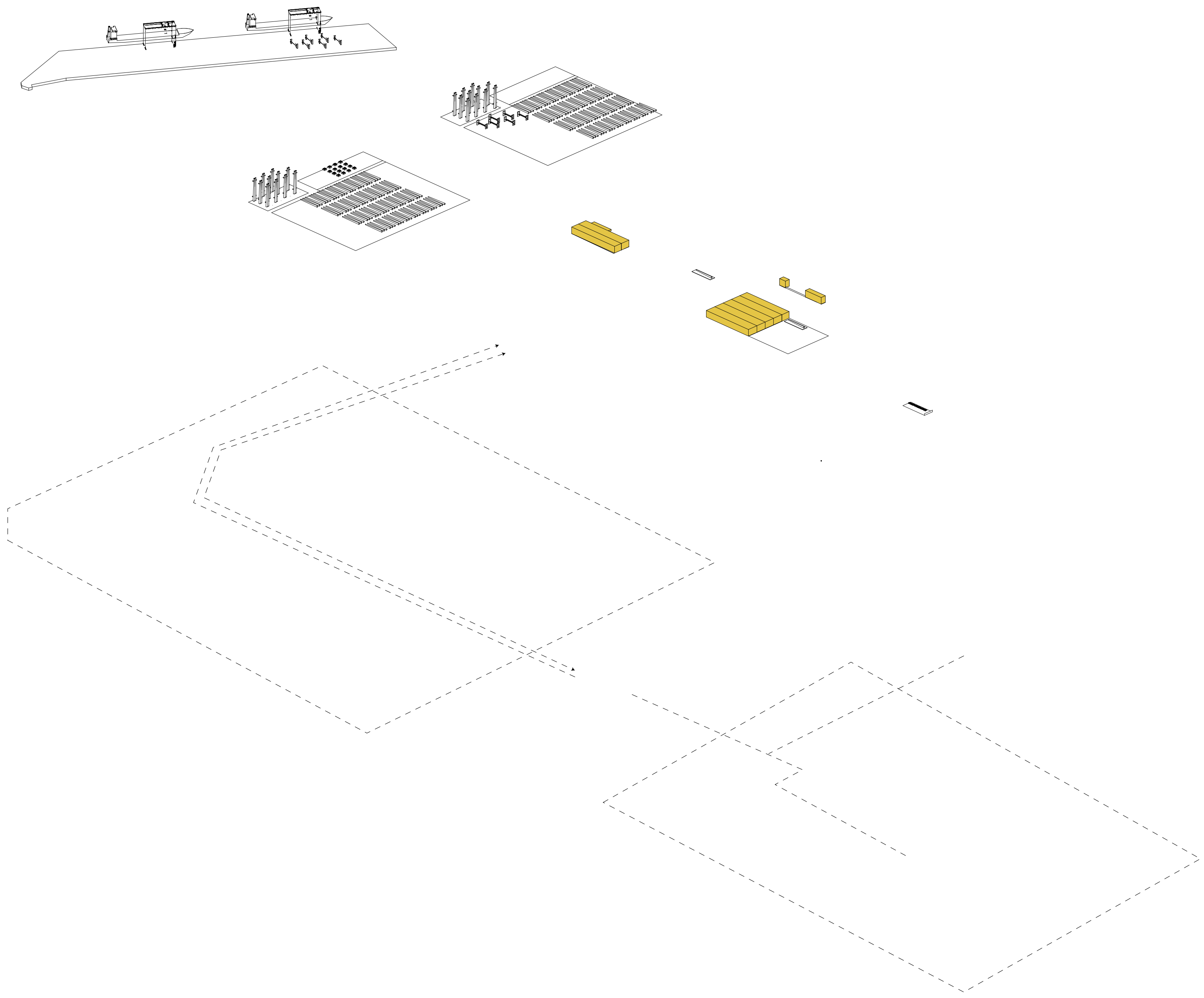
The first step sees the spatial splitting of functions that go against each other in terms of dynamics. This is central in the split between port and societal functions.

Highly dynamic functions require high level flexibility. This will be expected of the building elements of the port.

The last step is to look at combining ecological phenomena with the functions. The island in an atoll shape as a flood defense, the island expands based on dredging amounts.

Two aspects are shown on the right:

The framework: Patch, line and point elements that form a basis for the functioning of mainly the low dynamic processes.



Programatic Zones

Framework Connections

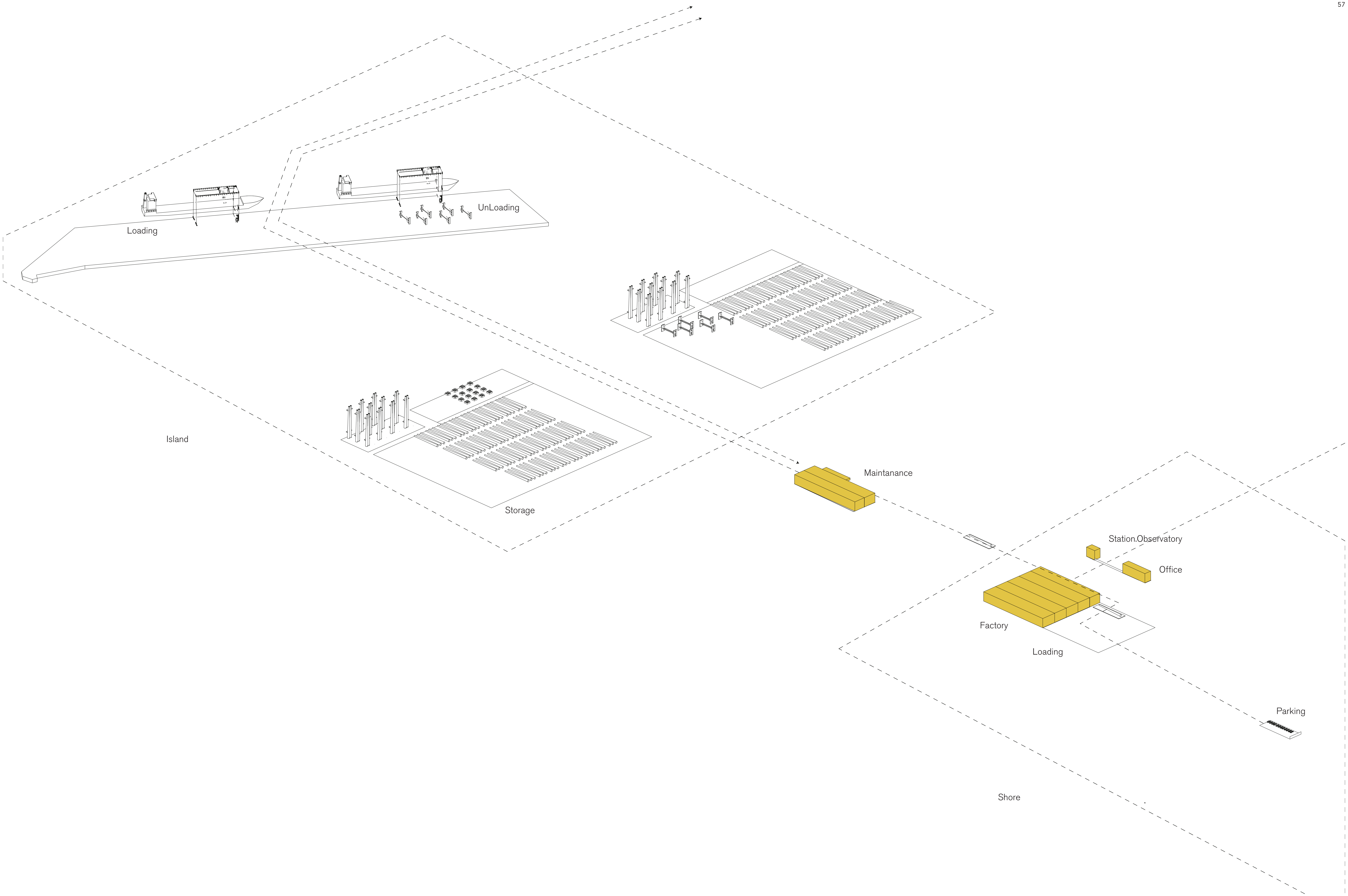


Image: Rearranging Framework and relations

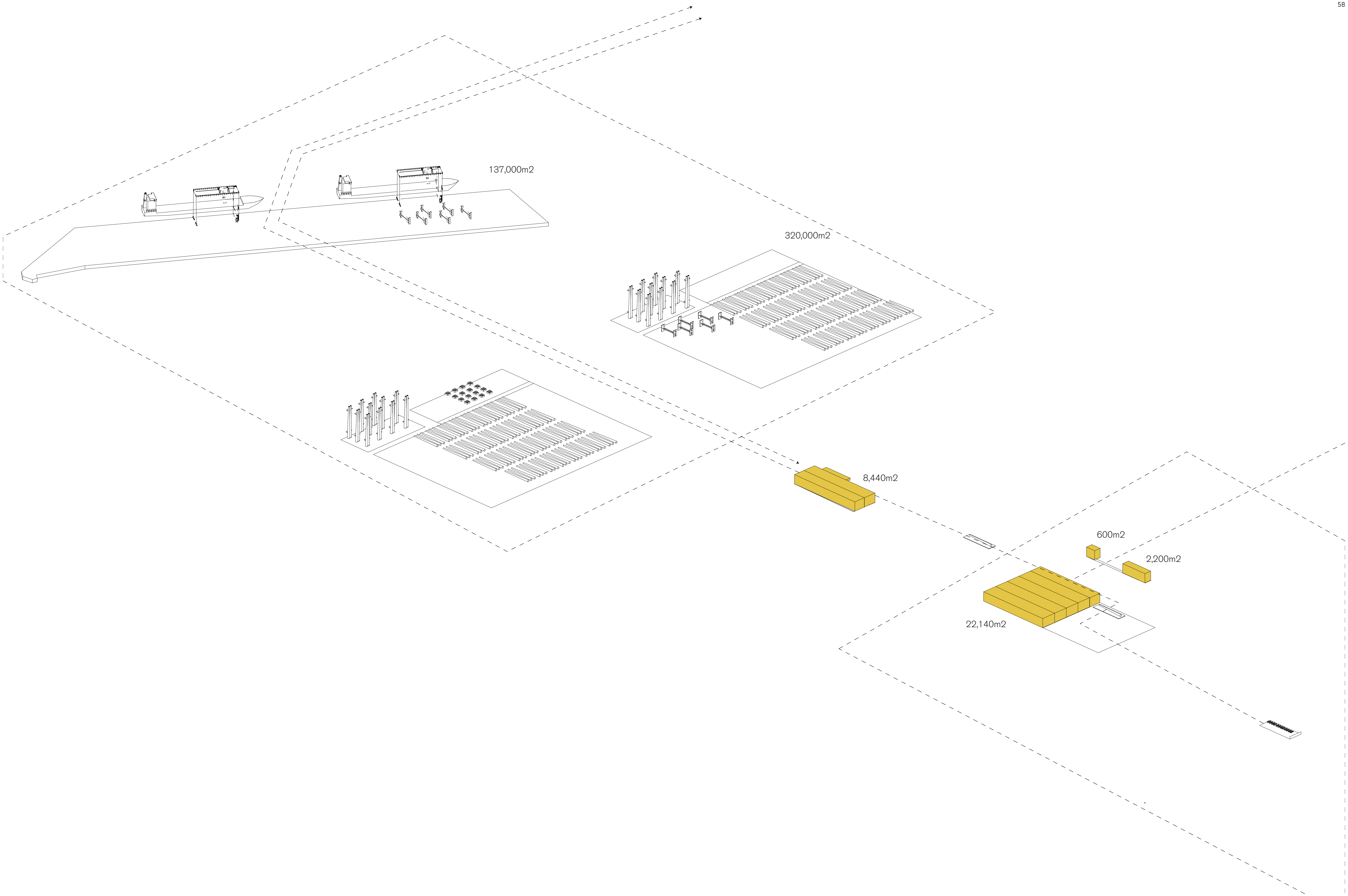


Image: Functional Areas

Image: Island Infill
Scale: 1:20000

Image: Island Base Volume

Scale: 1:20000

Image: Island Max Expansion (Double
Scale: 1:20000

Dredging Volume & Island Volume

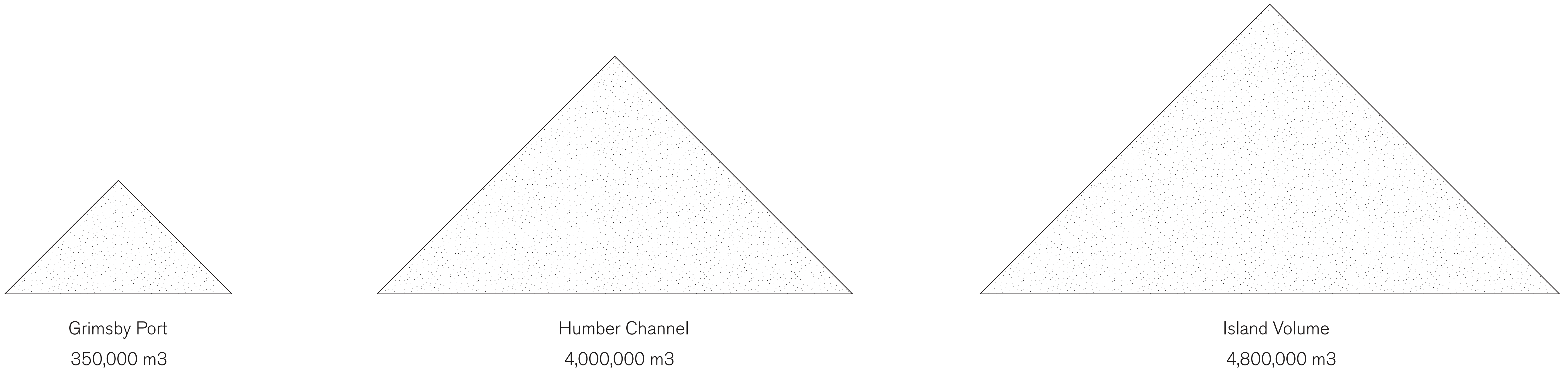
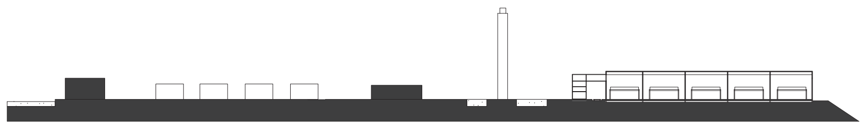


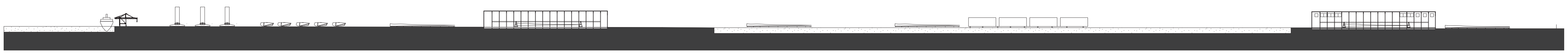
Image: Annual Dredging Volume vs. Island

Image: Energy Center Developments

Scale: 1:20000



SECTION A 1:5000



SECTION B 1:5000

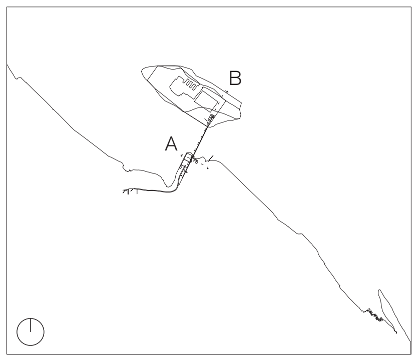


Image: Sections Project
Scale: 1:5000

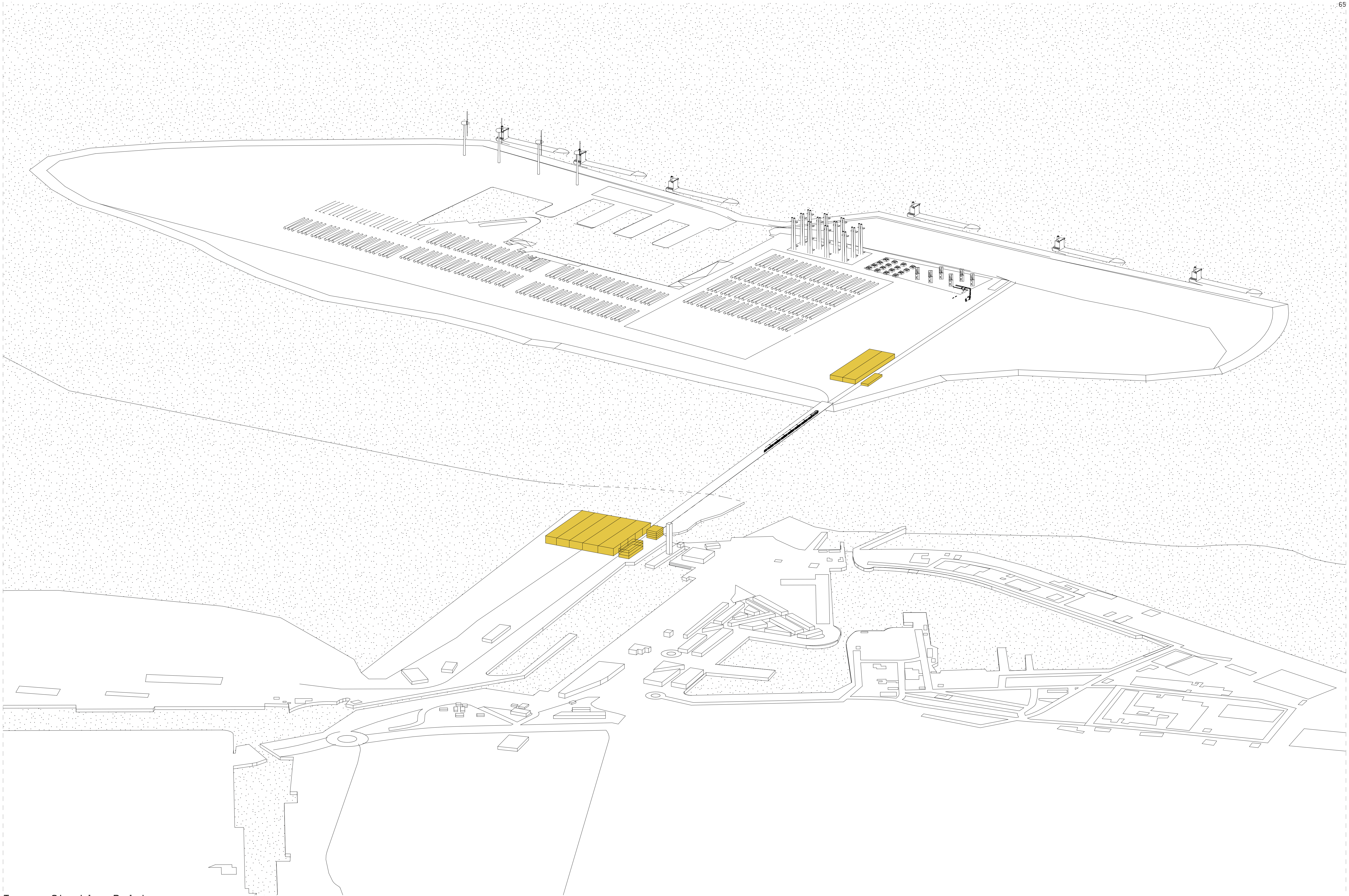


Image: Starting Point

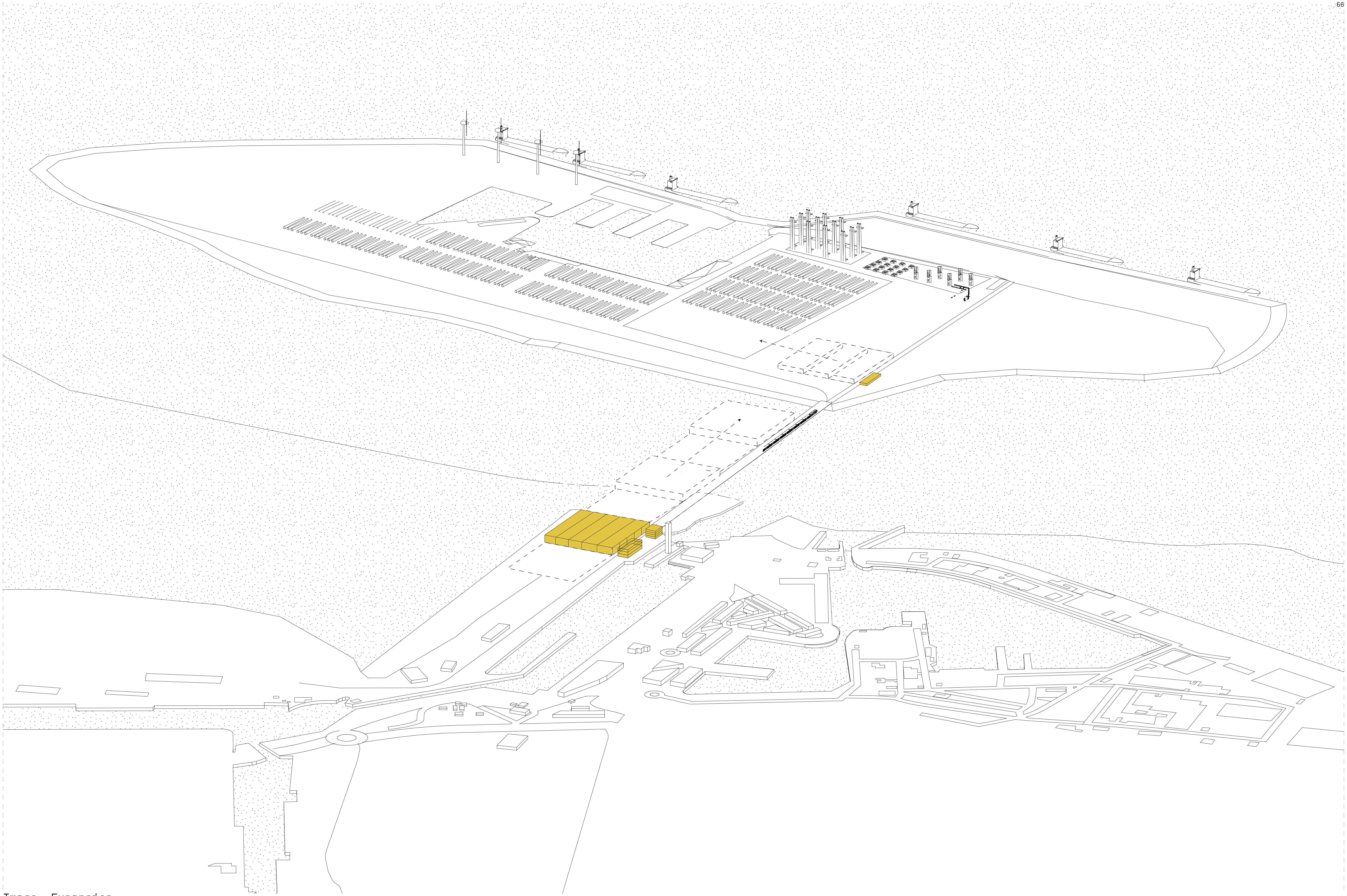


Image: Expansion

Scale: 1:1000

References

References

References

ABP ports. (2018). Humber Ports. Retrieved from http://www.abports.co.uk/Our_Locations/Humber/

Brigham, T. (1990). The Late Roman Waterfront in London. Britannia, 21, 99-183. Retrieved from https://www.cambridge.org/core/journals/britannia/article/late-roman-waterfront-in-london/2117E8E13B6BDD7D20B96FA98FB5C190

Caroll, J. (1999). Five reasons for scenario based design (Virginia: Virginia Tech, 1999)

Corner, J. (1999). Introduction: Mapping meaning in: Denis Cosgrove (ed.), Mappings (London: Reaktion Books, 1991).

DCLG. (2015). The English indices of deprivation 2015. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf

Department for transport. (2017). Port freight statistics 2016. Retrieved from https://www.gov.uk/government/statistics/port-freight-statistics-april-to-june-2018

Environmental Agency. (2018). Flood Risks UK. Retrieved from https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

Edina. (2018). Maps UK. Retrieved from http://edina.co.uk

Graham, S. (2001). Splintering Urbanism (London: Routledge, 2001)

Harvey, D. (2018). Rebel Cities (london: Verson, 2012)

Hein, C. (2014). Port Cities and urban wealth : Between global networks and local transformations. Retrieved from https://www.researchgate.net/publication/270461145_Port_cities_and_urban_wealth_Between_global_networks_and_local_transformations

HHC. (2018). History of Hull Docks. Retrieved from http://www.hullhistorycentre.org.uk/research/research-guides/history-hull-docks.aspx

Hooijmeijer, F. (2017). Drawing the subsurface: An integrative design approach (Delft: TU Delft, 2017)

Humber LEP. (2018). Humber Enterprise Zones. Retrieved from http://www.humberlep.org/business/enterprise-zones/

I-boating. (2018). Nautical Maps. Retrieved from http://fishing-app.gpsnauticalcharts.com/i-boating-fishing-web-app/fishing-marine-charts-navigation.

References: Images

References

Aecom. (2016). London Gateway [Photograph]. Retrieved from https://www.aecom.com/wp-content/uploads/2017/03/11641.London-Gateway-Port-front-facing-view.jpg

BAM. (2017). Offshore wind river tyne [Photograph]. Retrieved from https://www.baminternational.com/en/news/blyth-offshore-wind-farm-project-hits-new-milestone

CDDS. (2017). Siemens factory Hull [Photograph]. Retrieved from http://completediamonddrilling.co.uk/projects/

British Library. (1666) Great Fire of London [Map]. Retrieved from http://www.bl.uk/learning/timeline/large103629.html

DCLG. (2015). The English indices of deprivation 2015 [Tables] . Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf

European Commission. (2010). Economic Statistics Grimsby [Graphs]. https://ec.europa.eu/fisheries/sites/fisheries/files/docs/body/grimsby_en.pdf

Evans, M. (2018) Tobacco Warehouse London Docks Reconstruction [Sketch]. Retrieved from https://pixels.com/featured/tobacco-warehouse-at-london-docks-mary-evans-picture-library.html

Guardian. (2016). Green Port Hull [Image]. Retrieved from https://www.theguardian.com/business/2016/dec/01/hull-siemens-factory-wind-turbine-blades#img-2

Milne, G. (2016). Roman Londinium [Map]. Retrieved from https://www.gresham.ac.uk/lectures-and-events/the-growth-of-london-as-a-port-from-roman-to-medieval-times

Milne, G. (2016). Topography of Thames Islands [Map]. Retrieved from https://www.gresham.ac.uk/lectures-and-events/the-growth-of-london-as-a-port-from-roman-to-medieval-times

Museum of London. (2016). Londinium Warehouses [Map]. Retrieved from http://www.ancientpages.com/2018/08/16/londinium-ancient-roman-outpost-that-became-powerful-city-of-london/

PLA. (2016). Port of London [Map]. Retrieved from http://portoflondonhandbook.com/features/port-london-authority

Weller, E. (1884). River Thames with the Docks from Woolwich to the Tower [Map]. Retrieved from https://archive.org/details/dictionaryprac00mccu/page/n7

Port of Rotterdam. (2018). Port of Rotterdam [Map]. Retrieved from https://www.portofrotterdam.com/en/files/history-port-of-rotterdampng

Port of Rotterdam. (2018). Maasvlakte 2 [Images]. Retrived from https://www.maasvlakte2.com/nl/index/show/id/89/beeldbank

WMF. (2014). Grimsby Ice Factory [Photograph]. Retrieved from https://www.wmf.org/project/grimsby-ice-factory-and-kasbah

WMF. (2014). Kasbah [Photograph]. Retrieved from https://www.wmf.org/project/grimsby-ice-factory-and-kasbah

Siemens. (2018). Wind Blade Factory Hull [Render]. Retrieved from https://www.siemens.co.uk/en/wind/hull.htm

Image: Main design Scenarios