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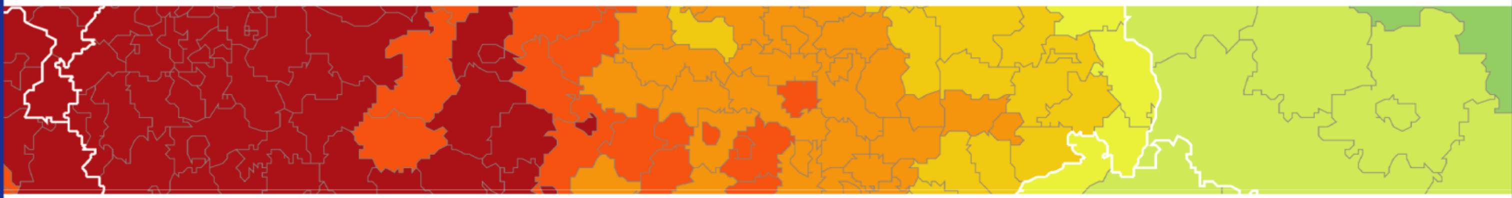

MSP-LSI – Maritime Spatial Planning and Land-Sea Interactions

Targeted Analysis
Version: 20/02/2020

Final Case Study Report: Netherlands

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Case Study Report: Netherlands

MSP-LSI – Maritime Spatial Planning and Land-Sea Interactions

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Abbreviations

CER	Container Exchange Route
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
DSO	Distribution Service Operators
EEZ	Exclusive Economic Zone
ESPON	European Territorial Observatory Network
ESPON EGTC	ESPON European Grouping of Territorial Cooperation
EU	European Union
EUR	Euro
FTE	Full time equivalent
GDP	Gross Domestic Product
GW	Gigawatt
ha	Hectares
HBO	Dutch higher professional education
IDON	Interdependent Directors' Consultative Body North Sea
ILO	International Labour Organization
IMO	International Maritime Organization
km	Kilometres
kWh	Kilowatt hours
LSI	Land-Sea Interaction
MARPOL	International Convention for the Prevention of Pollution from Ships
MBO	Dutch middle-level or vocational training level
MW	Megawatt
MSP	Marine Spatial Planning
nm	Nautical miles
NUTS	Nomenclature of Territorial Units for Statistics
O&M	Operation & Maintenance
R&D	Research and development
SVIR	Structural Vision Infrastructure and Spatial Planning of the Netherlands
SWOT	Strengths, Weaknesses, Opportunities, Threats
TSO	Transmission System Operator
TWh	Terawatt hours
UNCLOS	United Nations Convention on the Law of the Sea

1 Main highlights and executive summary

1.1 Governance Analysis

The analysis of the spatial planning system on a national and local level revealed the following insights:

1.1.1 Spatial Planning on Land

Land use planning in the Netherlands remains a largely decentralised process with the 390 municipalities exercising considerable control over the use of land through the production of detailed Bestemmingsplans. At municipal, provincial and national levels, spatial visions are intended to frame expected spatial developments in their area. The coastal municipalities have planning competences that extend 1km seawards from the coastline. Maritime and land based planning is essential covered by the same legislation which is currently expected to be revised in 2019 with a new Environment and Planning Act (Omgevingswet) seeking to streamline and simplify planning procedures.

1.1.2 Spatial Planning for the Sea

The Spatial Planning Act of 2008 forms the legal basis for planning in the Dutch territory for both land and sea out to the EEZ. Current Dutch MSP policy is The Policy Document on the North Sea 2016-2021 and is an appendix to the National Water Plan. It is prepared by the Interdepartmental Directors' Consultative Body North Sea (IDON) under the lead of the Dutch Ministry of Infrastructure and Water Management. This body seeks to coordinate national governmental bodies with an interest in maritime space. Maritime transport and renewable energy are issues of national interest, alongside defence, sand extraction and nourishment, CO_2 storage, mining for oil and gas, nature protection, free views of the horizon (extending 12nm from the coast) and guaranteeing coastal flood protection. Thoughts are now turning as to how this vision can be updated

1.1.3 Addressing LSI

The North Sea Policy document has understood the importance of land sea interaction and provided a list of LSIs per sector on land and at sea and has identified for sectors and designated uses some of the space requirements both at sea and on the land. It is not always clear how specific plans, especially on the land have dealt with this issues, although there is a hope that when the Policy Document for the North Sea is updated there will be more effective dialogue and input from coastal provincial and municipal governments, although the value chain analysis suggests the links extend beyond this narrow strip.

1.2 Value Chain Analysis

1.2.1 Maritime Transport of Cargo

Maritime transport remains an activity of significant national importance for the Dutch economy, and Rotterdam is the gateway to Europe, serving a hinterland of millions of inhabitants. Many European imports and exports are routed through the Netherlands and less that 10% of road transport from Rotterdam is cross border. This means that the roll of inland waterways and rail connections have been critical in Rotterdam's central position. Recently, in 2018, a prolonged dry period reduced the ability of the inland waterways to tranship goods and if this becomes a trend, it will have significant landward implications both for logistics provision and potentially sites of production. There remains intense and growing competition with other key ports, especially in and around the Mediterranean and Rotterdam's *Port Vision for 2030* has identified critical weaknesses and created an action plan to ensure the port remains competitive. Most of the ports are publically owned and they have strong links to the municipalities meaning that there is a close liaison between planning on the land and the space requirements so ports can remain competitive.

1.2.2 Offshore wind energy

Offshore wind energy is a relatively new requirement for Dutch sea space. In the recent past (in 2016 almost 95% of Dutch national energy supply came from fossil fuels North Sea gas and imported coal) and in response international requirements to respond to climate change, demands for energy transition and the opportunities for renewable wind energy in the North Sea, the Netherlands is committed to reducing greenhouse gas emissions by 40% by 2030.

The general plan is to develop 4.6GW of capacity of offshore wind energy by 2023. Offshore wind energy is in its relative infancy in the Netherlands and by 2017 1,118 MW of capacity was being generated by four offshore farms operating at that time.

MSP had an important role in making new space for these wind farms by negotiating adjustments to sea shipping routes, which in turn created space that could be zoned for offshore wind farms, and these were beyond the limits of territorial waters and in the EEZ.

Permission for development is required from the Netherlands Enterprise Agency (RVO.nl) and connections to the mainland is the responsibility of the government and in 2016 the Ministry of Economic Affairs appointed TenneT to manage the offshore electricity grid and connect it to the mainland. A special land use plan ('inpassingsplan') has been devised between the Minister for Economic Affairs and the Minister for Infrastructure and the Environment, working closely with the relevant municipalities and provinces for the routing of cables and construction of substations to enable connections to the electricity grid.

2 Introduction

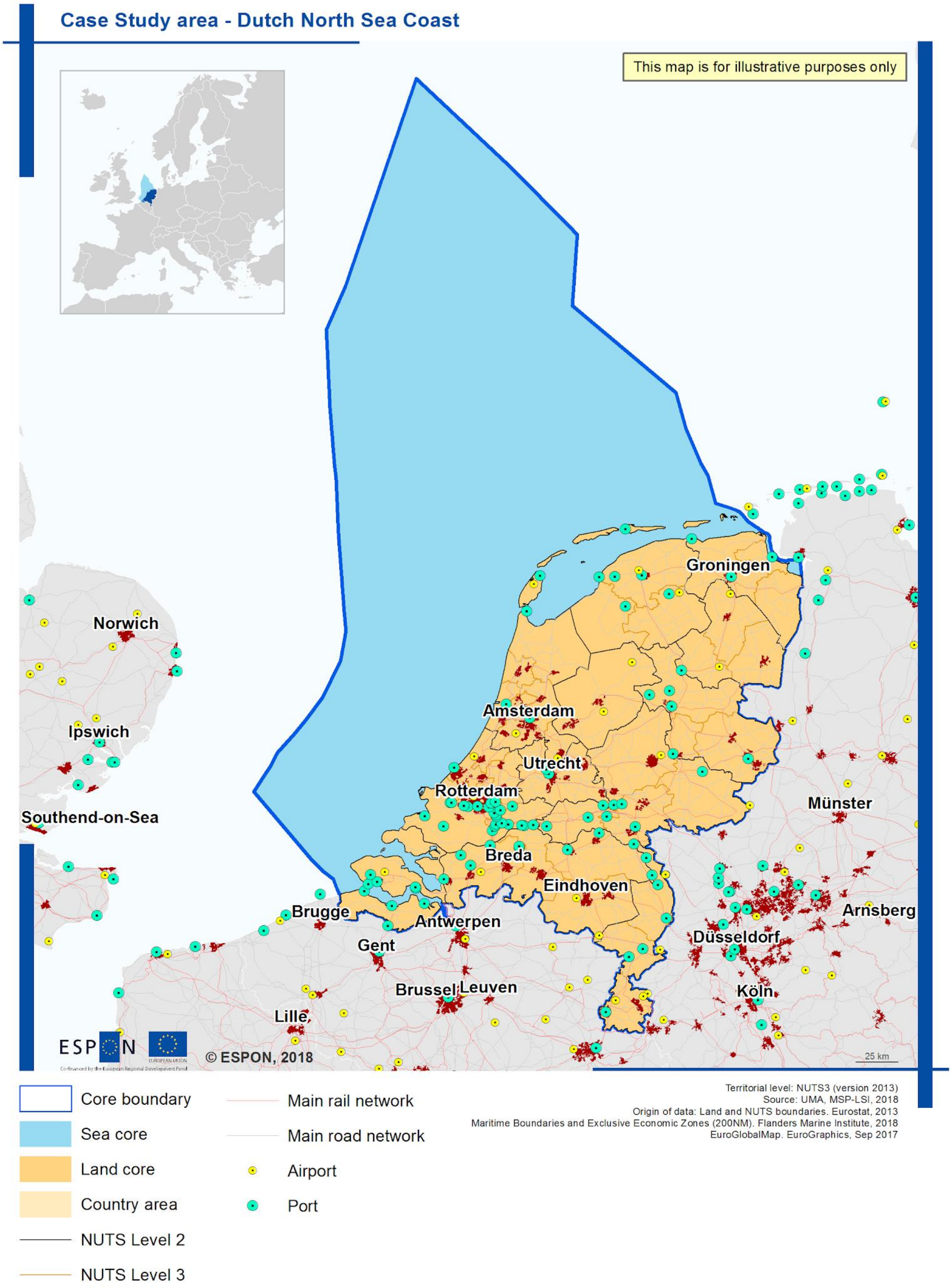
2.1 Case study context

The present case study report on the Netherlands is a scientific annex to the final report of an ESPON targeted analysis on Maritime Spatial Planning and Land-Sea Interactions, conducted within the framework of the ESPON 2020 Cooperation Programme. Among other objectives, the project aims to establish the main impacts on land of key maritime activities and to explore how these are managed and incorporated in terrestrial planning. In particular the project looked at sectors such as offshore wind energy, maritime transport, fisheries, environmental protection, coastal tourism and urban development. The Netherlands is one of five case studies selected in the project, which are representing different scales of European regional seas, types of coastlines, sectors and LSI challenges. The focal sectors selected for the Netherlands case study are maritime transport of cargo, with some of the main cargo importing and exporting ports, and the production of offshore wind energy (with a focus on offshore wind). This is set within the context of a Dutch national priority for energy transition and an understanding of what the implications for land sea interaction might be.

The core area for this case study is defined as all of the territory that the Dutch government claims territorial control over, both on land and sea.

The Netherlands is a small, low lying and densely populated country adjacent to the southern North Sea, with a 451 kilometres (km) long coastline bordering Belgium and Germany. The geology of the Dutch coastline is strongly influenced by the delta of the rivers Rhine, Meuse and Scheldt and by land reclamation efforts (17% of the country was reclaimed from lakes or the sea). Nowadays, almost a third of the country is located below sea level, and an even larger part of the Dutch territory is vulnerable to flooding. With 60% of the population living in areas below sea level, flood protection is of strong national importance, and the coastline has been heavily engineered, featuring dikes, dams, sluices and floodgates. Alongside this infrastructure, a complex water management system was developed that relies on artificial sand nourishment and continuous pumping to keep the polders dry and mitigate land subsidence. The most well-known large scale coastal protection infrastructure are the "Delta Works", which protect the Rhine-Meuse-Scheldt Delta in the province of Zeeland and South Holland from the sea, and the “Zuiderzee Works”, including the Afsluitdijk, which was constructed in 1932 over a length of 32 km to close off the Ijsselmeer, originally a bay, from the sea.

Map 1: Core area: Dutch North Sea Coast



The jurisdiction of municipal and provincial authorities over marine territory is limited to 1 km from the coastline, while the responsibility for all matters related to policy and management of the Dutch North Sea lies with the national government. This includes the territorial sea, which stretches outwards to the 12 nautical mile (nm) zone and the exclusive economic zone (EEZ), where the national jurisdiction is more limited. The main economic uses of the Dutch sea are fishing, maritime transport, nature protection, mineral extraction (including oil, gas and sand), recreation/ tourism and wind energy production, as well as military training.

Although the fishing sector enjoys a high visibility and is of cultural and historic importance, it accounts for less than 0.1% of the national gross domestic product (GDP). The size of the Dutch fishing fleet diminished from 718 vessels in 2015 to less than 600 vessels in 2017[1]. In 2015, 67% of the vessels were large scale vessels, and the total employment in 2014 was estimated at about 2,600 full time equivalent (FTE)[2].

Tourism and recreation, by contrast, is of strong economic importance for the country: every summer, Dutch beaches attract millions of domestic and inbound tourists (e.g. in 2017, 2.58 million inbound tourists visited the Dutch coast, and the total domestic coastal holidays amounted to roughly 2.8 million)[3]. Coastal tourism attractions include the islands of Friesland and Noord-Holland, beaches, flood protection works, dikes and dune districts (some of which have been declared protected areas), as well as the Wadden Sea, a system of tidal flats and wetlands of high biodiversity and ecological importance, which is listed as a protected area, a world heritage and Ramsar site.

While all of the marine or coastal economic activities outlined above feature important interactions between land and sea, the following sections will focus on the land-sea interactions associated with maritime transport of cargo and the production of offshore wind energy in the Netherlands. Later chapters will focus on planning processes on land and sea and highlight, how land-sea interactions in these two focal sectors are incorporated in planning processes, while safeguarding the needs of the other maritime sectors outlined above, such as coastal protection; tourism; nature protection; and oil, gas and sand extraction. Map 1 above outlines our study area.

2.2 LSI Scoping for MSP/Territorial Planning in the Netherlands

The core land and sea areas for the Dutch Case Studies are outlined above in Map 1 and is defined as all of the territory that the Dutch government claims territorial control over, both on land and sea. Although there are multiple maritime sectors of key importance to the Dutch economy for the focus of this study will be on the key sectors of maritime transport of cargo and offshore wind energy, chosen based on discussions with key stakeholders.

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[1] Statista (2019). "Number of fishing vessels in the Netherlands from 2009 to 2017". Available at: https://www.statista.com/statistics/647633/number-of-fishing-vessels-in-the-netherlands/

[2] FAO (2016). "Fishery and Aquaculture Country Profiles The Kingdom of the Netherlands". Available at: http://www.fao.org/fishery/facp/NLD/en

[3] Statista (2019). "Number of inbound coastal tourists in the Netherlands from 2007 to 2017". Available at: https://www.statista.com/statistics/755245/inbound-coastal-tourists-in-the-netherlands/; Statista (2019). "Number of domestic coastal holidays in the Netherlands in 2017". Available at: https://www.statista.com/statistics/755291/domestic-coastal-tourism-in-the-netherlands-by-area/

Figure 1: A methodology to explore LSI in MSP/Territorial Planning

<table>
<tr><th colspan="4">LSI Scoping for MSP/Territorial Planning</th></tr>
<tr><td rowspan="7">Governance Analysis</td><td>General context of the case study area and focal sectors</td><td rowspan="7">Value Chain Analysis</td><td>Developing the sector value chains</td></tr>
<tr><td rowspan="5">Spatial planning governance arrangements and LSI coverage in terrestrial/marine plans</td><td>Key sector characteristics</td></tr>
<tr><td>Sector framework conditions</td></tr>
<tr><td>Key sector actors</td></tr>
<tr><td>Sector statistics</td></tr>
<tr><td>Sector LSIs</td></tr>
<tr><td>Key LSI findings</td><td>Key LSI findings</td></tr>
<tr><td colspan="4">Mapping</td></tr>
<tr><td colspan="4">Recommendations for Good Management of LSI in MSP/Territorial Planning</td></tr>
</table>

The methodology outlined above in Figure 1 is designed to provide a flexible framework for LSI analysis that can be tailored for use in different contexts. It starts with an initial scoping stage where a core area for LSI examination is defined and LSI issues of particular significance in the case study context are identified. The MSP-LSI study was particularly concerned with LSI issues associated with maritime sectors and in each case 2 focal sectors were selected as the basis for more detailed LSI investigation. Following this scoping stage, 2 two aspects of analysis were undertaken related to governance and to the selected sector value chains. These analyses were supported by mapping activities which sought to provide visual material that could aid LSI understanding. Finally, based on these analyses recommendations for good management of LSI in the case studies were proposed, informed in some instances by stakeholder workshops. More detail on the key stages of the methodology are expanded upon below:

In consultation with the key stakeholders the core areas and the key sectors to be explored were defined. In this context the key sectors were largely defined by which sector was of most interest and/or causing greatest conflict either regarding interactions between sectors, or regarding land sea interactions. Across all of the case study areas, a range of different sectors has been chosen, and there were significant differences between the way that land sea interaction occurs, depending on the sector and particular localities. In defining the core area the marine space was seen as extending to the furthermost point that a country might claim a jurisdictional competence over. In many cases this would extend to the Exclusive Economic Zone, or its equivalent, where not agreed designations have been confirmed. In many countries, the maritime boundaries remain contested in specific areas, however, although disputed, in practice mechanisms of transnational co-operation and management are applied. On the land, the core area was defined in terms of the coastal areas, based for statistical purposes on NUTS level three definitions, recognising that whilst land sea interactions might be most intense at the coast, many impacts both from the land to the sea and vice versa will have territorial impacts which have a much wider spatial reach.

Because the knowledge gathering for each of the case studies was undertaken by local experts who could speak and read the local languages, it was necessary to prepare a detailed template document which contained instructions of what to look for regarding the two key elements that were important to this study, notably the governance arrangements for both the land and sea, and the degree of effective interaction, with a specific focus on the governance of land sea interactions associated with the specific sectors/value chains under consideration for that particular case study. With the value chain analysis, a similar structure and approach was adopted and this is explained in much greater detail in the methodological scientific report.

The following sections outline the outputs of the pilot investigations for the Netherlands case study.

Governance Analysis

This chapter is focused on presenting the governance terrestrial and maritime spatial planning, and provides insights into key policies and plans.

2.3 General context of case study area and focal sectors

The Netherlands is a small, low lying and densely populated country adjacent to the southern North Sea, bordering Belgium and Germany. A significant portion of the Dutch territory is vulnerable to flooding, and with 60% of the population living in areas below sea level, flood protection is of strong national importance. The Dutch part of the North Sea covers approximately 58,000 km2 with a coastline that traverses five provinces and includes important cities such as Amsterdam, The Hague and Rotterdam, which features Europe's biggest harbour, the Europort.

The main economic uses of the Dutch sea are fishing, maritime transport, nature protection, mineral extraction (including oil, gas and sand), recreation/ tourism and wind energy production, as well as military training. Maritime transport and the production of offshore energy, however, are the key sectors because of their contribution to the nation's economic performance, as well as representing areas where the Netherlands has a competitive advantage within Europe.

Governance of land-use and maritime spatial planning in the Netherlands is clearly defined in national legislation. The jurisdiction of municipal and provincial authorities over marine territory is limited to 1 km from the coastline, while the responsibility for all matters related to policy and management of the Dutch North Sea lies with the national government. Key policies and legislation of the case study relating to its land and sea-based planning include The Spatial Planning Act (2008), which re-defined the legal framework for spatial planning in the Netherlands and is applicable to the Dutch territory on land, as well as the territorial and marine waters. In addition to this Act, the legal basis for the Dutch MSP also falls under the National Water Act. The current Dutch MSP is laid down in the Policy Document on the North Sea 2016-2021 (Beleidsnota Noordzee), which is an appendix to the National Water Plan 2016-2016. To support MSP, an Interdepartmental Directors' Consultative Body North Sea is in charge of producing the North Sea Policy Document, and acts as a coordinating mechanism between Dutch ministries involved the planning process.

The scope of land- and sea-based planning jointly interlock within Dutch spatial planning laws, where one ends the other begins. However, despite this clear allocation of scope, the governance of various land-sea interactions seems to be taken up sectorally and on an ad hoc basis. One initiative in 2015 stands out, a project led by the national government in collaboration with several provinces municipalities and water boards to explore LSIs. According to the Dutch MSP, at the heart of the LSI concept, is the generation of value from activities near the sea or coastline which may take place much further in the hinterland. An important role for the streamlining of MSP with sectoral policies and land-based planning is the Interdependent Directors’ Consultative Body North Sea, which should serve to align sea-based policies and land-based policies. To date, however, overarching governance of LSIs are not specifically handled by either this body or local municipalities within a clear framework.

Interestingly, maritime harbours help facilitate land-sea interactions for international maritime transport, but also for many other sectors. Port authorities are typically organised as public limited companies, retaining strong ties to national or municipal governments. However, political interference is generally limited to environmental obligations for expansion of port infrastructure. An important challenge for LSI of the maritime transport sector is connectivity and access to the harbour while assuring flood protection, as well as logistical and operational challenges of ensuring smooth transhipments of cargo to the hinterland can occur.

For offshore wind energy, most LSI issues are handled by the Dutch government, which oversees the site selection for offshore wind development, environmental assessments as well as the allocation of connection with onshore grid systems (i.e. through TenneT). To reduce potential negative impacts from the development of offshore wind in the Netherlands, such as damaging the tourist industry or having a bearing on nature protection have been recognised. Visibility from the coast is a key criteria in site selection, and it is required by law for sites to be at least 12 nautical miles from the coastline. However, communication within municipal or local levels to coordinate between spatial plans and visions seems to be lacking. It is unclear how local development plans and strategies are included within national plans for offshore wind development, and how potential conflicts between these visions or strategies are handled.

2.4 Spatial Planning Governance and LSI

2.4.1 Spatial Planning in Netherlands

The Netherlands is split into twelve provinces and 390 municipalities. Spatial planning in general is mainly the responsibility of municipalities, while the national government sets the legal framework and carries a responsibility for areas and networks of national significance for the economic and social development of the country[4], and provinces may define areas of provincial importance and can intervene where spatial policies of municipalities conflict. Apart from this, higher levels of government do provide guidance for lower levels in form of structure visions. Sectoral and economic policy, targeted (co-)financing of specific projects and the purchasing of land are, of course, other ways by which public authorities can influence spatial development (municipalities in the Netherlands are, e.g., known to frequently engage in land

[4] Government of the Netherlands (2018). “Spatial Planning in the Netherlands”. Available at: https://www.government.nl/topics/spatial-planning-and-infrastructure/spatial-planning-in-the-netherlands

and property markets to assure their interests[5].). Below, the spatial planning system in the Netherlands is explained in more detail

Currently, the Dutch government is working on a reform of the Dutch spatial planning law into one overarching Environment and Planning Act (Omgevingswet), which will streamline and simplify spatial planning procedures and is expected to be issued in 2019[6].

The presently valid Spatial Planning Act was implemented in 2008 and forms the legal framework for spatial planning in the Netherlands. It is applicable to the Dutch territory on land, as well as the territorial waters and the EEZ and specifies that the scope of spatial planning authority of the municipality stretches out to 1 km seawards of the coastline. The Act requires every level of government (national, provincial and municipal) to create one or more structure visions (Dutch 'structuurvisie'), in which they describe expected spatial developments, as well as a strategy on how these developments will be steered[7]. The minister, provincial states and the city council are responsible, respectively, for drafting these visions. Visions are only legally binding for the drafting organ, but they should fulfil a guiding function for the administrative levels below and inform their respective visions[8]. Hence, technically speaking, there is no hierarchical relationship between the spatial visions of the different administrative levels, as their main function is to bring about internal structure[9].

Apart from the visions, the Spatial Planning Act stipulates that municipalities have to create one or more land-use plans (Dutch 'bestemmingsplan'), or zoning plans that describe where construction may take place, what may be built, the size of the structure and what it may be used for[10]. These plans are legally binding to land owners and are typically renewed every ten years; however, exemptions can be made if these are in the interest of the planning authority. Land-use plans form the basis for issuing licenses for all construction, and, just like the visions, must be freely accessible online[11]. In special instances, the Dutch government and provincial states may also produce land-use plans, however, these must be in line with their respective spatial visions. Project plans are another form of zoning plans, which take precedence over land-use plans and are typically drafted for specific projects which are in conflict with existing land use plans.

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[5] OECD (2017). "Land-use Planning Systems in the OECD Country Fact Sheets: Country Fact Sheet Netherlands". Available at: http://www.oecd.org/publications/land-use-planning-systems-in-the-oecd-9789264268579-en.htm

[6] *Ibid.*

[7] *Ibid.*

[8] Government of the Netherlands (2018). "Uitleg Structuurvisie". Available at: https://www.infomil.nl/onderwerpen/ruimte/ruimtelijke/wet-ruimtelijke/structuurvisie/uitleg/

[9] Government of the Netherlands (2018). "Hoofdstuk 2. Structuurvisies". Available at: https://www.infomil.nl/onderwerpen/ruimte/ruimtelijke/wet-ruimtelijke/wro-kort/#Hoofdstuk2Structuurvisies

[10] Government of the Netherlands (2018). "Spatial Planning in the Netherlands".

[11] See the website www.ruimtelijkeplannen.nl

In some instances, project developers need to assess the environmental consequences of proposed projects in the form of an environmental impact assessment (also referred to as "m.e.r."). Whether this is a requirement depends on the activities and how harmful they are to the environment[12]. Depending on the situation, the environmental consequences of spatial visions and land-use plans also need to be mapped. The environmental impact assessment assesses alternatives and the choice of location from an environmental perspective, but also looks outside the borders of the planning area, with the goal of fully integrating the environment into policy-making[13].

The present overarching spatial planning policy document on national level, which is binding at national level and has an informative function for all lower planning levels, is the 2012 Structural Vision on Infrastructure and Spatial Planning (Structuurvisie Infrastructuur en Ruimte) (SVIR), which sets out the long term national spatial development and mobility objectives (time horizon until 2040) and identifies water safety and the protection of natural and cultural heritage as issues of national importance[14]. It recognises the growing need for energy, mobility and connectivity with neighbouring countries (mainly Germany and Belgium) and important trade partners (e.g. China and India), and outlines the role for the national government in the development of infrastructure for logistics and the reservation of space for the generation- and transport of renewable energy. The Structural Vision Infrastructure and Spatial Planning (SVIR) does not refer specifically to land-sea interactions but contains a sub-chapter on the sea and coast with a map, relevant definitions and a list of the tasks of national importance ("nationale opgaven") for the Dutch North Sea in coherence with the maritime spatial plan.

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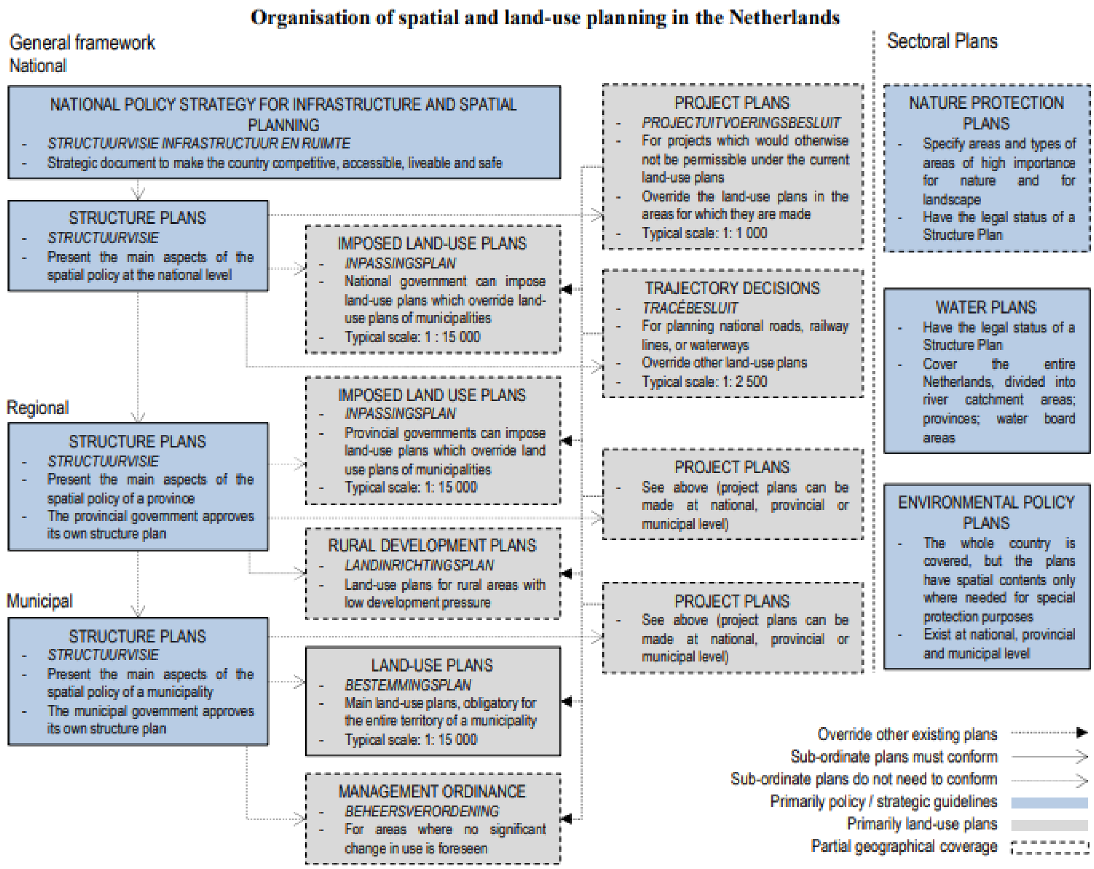
[12] Government of the Netherlands (2018). "Environmental impact assessment (MER)". Available at: https://business.gov.nl/regulation/environmental-impact-assessment-mer/

[13] Government of the Netherlands (2018). "Milieu-effectrapportage en Ruimtelijke planvorming". Available at: https://www.infomil.nl/onderwerpen/ruimte/ruimtelijke/milieu/

[14] Government of the Netherlands (2012) Structuurvisie Infrastructuur en Ruimte Nederland concurrerend, bereikbaar, leefbaar en veilig. Ministerie van Infrastructuur en Milieu. Available at https://www.rijksoverheid.nl/documenten/rapporten/2012/03/13/structuurvisie-infrastructuur-en-ruimte

Figure 2: Organisation of land use planning in the Netherlands.



Source: OECD (2017) The land use plans of Maasvlakte II and Borssele

In the paragraphs below, as an example, the spatial plans on municipal or below-municipal level of interest for the exploration of land-sea interactions of renewable energy and maritime transport at the Maasvlakte (which is part of the harbour of Rotterdam), and Borssele, (which covers the (future) point of connection between the national high voltage grid and the offshore wind farms Borssele 1 and 2) are going to be discussed.

Borssele is a small town (approximately 1500 inhabitants) located on the coastline of the province of Zeeland. It plays a crucial role as landing point for offshore wind energy coming from the offshore wind parks Borssele 1 and 2. The necessary infrastructure, including a high voltage- substation (which will be placed close to an existing substation) and cables (which will cross the channel to Antwerp), for the connection of the offshore wind parks to the land-based electricity grid are neither foreseen in the Structural Vision of the Municipality of Borssele (valid from 2015-2020), nor in the two relevant municipal land use plans and the management plan of Borssele:

- Bestemmingsplan Borsels Buiten (mainly focused on maintaining existing landscape)
- Bestemmingsplan Groenproject 't Sloe (focusing on the industrial area Sloe and the adjacent harbour) and

- Beheersverordening Zeehaven en industrieterrein Sloe 2013 (likewise focusing on the industrial area Sloe and the adjacent harbour, currently under revision),

Nor in the relevant land-use plan and the management plan by the adjacent municipality Vlissingen, which will also be affected by the new infrastructure developments:

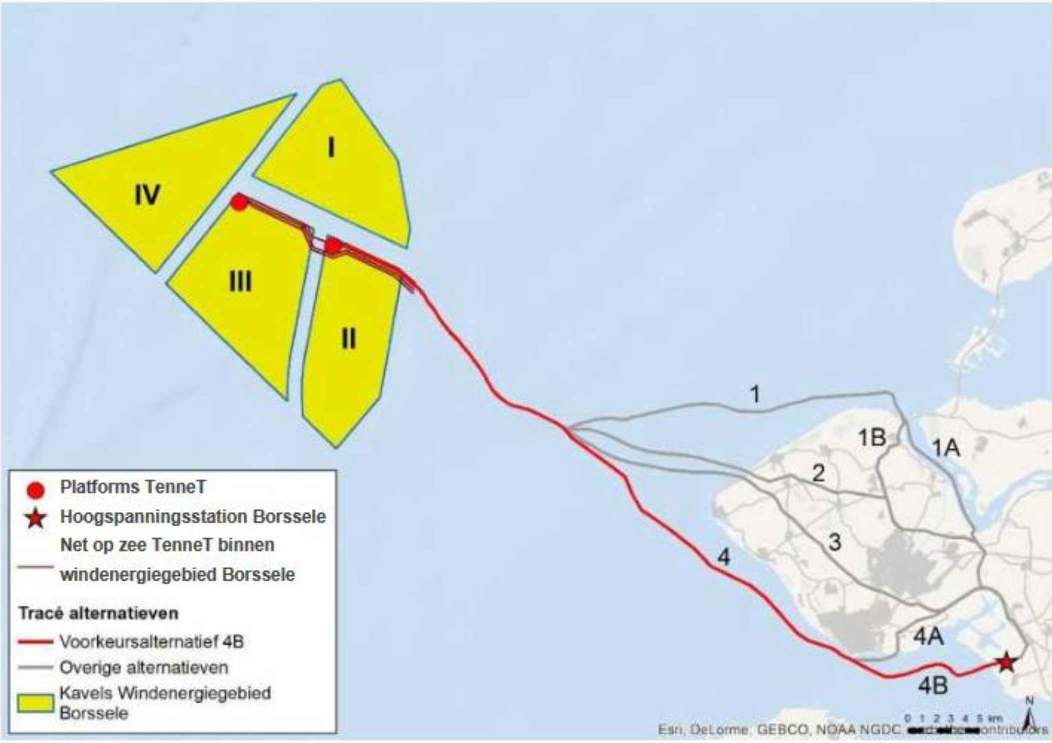
- Bestemmingsplan Buitengebied (mentions the coastline and sea, in particular focusing on nature protection and landscape quality) and
- Beheersverordening Vlissingen-Oost.

Also, none of these plans make any direct mentioning of land-sea interactions, and, if at all the plans only briefly mention the key sectors of this study in their EIA.

Therefore, in order to enable the licensing and construction of the cables and substations, the Minister for Economic Affairs and the Minister for Infrastructure and the Environment devised a special land-use plan (so-called "inpassingsplan")[15], which was drafted in close cooperation with the municipalities and the province. The EIA of the “inpassingsplan” does not explicitly mention land-sea interactions but tests for impacts on a number of coastal and maritime sectors (e.g. sand extraction, oil and gas mining, fishing, aquaculture, military) and identifies possible conflicts with the shipping sector (during construction and operation), as well as conflicts with the tourism sector (during construction), and suggests a number of mitigation measures.

[15] Ministerie van Economische Zaken & Ministerie van Infrastructuur en Milieu (2016): Inpassingsplan net op zee Borssele. L.IMRO.0000.EZip16nozBorssele-3000. Den Haag, 27th of June 2016 (https://www.rvo.nl/sites/default/files/2016/07/Inpassingsplan_net_op_zee_Borssele.pdf)

Map 2: Overview of options for deep sea cables connecting wind parks to electricity grid. Preferred alternative= 4B, coloured red



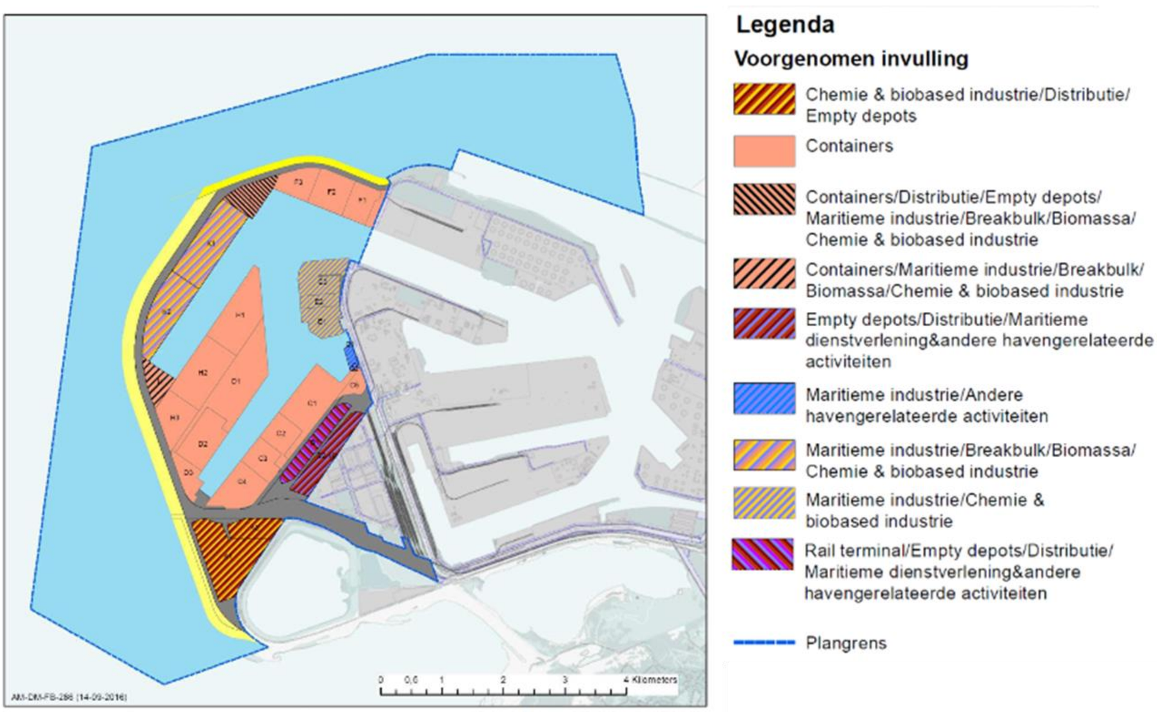
Source: Ministerie van Economische Zaken & Ministerie van Infrastructuur en Milieu (2016): Inpassingsplan net op zee Borssele

Map 3: Overview of project area (indicated in red)

The **Maasvlakte II** is an extension of Rotterdam harbour on artificial land outside the mouth of the river. It contains approximately 2000 ha of harbour and industrial area. The Maasvlakte II was originally planned and constructed for chemical industry and container trans-shipment and any activities related to transport of these.

The first land use plan for the Maasvlakte II dates back to 2008. The new land use plan from 2018 was drafted to accommodate the growing demand on the Maasvlakte for room for maritime industry (related to the development, construction, maintenance and dismantling of wind parks and oil and gas rigs), breakbulk (offshore industry objects, such as wind turbines, modules of oil rigs, refineries etc.) and agribulk (biomass.i.e.human and animal foodstuffs in very large quantities for storage and/or distribution, among other from North America). The construction of wind turbines at the edge of the area, as well as the location of a tourism pavilion are also part of the new land-use plan[16].

Map 4: Map of Maasvlakte II and envisioned uses.



Source: Bestemmingsplan Maasvlakte 2 (2018) (NL.IMRO.0599.BP1111Maasvlakte 2-va01)

2.4.2 The system of Maritime Spatial Planning in the Netherlands

Due to the limited amount of ocean space, as well as the relatively recent emergence of new uses in the EEZ, such as offshore wind farms and marine protected areas, Marine Spatial

[16] *Bestemmingsplan Maasvlakte 2 (2018) (NL.IMRO.0599.BP1111Maasvlakte 2-va01)*

Planning (MSP) has an important role to play in the Netherlands[17]. The responsibilities for MSP of the territorial sea are divided between the national government and the municipalities, which may devise policy and develop spatial plans up to 1 km seaward from the coastline. The rest of the territorial sea and the EEZ is subject to planning by the national government (as stipulated in the Spatial Planning Act). As such, the spatial planning authority for MSP starts as the 1 km seawards of the coastline and extends outwards to the limits of the Dutch EEZ. The Dutch MSP therefore includes both the territorial sea and the EEZ and covers an area of 58,000 km^2, which corresponds to approximately 1.5 times the total surface of the Netherlands[18]. The legal basis for the Dutch MSP is the Spatial Planning Act from 2008 and the National Water Act, which stipulates that the national government should outline the national water planning in a National Water Plan, which should be issued on a five year basis and should contain as an annex a spatial vision for the development of the Dutch territorial sea and EEZ.

The Interdepartmental Directors' Consultative Body North Sea (IDON) under the lead of the Dutch Ministry of Infrastructure and Water Management (formerly the Ministry of Infrastructure and the Environment) is in charge of producing the North Sea Policy Document[19]. The function of IDON is to coordinate the Ministry of Infrastructure and Water Management, Rijkswaterstaat, the Ministries of Economic Affairs and Climate Policy, of Agriculture, Nature and Food Quality, of Internal Affairs, of Education, Culture and Science and the Ministry of Defence and the Coastguard in the planning process regarding their specific tasks[20].

The current Dutch MSP is laid down in the Policy Document on the North Sea 2016-2021 (Beleidsnota Noordzee), which is an appendix to the National Water Plan 2016-2016. The Policy Document on the North Sea is a structural vision and as such only binding to the national government. The North Sea Policy Document provides an assessment framework for the national government to judge whether a use is permitted in a given area. Licenses for the occupation of marine space are issued through sectoral management and on the basis of different planning processes and documents.

The Policy Document on the North Sea identifies renewable energy and maritime transport both as activities of national interest, alongside defence, sand extraction and nourishment, CO_2 storage and mining of oil and gas. It also stipulates a number of other national priorities, which should function as guiding principles for the planning process[21]. These include the free

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[17] IOC UNESCO (2018). "Netherlands". Available at: http://msp.ioc-unesco.org/world-applications/europe/the-netherlands/

[18] Brief van de Minister van Economische Zaken en Klimaat aan de Voorzitter van de Tweede Kamer der Staten-Generaal, Den Haag, 27 maart 2018

[19] European MSP Platform (2018). "Maritime Spatial Planning Country Information: Netherlands". Available at: https://www.msp-platform.eu/sites/default/files/download/20181026_netherlands.pdf

[20] *Ibid.*

[21] Government of the Netherlands (2018). "Policy Document on the North Sea 2016-2021 (printversie)".

view of the horizon from the coastline to 12 nm, the preservation of the coastal fundament and the coastal protection works, the protection and preservation of Natura 2000 areas and the marine ecosystem as a whole, and the provision of space for the transport of dangerous substances via pipelines and the protection of archaeological values. The first priority, however, is to guarantee coastal flood protection (an important policy document in this respect is the Deltaprogramma which sets out a strategy for long term flood protection).

The Policy Document on the North Sea is complemented by a long term vision, which is expressed in the North Sea 2050 Spatial Agenda, focusing on possible future developments regarding the energy transition at sea, accessibility and maritime transport, among others[22]. These economic activities are closely interlinked, as the Dutch government realises that the foreseen increase in wind farms will take up more ocean space.

Chapter 3.13 (p61) of the North Sea Policy Document is focused on land sea interactions and provides a list of land sea interactions per sector on land and at sea.

Table 1: Overview of land sea interactions as specified in Beleidsnota Noordzee

Sector/designated use	**At sea**	**On land**
Electricity production	(Wind) energy farms	Assembly in ports Building of special ships
	Cables	Landing / connection to the grid
	Cooling water inlet / outlet	Power stations
	Room for experimentation	
Commercial mineral extraction	Sand extraction sites	Desalination / transhipment port
	Shell extraction	Trans-shipment port
Coastal defence	Sand extraction sites	Beach and foreshore replenishment
Oil and gas extraction	Exploration	
	Production platforms	Service industry (including helicopters, supplies), Maritime sector (construction, research, etc.)
	Pipelines and cables	Landing / connection of pipelines and cables
	Dismantling	Processing capacity
		Search & Rescue (SAR) capacity

[22] Government of the Netherlands (2018). “North Sea 2050 Spatial Agenda”. Available at: https://www.government.nl/documents/policy-notes/2014/07/28/north-sea-2050-spatial-agenda

CO2 storage	Vacant gas fields	CO2 capture units
	Platforms	
	Pipelines	Landing points
Shipping	Shipping routing measures	Ports
	Anchorages	Ports Trans-shipment Passenger terminals for ferries and cruises Inland shipping
	Dumping sites for dredging	Dredging ports
	Floating trans-shipment	Ports
		Shipbuilding Shipping assistance / coastguard Search & Rescue (SAR) capacity
Military use	Exercise zones	Military airbases Exercise zones and shooting ranges Military ports
Fisheries	Fishing zones	Fishing ports Fish processing industry
Aquaculture and mariculture	Hatcheries	Fishing port Processing industry
Telecommunications	Cables	Landing points / exchanges
Recreation	Free routes Dive sites Fishing locations	Marinas Beach, pier
	Swimming and surfing locations	Beach
		Maritime sector (building, maintenance)
	Unobstructed view of the horizon	Beaches / dykes
		SAR / rescue operations (KNRM)

To support environmental concerns, the National Water Plan is subject to a strategic environmental assessment. The public consultation on the current plan was carried out from 23.12.2014 until 22.06.2015 as part of the strategic environmental assessment. The North Sea Policy Document and the Marine Strategy were part of this consultation. The Environmental Impact Commission (Commissie MER) concluded that on a longer term there is a risk that there will be not enough space for the realisation of all goals and ambitions specified in the National Water Plan and the North Sea Policy Document, and the Commission recommends a further exploration of the potential for conflicts and risks regarding the environmental impacts which may make it necessary to set priorities. It appears that so far, these conflicts and risks have not been addressed in the current policy documents

The Dutch MSP states that the policy for and recognition of LSI as part of maritime spatial planning is still in its starting phase. It continues to stipulate that "the involvement of provinces, municipalities and water boards in policy development at sea is desired because of their big stakes" (Beleidsnota Noordzee (2015), p31[23]). To this end, the national government executed a project together with several provinces municipalities and water boards to explore LSIs further in 2015. According to the MSP the generation of value which is related to the sea or coastline but may take place much further in the hinterland at the heart of the LSI concept. Specific emphasis in this respect is placed on "logistical flows from sea to land and vice versa and ecological connections" (Beleidsnota Noordzee (2015), p18 [24]). An important role for the streamlining of MSP with sectoral policies and land-based planning is IDON, which may serve to align sea-based policies and land- based policies.

New applications for licenses for use of space in the Dutch North Sea are evaluated based on an assessment framework which is provided in the MSP (chapter 5). Licenses are not required for the following use functions: maritime transport, recreation and in part military practices, as well as fishing, because this is regulated by the EU Common Fisheries Policy. The assessment framework for issuing new licenses is based on five so-called tests:

1. Definition of spatial claim and precautionary principle
2. Choice of location and assessment of spatial and temporal use
3. Benefits and needs (including National stakeholders)
4. Mitigation measures
5. Compensation of effects

It should be pointed out that offshore wind generation as an activity of national importance and as such enjoys special importance in the assessment framework. Offshore wind generation is generally mostly regulated at a national sectoral level. Licenses, based on a 20 year period, are issued by the Netherlands Enterprise Agency, as a subordinate of the Ministry of Economic Affairs and Climate Policy, and it is responsible for executing the tendering and subsidy process. TenneT is the grid operator on both land and sea, and can

[23] Policy Document on the North Sea 2016-2021 including the Netherlands' Maritime Spatial Plan appendix 2 to the National Water Plan 2016-2021 (https://www.noordzeeloket.nl/publish/pages/115832/2016-2021_north_sea_policy_document.pdf)

[24] Policy Document on the North Sea 2016-2021 including the Netherlands' Maritime Spatial Plan appendix 2 to the National Water Plan 2016-2021 (https://www.noordzeeloket.nl/publish/pages/115832/2016-2021_north_sea_policy_document.pdf)

play an important role in promoting a harmonised development of the electricity grid between land and sea.

The following are examples of successful coordination between sectors for the development of policies:

- The National Wind Energy Association committed to a Code of Conduct in 2016 which was developed in collaboration with a number of environmental NGOs and it formulates general, basic rules for public participation in the development of wind energy projects[25]
- The coordinated development for the proposed and agreed changes in shipping routes to enable the creation of space for offshore wind concessionaires (the change of shipping routes came into effect in summer 2013).

The following are examples of public participation initiatives in the development of sustainable energy policy, including offshore wind exploitation:

- The negotiation of the National Energy Agreement for Sustainable Growth which was coordinated by the National Energy Council and signed by over forty organisations, including government, environmental NGOs, employers and trade unions, financial institutions and civil society organisations[26], containing broadly supported general agreements regarding the national goals for energy savings, clean technology and climate policy.
- The public consultation on the draft of the National Structural Vision Wind Energy at Sea (Rijksstructuurvisie Windenergie op Zee) which functioned as a partial revision of the Dutch MSP, through which additional areas for wind energy generation in the Dutch EEZ were designated.

Maritime harbours such as the Europort in Rotterdam and the Port of Amsterdam are key in facilitating land-sea interactions for international maritime transport, but also many other sectors. While international maritime transport is mostly guided by shipping routes set on an international level by the International Maritime Organization (IMO) and there is no specific licensing system for ship traffic in the Netherlands, landing of ships is addressed by sectoral policies on national and local level in the Netherlands. Port authorities such as those of the ports of Rotterdam or Amsterdam are typically organised as public limited companies, with the Dutch state and/or municipal governments maintaining ownership and leasing out the lands to the port authorities. However, political interference is generally limited to ensuring environmental obligations for expansion of port infrastructure such as the construction of the

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[25] Nederlandse Wind Energie Associatie (NWEA), Stichting De Natuur- en Milieufederaties Stichting Natuur & Milieu Greenpeace Nederland Vereniging Milieudefensie ODE Decentraal (2016). Gedragscode Acceptatie & Participatie Windenergie op Land. Utrecht, December 2016

[26] SER (2018). “Energieakkoord voor duurzame groei”. Available at: https://www.energieakkoordser.nl/energieakkoord.aspx

Maasvlakte II or deepening of shipping routes are addressed. International maritime transport is generally driven more by trade patterns, rather than by specific shipping policies. To this end, trade policies, customs and market access regulations may in fact play a far more important role in shaping maritime transport, than shipping routes or port policies. Future scenarios for the Dutch harbours predict that short distance shipping to and from the Dutch harbours will increase, due to more offshore activities in the Dutch EEZ, such as the expansion of offshore wind energy. For international maritime transport, however, no increase in the number of ships landing is expected, but an increase in their size is anticipated[27].

An important challenge for LSI of the maritime transport sector not previously mentioned is the task to assure connectivity and access to the harbour while assuring flood protection, which was the reason for the construction of the Maeslant Barrier, is a flood defence infrastructure which is only closed in the event of a storm surge.

2.5 Stakeholder Involvement

The most prominent stakeholders for wind energy are the Dutch Wind Energy Association, as well as a number of NGOs (Stichting De Natuur- en Milieufederaties Stichting Natuur & Milieu Greenpeace Nederland Vereniging Milieudefensie ODE Decentraal). The relevant processes for public participation in the energy sector are outlined in chapter 4.1 above. For maritime transport of cargo, an important stakeholder is Netherlands Maritime Technology but also the port authorities of Amsterdam and Rotterdam are important stakeholders.

[27] Government of the Netherlands (2018). “Policy Document on the North Sea 2016-2021 (printversie)”.

3 Value Chain Analysis

The following section provides an in-depth look into the two focal sectors of this case study: maritime transport of cargo and offshore wind energy utilising value chain approaches to inform LSI understanding and in particular identification of the main impacts on land of key maritime activities. The sections below detail: the development of the sector value chains; key sector characteristics; the framework conditions that they operate within (including links to governance and strategic plans), their key actors, as well as associated LSI. Analysis of these value chains aims to provide an understanding of their relative importance to the Netherlands case study area, as well as how they have and are expected to develop in the future. In the context of Blue Growth, these maritime sectors undoubtedly rely on land infrastructure to support and expand their activities, which should be taken into consideration in terrestrial spatial planning. Furthermore, these sectors are important for MSP plans and the development and use of maritime space, should be taken into account within national and local MSP processes.

3.1 Maritime transport of Cargo in the Netherlands

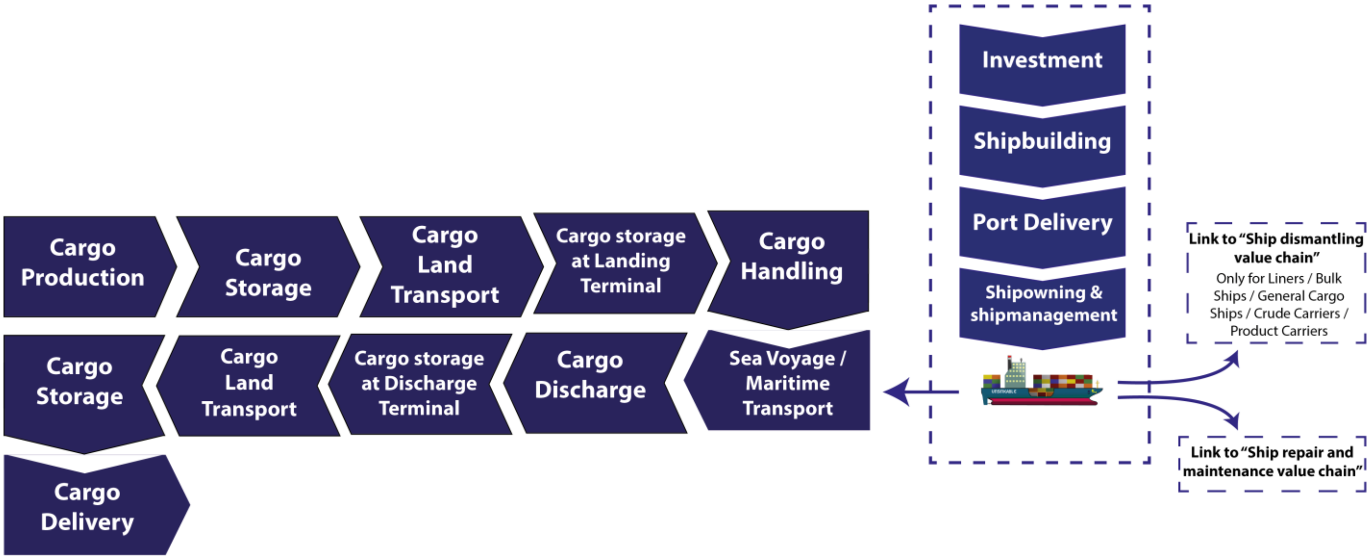
3.1.1 Developing the Value Chain - methodological clarifications

The general value chain for the maritime activity of transport of cargo was built based on previous offshore wind energy chain literature such as DG MARE Blue Growth Report[28]. However, additional segments were added to these value chains so as to spatially highlight Land Sea Interactions of the transport of cargo value chain process from cargo production through to cargo delivery (both on land) with segments of maritime transport occurring at sea. Segments of the value chain were selected in terms of their spatial nature in each of the process steps, so as to show the spatial allocation of these segments for the LSIs analysis.

The following diagram shows the various segments that constitute the general value chain of maritime transport of cargo (shipbuilding value chain is also included in this figure so as to show where both value chains would meet):

28 https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/publications/blue_growth_third_interim_report_en.pdf

Figure 3: General value chain for the Maritime Transport of Cargo.



The entire maritime transport of cargo value chain process can be summarized into the following 11 segments:

- Segment 1) Cargo Production. Place where those products to be transported by cargo are produced.
- Segment 2) Cargo Storage. Storage place of the cargo.
- Segment 3) Cargo Land Transport. Land transport mechanisms by which the cargo arrives to its exporting terminal.
- Segment 4) Cargo Storage at Landing Terminal. Storage place of the cargo at exporting terminal.
- Segment 5) Cargo Handling. Cargo handling activities at exporting terminal.
- Segment 6) Sea Voyage / Maritime Transport. Actual transport of the cargo to its final destination.
- Segment 7) Cargo Discharge. Cargo discharge activities at landing terminal.
- Segment 8) Cargo Storage at Discharge Terminal. Storage place of cargo at landing terminal.
- Segment 9) Cargo Land Transport. Land transport mechanisms by which the cargo arrives to its final storage place.
- Segment 10) Cargo Storage. Storage place of the cargo.
- Segment 11) Cargo Delivery. Place where those cargo products are delivered. Final destination.

3.1.2 Key characteristics of maritime transport of cargo in the Netherlands

With a total of around 3,600 km^2 of sea routes running through it, the North Sea is of great significance for international maritime transport[29]. In in 2017, almost 30,000 sea-going vessels and 105,000 inland vessels frequented the port of Rotterdam, which is currently the biggest harbour in Europe[30]. The Port of Rotterdam covers an area of 12,643 hectares (ha), a great part of which is reclaimed land (e.g. the Maasvlakte II, which is also becoming an important hub for the generation of wind energy). The Port of Rotterdam is the main transhipment centre for bulk goods, including liquid bulk (mainly crude oil and mineral oil products), iron and coal, and processed over 8 million containers in 2017[31]. To this end, the Dutch government underlines that the maritime transport and port industry and services are vital for the national economy[32]. Port areas such as the Europort are the points of connection for marine transport between land and sea. It is important to remember that transport networks along rivers, roads and railways carry the impacts of cargo transport far inland[33].

[29] Government of the Netherlands (2018). "Policy Document on the North Sea 2016-2021 (printversie)"; Government of the Netherlands (2018). "Shipping". Available at: https://www.noordzeeloket.nl/en/functions-and-use/scheepvaart/

[30] Port of Rotterdam Authority (2018). "Port of Rotterdam, facts and figures". Available at: https://www.portofrotterdam.com/sites/default/files/facts-and-figures-port-of-rotterdam_0.pdf

[31] *Ibid.*

[32] Government of the Netherlands (2018). "Shipping".

[33] Olierook, S. (2014): "Port of Rotterdam Global Hub & Industrial Cluster in Europe Expertgroup Euro-Asian Transport Linkages". Available at: https://www.unece.org/fileadmin/DAM/trans/doc/2014/wp5/wp5-eatl/WP5_GE2_10th_session_Ms_Olierook_Port_of_Roterdam.pdf

Map 5: Example of transport linkages from the Port of Rotterdam to European hinterland

An elaborate system of shipping rules and regulations devised by the IMO works to avoid and/ or mitigate conflicts between maritime transport and other economic activities. It stipulates, for example, that approach areas and clearways cannot conflict with other uses, and areas that are suitable for oil and gas extraction or wind farms are at the highest risk in this regard[34]. Other activities, such as fishery, mineral extraction, and pleasure craft are allowed in shipping routes, but since almost the entire North Sea can be exploited to this end, these activities commonly do not restrict shipping activity[35]. In August 2013, the system of shipping routes off the Dutch coast was revised in relation to maritime traffic safety, accessibility of ports and increasing space for offshore wind energy[36].

Maritime transport is a key economic activity of the Netherlands, and has been well established in the country for decades. The country has a strong global maritime position, in

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[34] *Ibid.*

[35] *Ibid.*

[36] Government of the Netherlands (2018). “Policy Document on the North Sea 2016-2021 (printversie)”.

part due to its strategic location at the estuary of the rivers Meuse, Rhine and Scheldt[37]. Globally, it is one of the top ten exporters of the world. The country's maritime cluster includes many different subsectors, such as dredging, deep-sea-, short sea-, inland- and recreational shipping; pelagic fishing; maritime supply; offshore; shipbuilding; maritime research; hydraulic engineering and maritime services[38].

All types of merchandise, from dry and liquid bulk to containers, lands directly in the Netherlands and are distributed by land transport or smaller vessels to other countries. Since 2010, the Netherlands has handled the largest volumes of seaborne freight in Europe, amounting to 589 million tonnes or 15.2% of the EU total in 2016[39]. In the same year, the total amount of vessels that berthed in the country equalled 35,066 vessels with 790,373 thousand gross tonnes, the breakdown for each type of vessel can be seen in Table 1. In terms of the gross weight of goods, ports in the Netherlands mostly handle liquid bulk goods (281,361 thousand tonnes, 47.8% of total amount of goods handled), followed by dry bulk goods (140,047 thousand tonnes, 23.8%), large containers (109,343 thousand tonnes, 18.6%), Ro-Ro units (self and non-self-propelled) (19,249 thousand tonnes, 3.3%), and lastly other cargo not elsewhere specified (38,771 thousand tonnes, 6.6%)[40].

Table 2: Number and Gross Tonnage of Vessels in Netherlands Main Ports, 2016: [41]

Type of Vessel	**Number of Vessels**	**Gross Tonnage**
Liquid bulk tanker	10,999	215,176
Dry bulk carrier	2,122	91,340
Container ship	6,707	273,114
Specialised carrier	277	10,882

[37] Dutch Ministries of Infrastructure and the Environment, Economic Affairs, Defence, Education, Culture and Science, Finance, Foreign Affairs, Security and Justice, Social Affairs and Employment (2015). "The Dutch Maritime Strategy: 2015-2025". Available at: https://www.government.nl/binaries/government/documents/reports/2015/07/07/the-dutch-maritime-strategy-2015-2025/150604-maritieme-strategie-uk-lr-2.pdf

[38] Dutch Ministry of Infrastructure and the Environment (2016). "The Netherlands: Home to leading maritime companies". Available at: https://www.government.nl/binaries/government/documents/reports/2016/12/08/the-netherlands-home-to-leading-maritime-companies/The+Netherlands+Home+to+Leading+Maritime+Companies.pdf

[39] Eurostat Statistics Explained (2018). "Maritime ports freight and passenger statistics". Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_ports_freight_and_passenger_statistics#Rotterdam.2C_Antwerpen_and_Hamburg_stayed_top_ports

[40] Eurostat (2018). "Country level - gross weight of goods handled in main ports, by type of cargo [mar_mg_am_cwhc]". Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mg_am_cwhc&lang=en

[41] Eurostat (2018). "Country level - number and gross tonnage of vessels in the main ports (based on inwards declarations), by type of vessel [mar_mt_am_csvi]". Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mt_am_csvi&lang=en

General cargo, non-specialised	14,088	196,567
Offshore activities vessel	869	3,189

The largest port in the Netherlands and in Europe is Rotterdam, and the second largest in the country is Amsterdam[42]. Rotterdam is regarded as the ‘gateway’ to Europe, and serves as a hinterland to hundreds of millions of inhabitants. In 2016, it handled over 431,944 thousand tonnes of goods (298,280 of which were imported and 133,664 were exported), while Amsterdam handled 96,343 thousand tonnes (62,347 imported; 33,995 exported)[43]. Aside from these two, the next largest ports in the Netherlands are Moerdijk, Zeeland Seaports and Groningen Seaports. Altogether, these five ports account for 48% of the market share for maritime cargo transport in the Hamburg-Le Havre area[44].

An important flow of goods for the ports is the transhipment of containers, or ‘Cargo Handling’, ‘Sea Voyage/ Maritime Transport’ and ‘Cargo Discharge’ segments of the value chain. The container transhipment in the Netherlands largely takes place in the Port of Rotterdam. In the supply of containers, there has been an enormous increase in the scale of container transport within a short period of time. In 2011, 'container giants' (ships with more than 10,000 TEU on board) provided 16% of the container supply in the port of Rotterdam. This rose to almost 50% in 2016[45]. Many of these container ships arrive from all over the world, and their shipments have been increasing over the years. The Port of Rotterdam saw an increase of 6.5% of container ships from Asia in 2016, mainly from Vietnam, Taiwan, India, Singapore and Malaysia. Rotterdam also handles container shipments from European countries. In 2016, roughly a third of all container transport arriving into the Port of Rotterdam came from European countries, mainly the United Kingdom, Ireland and Finland. Other countries like Brazil, South Africa and Russia are among the top 10 countries of inbound cargo into Rotterdam[46].

For inland ports associated with maritime transport, there are 11 Dutch municipalities capable of accommodating between 3 million tonnes and 6 million tonnes of goods (excluding container transhipment). These inland ports (where mainly bulk cargo is transhipped) represent about one third of the total transhipment in Dutch inland ports. There are 20 municipalities with more than 50,000 TEU transhipments to inland shipping. The five largest of which in terms of inland container transhipment are: Alphen aan de Rijn, Borne, Utrecht,

[42] Eurostat (2018). “Top 20 ports - gross weight of goods handled in each port, by direction [mar_mg_aa_pwhd]”. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mg_aa_pwhd&lang=en

[43] *Ibid.*

[44] Dutch Ministry of Infrastructure and the Environment (2016)

[45] *Ibid.*

[46] Statistics Netherlands (CBS) (2017). “Less cargo throughput in Dutch seaports”. Available at: https://www.cbs.nl/en-gb/news/2017/25/less-cargo-throughput-in-dutch-seaports

Hengelo and Den Bosch[47]. Inland ports are important connections from the hinterland to key seaports, such as Rotterdam and Amsterdam, where a lot of maritime container cargo is transferred to inland shipping (and vice versa). In the Port of Rotterdam, inland shipping is responsible for roughly 50% of incoming and outgoing cargo to and from destinations in Europe[48]. Inland shipping currently has a 40% share in the transportation of containers between Maasvlakte in Rotterdam and the hinterland. The Port Authority of Rotterdam aims to increase this share to 45% by 2030[49].

Besides inland shipping, road transport is another means by which cargo is transported to and from the ports. Roughly 40% of transported goods leaving the Port of Rotterdam by truck remain in the Rotterdam region. Of these goods, about half is destined for the Dutch market and only 10% of road transport from Rotterdam crosses a border. For road transport, the A15 motorway is the main means of access to and from the port area. This route links to both national and European motorway networks. As road transport to and from the port is important, billions of euros (EUR) are invested in its upkeep and improvements to the road network[50].

Regarding rail connections, the Port of Rotterdam has more than 250 international rail services to and from the port. Many of the port terminals have their own rail transfer facilities, ensuring that cargo can be placed on a train immediately and smoothly. Rail connections transport containers, dry bulk, general cargo and chemical products. The Rail Service Centre Rotterdam, located in the port, focuses fully on handling shuttle trains and combined transport (i.e. a form of intermodal transport that sees the movement of goods between different modes of transport without handling the goods themselves in changing modes)[51].

Shipbuilding in the Netherlands represents a smaller sub-sector within the maritime industry, which includes the construction of offshore vessels, specialist vessels (e.g. complex dredgers and multipurpose dry cargo ships) and superyachts (i.e. yachts over the length of 24 m). The Netherlands is one of the market leaders in the construction of superyachts. The shipbuilding and repair sector in the Netherlands comprised approximately 1,500 companies in 2016, an increase of roughly 40 companies from the previous year. The global shipbuilding industry is

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[47] Ecorys (2017). “De Nederlandse Maritieme Cluster Monitor 2017”. Available at: https://www.maritiemland.nl/wp-content/uploads/2017/11/NMLversie-3-IJ-20.pdf

[48] Port of Rotterdam Authority (2018). “Inland Shipping”. Available at: https://www.portofrotterdam.com/en/doing-business/logistics/connections/intermodal-transportation/inland-shipping

[49] Port of Rotterdam Authority (2018). “Optimising inland container shipping chain”. Available at: https://www.portofrotterdam.com/en/doing-business/logistics/connections/intermodal-transportation/inland-shipping/optimising-inland

[50] Port of Rotterdam Authority (2018). “Road Transport”. Available at: https://www.portofrotterdam.com/en/doing-business/logistics/connections/intermodal-transportation/road-transport

[51] Port of Rotterdam Authority (2018). “Hinterland Connections”. Available at: https://www.portofrotterdam.com/en/asiaconnections/hinterland-connections

becoming increasingly competitive, due to the overcapacity of mainly Asian companies building bulk carriers and container ships. As such, some Asian companies may shift to building more technically complex ships that would compete with those built in Europe and the Netherlands[52].

Lastly, with respect to passenger transport, the Netherlands saw 1,906 thousand passengers in 2016 embark and disembark in its seaports, a 0.2% decrease from 2015 levels[53]. Passenger transport is also considered part of maritime transport, though does not play a large role in the Netherlands nor within Europe. Of the top 20 most visited ports in Europe, none of the listed ports are from the Netherlands[54]. Given that freight or cargo transport generates the most added value, and is proportionally the largest activity in the Netherlands, especially in comparison to both shipbuilding and passenger transport, we propose to focus on this aspect of the Dutch maritime transport value chain in more depth in the following sections.

3.1.3 Framework conditions affecting maritime transport of cargo in the Netherlands

3.1.3.1 International, national and sub-national governance

Shipping is mainly regulated on global level by the London-based IMO, while Labour standards for seafarers fall under the responsibility of the International Labour Organization (ILO). The complex legislative framework adopted by the IMO includes technical regulations for the safety on board and the protection of the marine environment. The responsibility for the enforcement of these international rules is carried by the flag states. However, also port state control may carry out inspections and even detain foreign ships if these fail to comply with international requirements.

The IMO is the only internationally recognised body that establishes routing measures for ships. The main criteria for the localization of shipping routes are safety reasons related to avoiding or minimising the risks of collisions or other accidents. The most well-known regulations with importance to shipping are, among others, the International Convention for the Prevention of Pollution from Ships (MARPOL, 1973/1978), the United Nations Convention

52 Ecorys (2017).

53 Eurostat Statistics Explained (2018).

54 Eurostat Statistics Explained (2018).

on the Law of the Sea (UNCLOS, which came into force in 1994) and the Convention on the International Regulations for Preventing Collisions at Sea, (COLREGS, 1972)[55].

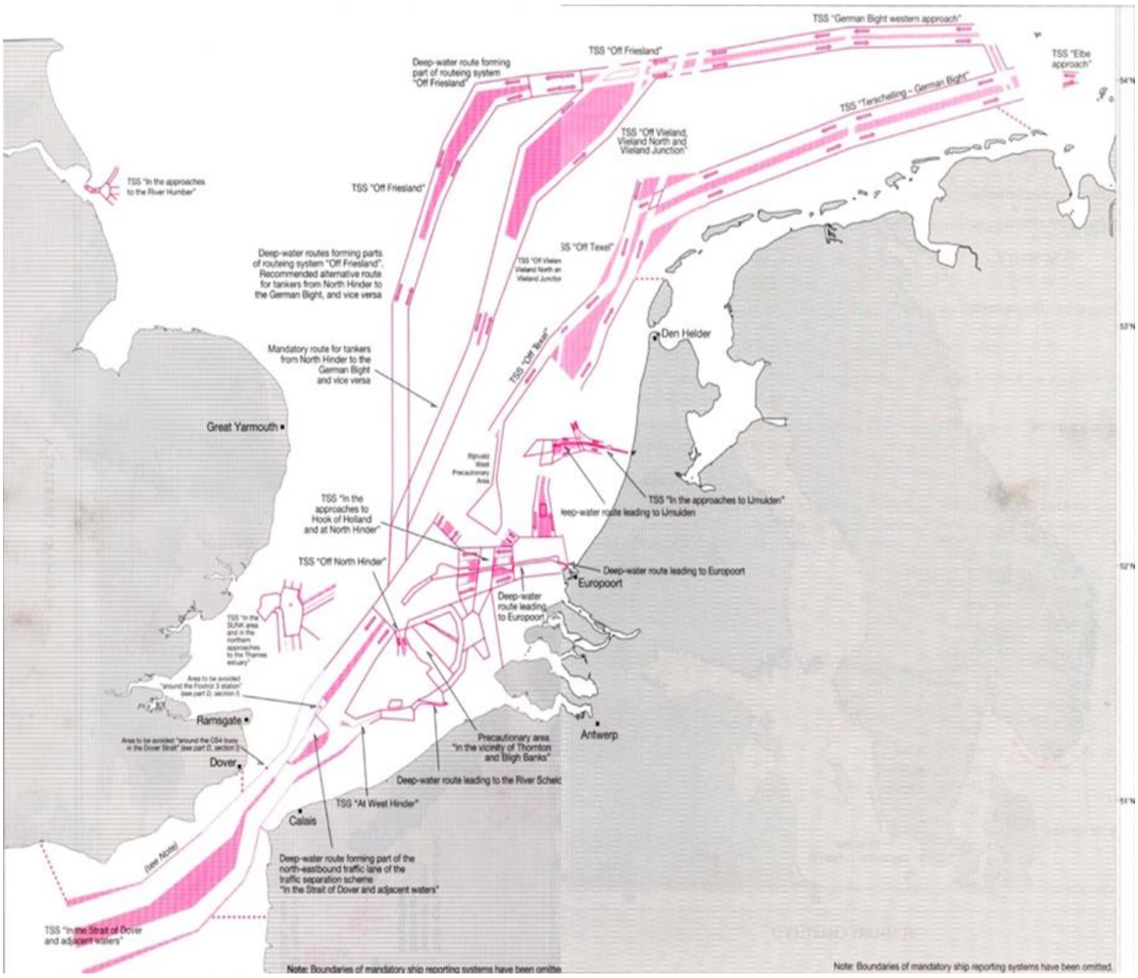
In the Southern North Sea, a Traffic Separation Scheme has been established by the IMO, where ship traffic is highly regulated and specific traffic lanes are designated for all travelling directions. The Traffic Separation scheme in the Southern North Sea is complemented by other routing measures, such as deep-water routes (which are, for example, mandatory for tankers passing the Wadden Sea protected area), precautionary areas, areas to be avoided (mainly in the vicinity of oil and gas platforms), two-way routes or recommended routes.[56] Any change of the existing shipping routes, such as the last major adjustment for the Southern North Sea which was initiated by the Dutch Directorate-General for Public Works and Water Management for the purpose of assuring continued safety and freeing up contiguous areas for wind exploitation, requires approval by the IMO[57]. Access to the Europort of Rotterdam with its Maasvlakte I and II is enabled via the dredged Euro-Meuse channel.

[55] For a more detailed overview, see also the website https://northsearegion.eu/northsee/s-hipping/current-legislation-relevant-for-shipping/

[56] Transnational Maritime Spatial Planning in the North Sea: The Shipping Contex. Report from the NorthSEE project

[57] Government of the Netherlands (2018). “Shipping”.

Map 6: Southern North Sea shipping routes



Source: EU transport policy

While the majority of regulation concerning shipping to and from the Netherlands is shaped by international legislation (e.g. by the IMO), national regulations apply in the Dutch ports. Of particular importance are, the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways and the Inland Waterways Police Regulations. Apart from this, various byelaws can stipulate specific requirements or 'house rules' for the ports[58].

3.1.3.2 Economic framework conditions

In the Netherlands, container transport in particular has seen growing competition due to an increase in the scale of ships and terminals, the formation of alliances among ship owners (with members sharing shipping space), more flexible global trade routes, the optimisation of transport chains and the emergence of southern European seaports. For example, emerging competition can be seen with the port of Piraeus in Greece and its strengthening role as a link between China and Europe. At the moment this role is limited due to its poor hinterland

[58] For more information, please go to Port of Rotterdam Authority (2018). "Legislation and Regulations". Available at: https://www.portofrotterdam.com/en/shipping/legislation-and-regulations

connection. Therefore, Piraeus currently functions mainly as a so-called transhipment port: containers from large ships are transferred to smaller ships, which then transport the cargo to destinations in Italy, Turkey and the Black Sea region.

Furthermore, the formation of alliances among (container) shipping companies has increased their market power and has increasingly determined the conditions under which they wish to do business with terminals worldwide[59]. Lower rates of berthing are an important part of these negotiations. This means that highly efficient port/terminals, unhindered nautical access for the very largest ships and a strategic location have the best opportunities to attract the largest container flows to the port in the future. Rotterdam seems to be in a better position in this respect than two closest competitors, Hamburg and Antwerp, because they are less accessible[60].

In response to the consolidation at the container shipping companies and the increasing alliance formation, there is an increasing cooperation between large terminal companies. For example, at the end of 2016, five global terminal companies (APM Terminals, DP World, Hutchison Port Holdings, PSA International and Shanghai International Port)[61] and the Port of Rotterdam Authority concluded an agreement for closer cooperation in individual ports (the so-called Global Ports Group). This is currently being submitted for approval to the US regulator, the Federal Maritime Commission[62].

For shipping, 2016 demonstrated fierce competition and pressure on freight rates, which remain far below pre-crisis levels in 2008. This led to the bankruptcy of two relatively large shipping companies (Flinter and Abis). Due to poor results, a number of other large shipping companies have had to make refinancing agreements with the banks in 2016. However, no new major bankruptcies have yet occurred since 2017. Freight rates also remain low for container, feeder and multipurpose vessels in the short sea shipping sector, mainly due to overcapacity[63].

Within the Dutch maritime sector, the ports sub-sector generates the most added value, followed by offshore industry, maritime suppliers, shipping and shipbuilding. Ports includes activities associated with the 'loading, unloading and transhipment', 'storage', 'waterborne transport service' and 'freight transport intermediaries'[64]. While Dutch ports are usually controlled by local authorities, the companies within the ports sector are experiencing strong

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[59] Port of Rotterdam Authority (2017). “Voortgangsrapportage 2017 Havenvisie 2030: Port Compass”. Available at: https://www.portofrotterdam.com/sites/default/files/voortgangsrapportage-2017-havenvisie-2030.pdf?token=4u6LQu3R

[60] Ecorys (2017).

[61] The first three have terminals in the port of Rotterdam under the names APMT, RWG and ECT.

[62] Ecorys (2017).

[63] *Ibid.*

[64] *Ibid.*

internationalisation. ECT delta terminals and APM terminals Rotterdam belong to the segments Cargo 'Handling', 'Cargo Discharge' and 'Sea Voyage/ Maritime Transport'. Both port transhipment companies belong to globally operating groups (res. Hutchison Whampoa Limited from Hong Kong and Maersk from Denmark). An increasing part of the port transhipment activities is being taken over by globally operating groups. Changes in the calls of ships are therefore attuned to the locations of the own terminals. As a result, they exercise great influence on the distribution of cargo packages across ports and the control of port managers is becoming increasingly less.

Rotterdam's 2011 "*Port Vision 2030*" lays out the long-term goals for the port and developed a set of scenarios to forecast impacts on throughput into Rotterdam. These four scenarios were Low Growth, European Trend, Global Economy and High Oil Prices; resulting in expected 2030 throughput in the port ranging between 475 million tonnes under Low Growth to 750 million tonnes under the Global Economy scenario, a substantial increase from the 432 million tonnes that was seen in 2016. In addition to these forecasts, the *Port Vision 2030* undertook a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the port. Some of these weaknesses identified include the need for huge efficiency improvements to hinterland connections; the need to develop the container rail market (services, frequencies) to compete with North German ports; issues of road congestion; the strong position of (energy) production based on fossil fuels could hinder the transition to more sustainable forms; the distance to the Maasvlakte for commuter traffic; and issues on the perception of living in the Rijnmond region[65].

Building on this Port Compass vision, the Port of Rotterdam Authority established a short-term "Business Strategy 2016-2020" in 2015, with the following eight key objectives[66]:

- Competing in mature markets
- Market leader in growth markets
- Leader in development of new markets
- Excellent location
- Leading the way in sustainability of chains and clusters
- The most efficient and safe handling via all modalities
- Value creation through (international) port development
- Sufficient capital for the long term

[65] Port of Rotterdam Authority (2011). "Port Vision 2030: Port Compass". Available at: https://www.portofrotterdam.com/sites/default/files/upload/Port-Vision/Port-Vision-2030.pdf

[66] Port of Rotterdam Authority (2018). "Ondernemingsstrategie 2016-2020". Available at: https://jaarverslag2017.portofrotterdam.com/haven-en-havenbedrijf-rotterdam/strategie/ondernemingsstrategie-2016-2020

The 2017 update on this strategy reported a focus on four key areas: (1) attracting new activities and new companies in new sectors to the port; (2) positioning Rotterdam at the forefront of the container market; (3) create a digital business model; and (4) evaluating and strengthening the port's funnel management process[67]. Importantly for container shipping, large ships faced limitations in Antwerp and Hamburg, which contributed to more cargo volumes in Rotterdam. This has led to an increase in throughput growth in 2017 of 12.3% compared to 2016.

Regarding employment in Netherlands' ports, there have been staff shortages across the board but are more heavily concentrated in executive positions. The logistics and maintenance sectors are growing and dynamic, increasingly seeking personnel with ICT-relevant skills and knowledge and raising starting qualifications for new personnel. In 2016, there were an estimated 2,000 vacancies in the ports, of which one third were at higher professional education (HBO) level and two thirds at middle-level or vocational training levels (MBO). In part, these vacancies are due to an ageing workforce, with many people over 50 expected to retire in the coming years. This is expected to increase staffing shortages in the ports. It is expected that companies will attract more personnel from abroad, a trend that is already happening in the logistics sector, where secondment agencies are recruiting in Eastern Europe[68].

For shipping, employment on shore has increased compared to 2015 and there is no large unemployment among Dutch captains or officers, which remain in demand on the maritime labour market. No bottlenecks on the labour market are expected in the coming years, but there are a few niche markets with shortages, particularly for ships that are active in offshore wind energy. Personnel with a MBO 4 education are lacking, and are often sourced from abroad. Mechanics are scarce in all sectors, including maritime shipping, and there is a shortage of engine room personnel. The demand for technical personnel on board the ships, and the demand for mechanical engineers (all grades) is high. With innovation in the shipping industry around autonomous sailing, this can be expected to result in a gradual reduction in the employment of seafarers and an increase in demand for data control centres[69].

Port extension projects like Maasvlakte II have helped to increase capacity of Rotterdam and ensure return of transhipment[70]. Other port projects like the Container Exchange Route (CER) aim to link container companies on the Maasvlakte with each other and make it possible to

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[67] Port of Rotterdam Authority (2018). "Strategie 2017". Available at: https://jaarverslag2017.portofrotterdam.com/strategie-en-resultaten/strategie-2017/strategie-2017

[68] Ecorys (2017).

[69] *Ibid*

[70] Port of Rotterdam Authority (2018). "Beste Europese containerhaven". Available at: https://jaarverslag2017.portofrotterdam.com/strategie-en-resultaten/groeimarkten/beste-europese-containerhaven

reduce the exchange costs for containers. This would improve the hinterland and transhipment product and strengthen the competitive position of the port of Rotterdam as a container hub. The CER consists of, among other things, infrastructure, IT systems and logistical agreements between deep sea container terminals, empty depots, rail terminals and distribution centres[71].

To improve road transport connections, Rijkswaterstaat (Directorate-General for Public Works and Water Management) widened the A15 by the end of 2015 to optimise traffic flow, and projects are underway to minimise the number of delays[72]. Rail connections to and from the port of Rotterdam are key areas of infrastructure investment, due to expected increases in imports from ocean going vessels. As such, the port of Rotterdam is actively investing in rail transport improvements to decrease bottlenecks and ease traffic flows[73].

3.1.4 Key actors of the maritime transport of cargo in the Netherlands

We gathered the most recently available information that was available through the following NACE codes businesses of the Maritime Transport Activity[74]:

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[71] *Ibid*

[72] Port of Rotterdam Authority (2018). "Road Transport"

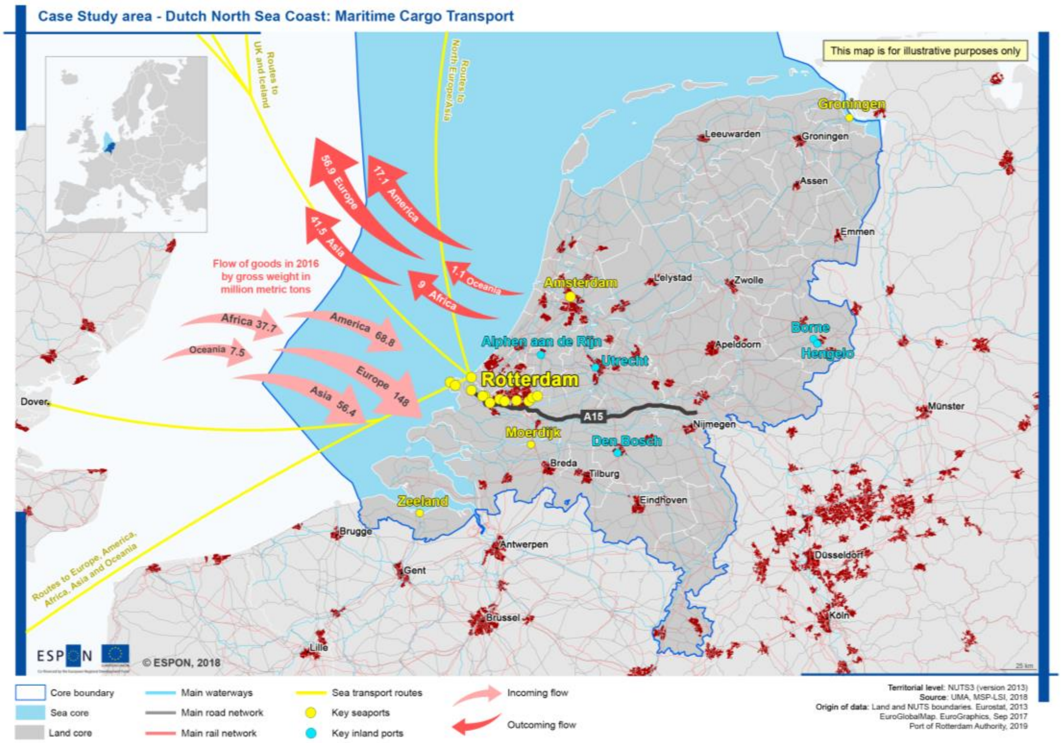
[73] Port of Rotterdam (2018). "Port of Rotterdam Authority invests in Port railway line capacity expansion". Available at: https://www.portofrotterdam.com/en/news-and-press-releases/port-of-rotterdam-authority-invests-in-port-railway-line-capacity-expansion

[74] NACE Rev 2 Statistical classification of economic activities in the European Community. 2008. Eurostat Methodologies and working papers, European Commission, Luxembourg. ISBN 978-92-79-04741-1. Availble at https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

Table 3: Maritime transport of cargo activities and their related NACE codes

Sector/Group		**Activity**	**Nace code**
Maritime transport	Ports, warehousing and construction of water projects	Service activities incidental to water transportation	H.52.22
		Cargo handling	H.52.24
		Warehousing and storage services	H.52.10
		Construction of water projects	F.42.91
	Shipbuilding and repair	Building of pleasure and sporting boats	C.30.12
		Building of ships and floating structures	C.30.11
		Repair and maintenance of ships and boats	C.33.15
	Freight & passenger transport (including deep and short sea shipping)	Sea and coastal passenger water transport (-cruise transport)	H.50.10
		Sea and coastal freight water transport	H.50.20
		Inland passenger water transport	H.50.30
		Inland freight water transport	H.50.40
	Other maritime transport activities	Other transportation support activities	H.52.29
		Non-life insurance	K.65.12
		Reinsurance	K.65.20
		Rental and leasing services of water transport equipment	N.77.34
		Engines and turbines, except aircraft, vehicle and cycle engines	C.28.11
		Agents involved in the sale of machinery, industrial equipment, ships and aircraft	G.46.14
		Dismantling of wrecks	E.38.31
	Transportation and Storage	Freight transport by road	H. 49.41
		Freight rail transport	H. 49.20
		Sea & Coastal freight water transport	H. 50.20
		Freight air transport	H. 51.21

Map 7: Key actors of the Maritime Cargo Transport Value Chain in the Netherlands.

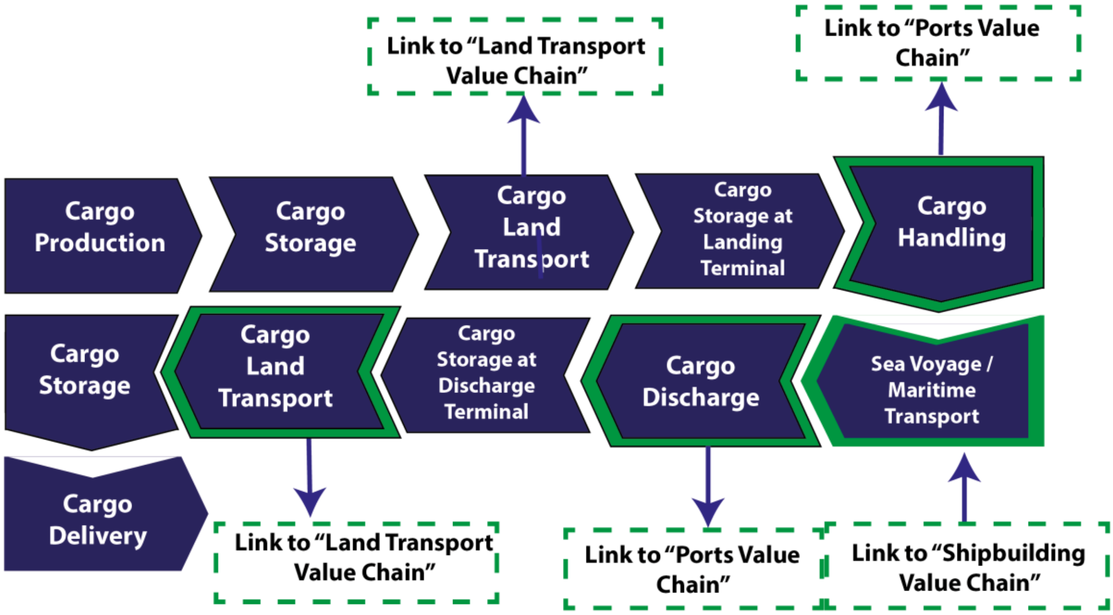


The above map highlights **key seaports of Zeeland, Moerdijk, Rotterdam, Amsterdam and Groningen and key inland ports of Alphen aan de Rijn, Utrech, Den Bosch, Borne and Hengelo** as well as total 2016 gross weight in million metric tones of imports and exports. In 2016, **imports arrived mainly from other parts of Europe, America, Asia and Africa, whilst exports where delivered to other parts of Europe, Asia and America**.

3.1.5 Tailoring the maritime transport of cargo value chain

The below value chain (Figure aims at bringing forward the land-sea component of activities stemming from maritime transport of cargo in the Netherlands.

Figure 4: Tailored Maritime Transport of Cargo Value Chain in the Netherlands



Each segment of the value chain corresponds to specific activities and their land-sea dynamics. Figure 4 above highlights segments 3, 5, 6, 7 and 9 as an important flow of goods for the ports is the transhipment of containers, or 'Cargo Handling', 'Sea Voyage/ Maritime Transport' and 'Cargo Discharge' segments of the value chain. Transport of good up to the ports is also important in the region and that is why we have highlighted it in the tailored value chain. In-land transport is usually performed through inland shipping, road transport and rail connections.

Land infrastructure connections are of high importance to ensure that the cargo arrives and leaves the ports efficiently and that is the reason we have highlighted these linkages in the value chain. In a similar way the link to ports value chain and that for shipbuilding was also highlighted as ports infrastructure is essential for the good performance of the maritime transport of cargo value chain as well as shipbuilding, which in the Netherlands represents a smaller subsector within the maritime industry, but it is one of the market leaders in the construction of super yachts.

3.1.6 Statistical information on the sector

The following section aims at providing additional insight on the key characteristics of the maritime transport of cargo sector in the Netherlands. The statistical information has been retrieved from the most recently available sources and generally includes data on production value and sector employment.

In the Netherlands, the production value (both direct and indirect) of the entire maritime cluster[75] was almost 55.1 billion EUR in 2017. The total value added of this cluster was 22.8 billion EUR, of which 18.5 billion EUR was direct value added and 4.3 billion EUR was indirect value added. The table below shows the breakdown of direct and indirect added value for each sector of the maritime cluster[76]. Combined, these sectors generated around of 3.1% of the Netherland's total GDP, a decrease of 0.2% from 2016 levels. Dutch total exports generated nearly 26 billion EUR in 2017, a decrease of around 0.35 billion EUR compared to 2016 levels, -0.62 billion EUR compared to 2015, +5.25 billion EUR compared to 2010 levels. Nevertheless**,** in all direct economic indicators, the Dutch maritime cluster has shown a general increase over time. In 2017, ports contribute the largest share of exports (31%), followed by shipping (21%) and offshore[77] (12%)[78].

Table 4: Added Value and Employment in Dutch Maritime Cluster, 2017[79]

Maritime Cluster Sector	**Direct Added Value**	**Indirect Added Value**	**Total Added Value**	**Direct Employment**	**Indirect Employment**	**Total Employment**
	(Million €)			*(total number of employees)*		
Ports	7,171	2,579	9,750	47,703	37,924	85,627
Offshore	2,540	1,507	4,047	26,259	25,531	51,790
Maritime suppliers	1,722	1,118	2,840	16,737	14,339	31,076
Shipping	1,563	696	2,259	7,218	6,469	13,687
Maritime services	1,410	535	1,945	13,612	6,067	19,679
Inland navigation	1,217	542	1,759	12,797	11,469	24,266
Shipbuilding	672	995	1,667	11,986	16,624	28,610
Water sports industry	1,017	627	1,644	13,331	12,304	25,635
Hydraulic	568	636	1,222	6,298	9,142	15,440

[75] Includes: dredging, deepsea-, short sea-, inland- and recreational shipping; pelagic fishing; maritime supply; offshore; shipbuilding; maritime research; hydraulic engineering and maritime services

[76] Ecorys (2018). "De Nederlandse Maritieme Cluster Monitor 2018". Available at: https://www.maritiemland.nl/maritieme-sector/publicaties/maritieme-monitor-2018/

[77] Includes: all companies that enable large oil, gas and energy companies to produce as efficiently as possible by supplying high-quality maritime products and services

[78] Ecorys (2018).

[79] *Ibid*

engineering						
Navy	578	186	764	12,050	6,577	18,627
Fishing	358	69	427	2,268	668	2,936

In 2017, employment in the Netherlands' maritime cluster amounted to 258,722 jobs, representing 2.85% of total employment in the country and a slight decrease (0.05%) compared to 2016. Direct employment in the cluster equalled 166,763 jobs, an increase from 2016 levels of 166,600 jobs. Indirect employment decreased marginally by 0.2%. As seen in the Table 3, direct employment is highest in the port sector, which employed both directly and indirectly over 85,000 people; a strong increase of more than 1,750 persons (30%) compared to 2006 levels[80].

There is increasing demand for general, yet highly skilled, technical staff. The sustainable influx of new personnel, at a variety of skills, backgrounds, and levels of education is essential for the future of the sector. Rapid economic and technological development – such as the rise of digitalization, the internet of things, and robotization/automatization – calls for advanced training of students and existing personnel. The maritime sector grows more and more into an overall future-oriented labour market[81].

Shipping

In 2017, turnover of the Dutch shipping sector generated approximately 6 billion EUR, a slight increase of more than 200 million EUR (4%) compared to 2016. After adjusting for deliveries within the sector, total production value is estimated to be approximately 7.585 billion EUR, of which 5.477 billion EUR is from direct production and 2.109 billion EUR from indirect production in 2017. Total value added was estimated to be 2.259 billion EUR; direct value added represented around 1.563 billion EUR, a decrease of 3% compared to 2016, and indirect value added represented around 0.696 billion EUR. For inland navigation, the sector generated approximately 2.65 billion EUR, a slight increase of more than 43 million EUR (1.6%) compared to 2016. After adjusting for deliveries within the sector, total production value is estimated to be approximately 3.622 billion EUR, of which 2.615 billion EUR is from direct production and 1.007 billion EUR from indirect production in 2017. Total value added was estimated to be 1.759 billion EUR; direct value added represented around 1.217 billion EUR, an increase of 4% compared to 2016, and indirect value added represented around 0.542 billion EUR[82].

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[80] *Ibid*

[81] *Ibid*

[82] *Ibid*

Furthermore, employment levels in the sector totalled 13,750 jobs, almost equally split between direct (7,218) and indirect (6,469) positions. Compared to 2016, direct employment in the sector decreased slightly by 282 jobs. Of these directly employed positions, approximately one third (2,326 people) are employed as on shore personnel and two thirds are seafarers (4,892 persons). Onshore personnel have decreased compared to 2016. The total number of seafarers on Dutch flag ships was estimated to have exceeded 28,000 in 2017. The number of foreign employees on ships under the Dutch flag is estimated at 21,444, representing more than 80% of the personnel on board. In general, most of these foreign seafarers come from outside the EU, from the countries of Russia and Ukraine (esp. among captains and officers) and the Philippines (esp. among ratings, but also officers). Most Dutch seafarers sail on ships under the Dutch flag, and estimations indicate that not many Dutch people work on foreign ships[83].

Employment in the Dutch shipping sector has increased since 2011, but fell slightly in 2015 and has stabilised since 2016. The table below indicates some key economic trends in the Dutch shipping sector between 2006 and 2017[84].

[83] *Ibid*

[84] *Ibid*

Table 5: Economic statistics on shipping in the Netherlands

												Index (2006 = 1)	Index (2016 = 1)
Million €	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2006-2017**	**2016-2017**
Turnover	5,783	6,416	6,797	5,485	5,432	5,352	5,966	6,281	6,579	6,601	5,841	6,070	1.05	1.04
Of which exports	*5,396*	*5,800*	*6,130*	*4,714*	*4,949*	*5,010*	*5,427*	*5,552*	*5,749*	*6,141*	*5,392*	*5,580*	1.03	1.03
Production Value	5,356	5,767	6,089	5,010	4,999	4,924	5,503	5,765	5,990	6,009	5,251	5,477	1.02	1.04
Added Value	2,218	2,238	2,161	1,540	1,280	1,056	1,105	1,475	1,614	1,907	1,614	1,563	0.70	0.97
Employment (in persons as of 1 January)	6,878	6,844	6,844	6,698	6,551	6,867	7,087	7,436	7,560	7,467	7,506	7,218	1.05	0.96

Table 6: Economic statistics on inland navigation in the Netherlands

													Index (2006 = 1)	Index (2016 = 1)
Million €	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2006-2017**	**2016-2017**
Turnover	3,016	3,208	3,556	2,927	2,898	3,291	3,059	3,012	3,186	2,806	2,607	2,650	0.88	1.02
Of which exports	*1,308*	*1,406*	*1,531*	*1,261*	*1,304*	*1,322*	*1,431*	*1,465*	*1,516*	*1,288*	*1,130*	*1,170*	0.89	1.03
Production Value	2,976	3,163	3,500	2,876	2,856	3,245	3,016	2,962	3,123	2,771	2,572	2,615	0.88	1.02
Added Value	1,142	1,226	1,288	1,124	1,046	1,154	1,047	1,042	1,120	1,199	1,171	1,217	1.07	1.04
Employment (in persons as of 1 January)	13,534	13,705	13,694	13,428	13,662	14,094	14,186	13,651	13,587	13,881	13,932	12,797	0.95	0.92

Ports

Dutch sea and inland ports[85] within the total maritime cluster represents a considerable portion, with a turnover of 14.8 billion EUR, a production value of 12.0 billion EUR and an added value of more than 7.1 billion EUR in 2017. Direct employment in the ports (excluding all non-maritime activities) amounted to almost 48,000 persons employed and indirect

[85] Includes 'loading, unloading and transhipment', 'storage', 'waterborne transport services' and 'freight traffic intermediaries'. These correspond to the value chain segments of ‘Cargo handling’, ‘Cargo discharge’, ‘Cargo storage at landing terminal’, ‘Cargo storage at discharge terminal’, and ‘Sea voyage/ maritime transport’.

employment to almost 38,000 persons. Compared to 2006, employment in ports increased by 4%[86].

In 2017, cargo traffic in Dutch seaports increased by 1% to 595 million tonnes compared to 2016, mostly due to growth in container shipping. Container transhipment in the Netherlands largely takes place in the port of Rotterdam. Rotterdam did better than its direct competitors Antwerp and Hamburg. For the port of Rotterdam, one in five transhipment containers carry wood and paper. Wood mainly comes from Finland, Russia and Sweden, which is then transhipped to China[87].

Transhipment of wet bulk goods (oil and petroleum products) decreased compared to 2016 levels. This decrease of more than 3% to almost 273 million tonnes in 2017, can largely be attributed to the stagnating transhipment (-17%) of petroleum products, and especially the export of fuel oil, from the Port of Rotterdam. Much of these goods come from Russia, which are then shipped to Asia via Rotterdam. Because tankers offer their services cheaply, it has become less interesting to first store the oil in Rotterdam, before transporting it to Asia by mammoth tankers[88].

The supply of coal and iron ore (in the dry bulk category) in Dutch seaports fell by almost 7%, with 51.4 million tonnes of coal and 41 million tonnes of ore in 2017, compared to 2016[89]. Coal transhipment decreased for the third year in a row, but with 25 million tonnes of transhipment, Rotterdam is still the largest coal port in Europe where the largest dry bulk coal vessels can unload. Amsterdam is the second transhipment port for coal at 19 million tonnes[90]. For Dutch ports, coal accounts for an important part of the total annual cargo traffic, representing approximately an eighth of the total goods arriving by sea. For the port of Amsterdam, the supply of coal in 2017 was almost 30% of the quantity of goods unloaded. Much of this coal is shipped via inland waterways and networks, accounting for roughly 20% of all international transport via inland shipping. For rail transport, the share of coal is 30% of the total weight that is carried abroad, a decrease of 4% from 2016 figures. The supply of coal is mainly from Russia and the United States, which account for half of all coal shipments to Dutch seaports. A quarter of the coal supplied in Amsterdam was destined for the coal-fired power station and blast furnace in Velsen and IJmuiden[91]. However, the supply of ores

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[86] *Ibid*

[87] *Ibid*

[88] CBS (2018). “Traffic growth in ports driven by container sector”. Available at: https://www.cbs.nl/en-gb/news/2018/24/traffic-growth-in-ports-driven-by-container-sector

[89] *Ibid*

[90] CBS (2018). “Sustained decline coal transhipment at Dutch seaports”. Available at: https://www.cbs.nl/en-gb/news/2018/24/sustained-decline-coal-transhipment-at-dutch-seaports

[91] *Ibid*

increased by 9.4 % (+3.5 million tonnes) in 2017, and was largely due to the rise in ores imported from Brazil and South Africa[92].

Direct employment in Dutch ports (excluding all non-maritime activities[93]) amounted to 47,703 persons employed in 2017, about 1,762 more than in 2016 (+4%). This makes the port the largest employer in the maritime cluster. Automation has resulted in an increase in staff productivity in the port in recent years, while technological developments in the port sector are increasing the need for higher educated and more specialised personnel. In the medium term, the upgrading of work is expected to continue, especially in the technical professions[94]. There are staff shortages on the executive side. About 30% of the companies participating in the port survey indicated that they had vacancies that were difficult to fill. This mainly concerns positions such as, maintenance technician (MBO-4), mechanical engineer (HBO), electrical technician (HBO) and maintenance 1st technician (MBO-3) in the technical professions and logistics and economy (HBO) and Waterklerk / Operator (MBO-4) in the logistics professions[95]. The table below indicates some key economic trends in the Dutch ports sector between 2006 and 2017[96].

Table 7: Economic statistics on ports in the Netherlands

												Index (2006 = 1)	**Index (2016 = 1)**
Million €	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2006-2017**	**2016-2017**
Turnover	10,480	11,860	12,284	11,064	11,577	12,671	13,164	13,395	14,111	14,027	14,175	14,810	1.41	1.04
Of which exports	*5,869*	*6,660*	*6,883*	*6,038*	*6,368*	*6,969*	*7,240*	*7,367*	*7,761*	*7,715*	*7,796*	*8,146*	1.39	1.04
Production Value	8,491	9,594	9,933	8.948	9,369	10,226	10,780	10,934	11,515	11,471	11,617	12,037	1.42	1.04
Added Value	5,044	4,710	5,956	5,377	5,652	6,192	6,538	6,633	7,071	7,073	7,151	7,171	1.42	1.00
Employment (in persons as of 1 January)	36,927	37,810	38,275	38,106	37,415	39,414	40,996	42,649	43,462	43,583	45,941	47,703	1.29	1.04

[92] CBS (2018). “Traffic growth in ports driven by container sector”

[93] This would include sectors not directly involved in shipping and maritime transport, but are geographically located near or in ports (e.g. large chemical complexes).

[94] Ecorys (2018).

[95] Zandvliet K. and de Rooij- van Leeuwen, M. (2018). “Arbeidsmarktonderzoek haven- en industriecomplex Rotterdam 2016-2017. Rotterdam: SEOR”. Available at: https://www.seor.nl/sites/default/files/reports/Eindrapport%20arbeidsmarktonderzoek%20HIC%20Rotterdam%202016-2017.pdf

[96] Ecorys (2018).

In particular for the port of Rotterdam, the Port Authority directly employed around 1,150 employees in 2017 with a turnover of approximately 712.1 million EUR, an increase of 4.6% from 2016 figures. In the port itself, employment is around 180,000 jobs. Gross investments by the Port Authority of Rotterdam amounted to 179.8 million EUR, mainly within customer-related and public infrastructure and in business assets. The Table below shows the direct added value and employment in the port of Rotterdam between 2014 and 2016[97].

Table 8: Direct added value and employment in the Port of Rotterdam between 2014 and 2016

Main sector and subsector	Added value			Active personnel		
	2016	2015	2014	2016	2015	2014
Hub	**7,614**	**7,188**	**7,057**	**63,153**	**60,282**	**60,983**
Transport	3,271	3,019	2,911	38,627	37,647	38,023
Sea-going shipping	335	362	315	1,844	1,756	1,766
Inland shipping	717	609	586	6,345	6,357	6,766
Road transport	1,990	1,832	1,792	29,139	28,214	28,075
Rail transport	85	82	87	1,246	1,268	1,364
Pipelines	143	134	131	53	52	52
Transport services	2,223	2,129	2,072	15,046	13,885	13,941
Transhipment/storage	2,120	2,040	2,074	9,480	8,750	9,019
Location	**6,820**	**6,284**	**4,623**	**35,359**	**33,555**	**33,595**
Industry	5,168	4,761	3,129	21,245	20,112	20,077
Food industry	357	308	308	2,331	2,220	2,262
Petroleum industry	1,072	1,091	-185	3,556	3,426	3,372
Chemicals industry	2,486	2,190	1,836	5,096	4,733	4,754
Basic metals and metal products industry	293	259	306	2,776	2,781	3,185
Transport equipment industry	157	148	143	2,101	2,049	2,009
Electricity generation	473	489	467	1,662	1,732	1,751
Other	330	275	253	3,723 0	3,171 0	2,744 0
Wholesale	977	895	869	8,669	8,266	8,333
Business and non-business services	675	628	625	5,445	5,177	5,185
Total	**14,434**	**13,473**	**11,680**	**98,511**	**93,837**	**94,578**

Unit: value in € millions and number of active personnel

3.1.7 Identification of Land-Sea Interactions of maritime transport of cargo in the Netherlands

Apart from the coastal and maritime dimension of maritime transport of cargo, the sector has important onshore components and implications.

Hereafter, we focus our attention on specific land and sea impacts of maritime transport of cargo, which are very much related to the economic development of the Netherlands. They are organized in three typologies: environmental, socio-economic and technical[98].

Environmental LSIs:

[97] Port of Rotterdam Authority (2018). “Facts and Figures”.

[98] As defined in the European Commission Report “Land Sea Interactions in Maritime Spatial Planning Report”. Available at http://ec.europa.eu/environment/iczm/pdf/LSI_FINAL20180417_digital.pdf

- impacts on habitats and species associated with port development and channel dredging;
- modification of hydrographic conditions, underwater noise, increased risk of collision (e.g. by mammals), increased risk of accidents, pollution from marine litter and the introduction of non-indigenous species by vessels;
- wider impacts including poor air quality, airborne noise and traffic.

Socio-economic LSIs:

- the impacts of port activity on income and employment and facilitation of ancillary and supply chain businesses;
- the displacement of other sectors including mineral extraction, offshore energy and others.

Technical LSIs:

- the achievement of efficient connectivity with terrestrial transport networks.

The Table 9 provides additional information on specific land-sea implications per each segment of the maritime transport value chain. Each segment has, in fact, direct or indirect land-sea interactions. Naturally, these are more apparent at the land-sea interface where some segments of the value chain are occurring. The table highlights the key LSIs for three value chain segments of maritime transport of cargo in the Netherlands: Cargo handling and Cargo discharge at terminals and the Sea Voyage/ Maritime transport.

Table 9: LSI linkages to segments of the value chain- Maritime Transport of Cargo

Segments of the Value Chain	Main elements characterizing the LSI
1) Cargo Production	Impact of waste management; Employment and Income generation; Impacts on land infrastructure
2) Cargo Storage	Impact of waste management; Employment and Income generation; Impacts on land infrastructure
3) Cargo Land Transport	Accessibility to Infrastructure; Employment and Income generation; Impacts on land infrastructure
4) Cargo Storage at Landing Terminal	Impact of waste management; Displacement of other sectors, Employment and Income generation; Impacts on land infrastructure
5) Cargo Handling	**Impact on coastal processes; Impact of waste management; Invasive non-native species; Impact on air quality; Displacement of other sectors; Employment and Income generation; Impacts on land infrastructure**
6) Sea Voyage / Maritime	**Invasive non-native species; Impact on air quality; Displacement of other sectors; Employment and Income generation; Pollution, noise or species'**

Transport	disturbance
7) Cargo Discharge	**Impact on coastal processes; Impact of waste management; Invasive non-native species; Impact on air quality; Employment and Income generation; Impacts on land infrastructure**
8) Cargo Storage at Discharge Terminal	Impact of waste management; Displacement of other sectors, Employment and Income generation; Impacts on land infrastructure
9) Cargo Land Transport	Accessibility to Infrastructure; Employment and Income generation; Impacts on land infrastructure
10) Cargo Storage	Impact of waste management; Employment and Income generation; Impacts on land infrastructure
11) Cargo Delivery	Impact of waste management; Employment and Income generation; Impacts on land infrastructure

Offshore Wind Energy in the Netherlands

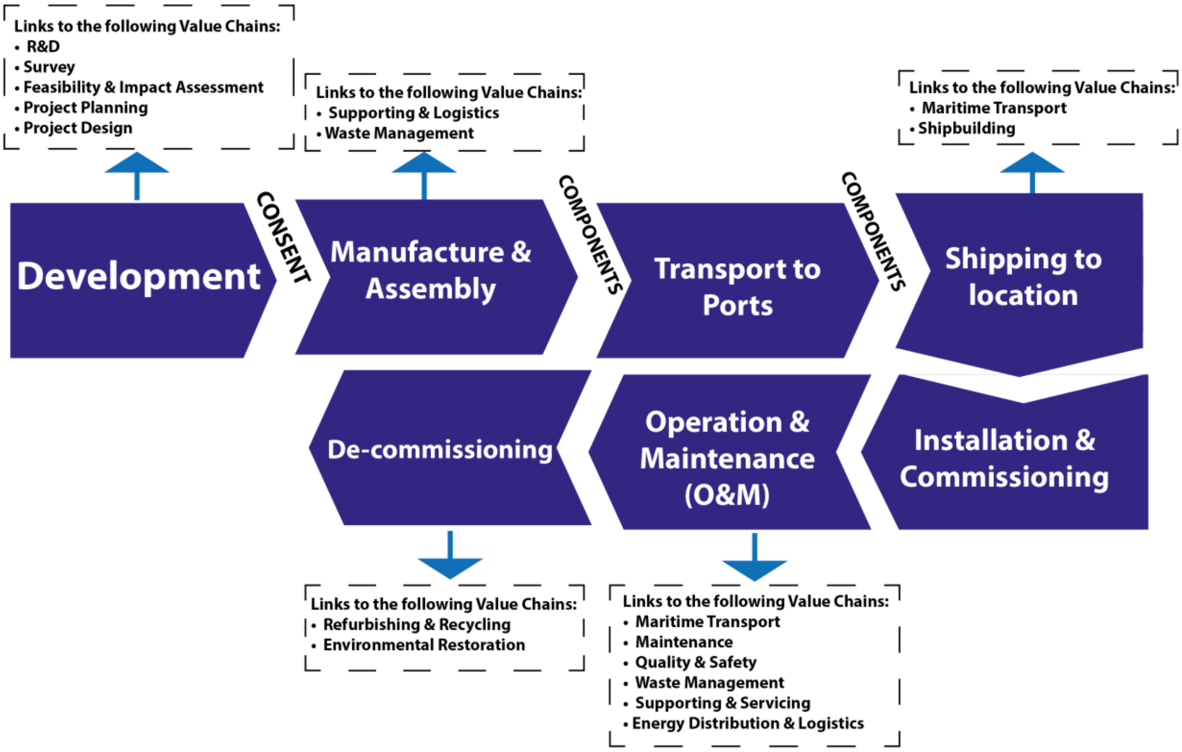
3.1.8 Developing the Value Chain - methodological clarifications

The general value chain for the maritime activity of offshore wind energy was built based on previous offshore wind energy value chain literature such as DG MARE Blue Growth Report[99]. However, some other segments were added to these value chains so as to spatially highlight the land sea interactions of the offshore wind energy value chain process from the development and design of the wind farms to the de-commissioning of these passing through the offshore wind energy installation, commissioning operation and maintenance works. The segments of the value chain where selected in terms of the spatial nature of each of the process steps, so as to show the spatial allocation of these segments for the LSIs analysis.

The following diagram shows the various segments that constitute the general value chain of ocean energy:

99 https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/publications/blue_growth_third_interim_report_en.pdf

Figure 5: General Value Chain for Offshore wind energy.



The entire offshore wind energy value chain process can be summarized into the following 7 segments:

- Segment 1) Development.
- Segment 2) Manufacturing & Assembling.
- Segment 3) Transport to ports.
- Segment 4) Shipping to location.
- Segment 5) Installation & Commissioning.
- Segment 6) Operation & Maintenance (O&M).
- Segment 7) De-commissioning.

3.1.9 Key characteristics of offshore wind energy in the Netherlands

The offshore Dutch wind energy sector is currently envisioned to undergo a speedy development. Due to their oil and gas deposits in the North Sea, the Netherlands have been relying heavily on fossil fuels for power generation in the recent past (in 2016, almost 95% of the national energy supply came from fossil fuels)[100]. However, driven by its commitments under the United Nations Framework Convention on Climate Change, including the Kyoto

[100] Ministry of Economic Affairs of the Netherlands 2016: Energy report: Transition to sustainable energy

protocol and the Paris Agreement (and by the decrease of oil and gas in the North Sea and a desire to reduce a reliance on imported coal), the Netherlands have initiated an energy transition, with the aim of reducing greenhouse gas emission by 40% in 2030 in line with EU commitments.

In 2017, 957 of megawatt (MW) were being generated by the four operational offshore wind farms operational to that date: Gemini Wind Park (600 MW), Luchterduinen (129 MW), Prinses Amaliawindpark (120 MW) and Egmond aan Zee (108 MW). (The other designated areas for establishing offshore wind farms in the North Sea, which are going to be tendered until 2022, include Borssele (foreseen capacity of 1,400 MW), Coast of Holland (west) (foreseen capacity 1,400 MW), and Coast of Holland (north) (foreseen capacity 700 MW), North of Wadden Sea Islands (foreseen capacity 700 MW) and Ijmuiden Ver (foreseen capacity 4000 MW)[101]. The economic contribution (turnover) of the Dutch offshore wind energy sector in 2017 was approximately 2.2 billion EUR, including development & design, manufacture & assembly, transport, installation and commissioning and operation and maintenance. According to a forecast by PwC (2018), the Dutch wind energy at sea could potentially provide cumulative economic value of 100 billion EUR and more than 13,000 FTE until 2040.

The main LSIs associated with offshore wind farms are port infrastructure (e.g. Europort of Rotterdam and port of Eemshaven, in the Dutch case), which are required for offshore transport of material and workers, and cables connecting the wind farms to the land-based electricity grid, which may also serve land-based wind farms. To this end, the National Structural Vision for Wind Energy at Sea stipulates that in locations where electricity from large scale offshore wind farms comes ashore, coordination regarding the possible connection of wind farms on land to the same infrastructure is required[102].

There are several potential conflicts between offshore wind energy generation and other maritime sectors in general, including shipping, mineral extraction, tourism, fishery and nature protection, and a policy regarding the mitigation of conflicts between sectors or the possibilities for co-use of wind-parks for nature protection or agriculture is currently under development.

As the Southern North Sea is a densely shipped area, care must be taken to maximise safety and to avoid conflicts with the international shipping routes. The Dutch shipping routes had to therefore be adjusted following a complex procedure, in 2013, to accommodate the plans for offshore wind energy expansion. Regarding the extraction of minerals, a safety distance to oil and gas platforms and sites of sand extraction is required for wind farm locations. In order to avoid the disturbance of recreational activities by wind farms and other economic activity, the

[101] European MSP Platform (2018).

[102] Rijksstructuurvisie Windenergie op Zee

Dutch MSP stipulates that a free view of the horizon from the coastline, out to 12 nautical miles, needs to be guaranteed[103]. The conflict between nature protection and the construction and operation of wind farms has been explored in a vast array of publications. The Dutch Maritime Spatial plan does in general not foresee the installation of offshore wind farms in protected areas, with the exception of the Dogger Bank, which is designated as a Natura 2000 area. At the time of writing, the planning process regarding wind energy exploitation on the Dogger Bank had not yet been concluded. An important development to be mentioned in this respect, however, is the North Sea Power Hub consortium, which aims to establish a large-scale European offshore electricity grid for offshore wind energy in the North Sea. This initiative would entail the construction of artificial islands in Dogger Bank for the generation and distribution of offshore wind energy in the North Sea.

Within the offshore wind energy value chain of the Netherlands, 5 segments appear to be particularly relevant to the Netherlands case study area. These are: 'development', 'manufacturing and assembling', 'shipping to location', 'installation / commissioning', and 'operation and maintenance'. Indeed, Netherlands holds a strong position in the international market, particularly in the installation of wind farms, construction of foundations and seabed research. It is also an important area for the ship building step of the offshore wind energy value chain in terms of building ships that can serve both for the installation and commissioning phases and for the operation and maintenance works (once wind-farms are in place).

Manufacturing and assembling works usually occur at those locations nearby ports so the transport to ports segment of the value chain is not of such importance for this case study area. Key characteristics of offshore wind energy in the Netherlands

According to Statistics Netherlands (CBS), the Netherlands is a net-importer of energy, with total energy consumption in 2016 at 120 billion kilowatt hours (kWh) versus energy produced at 115 billion kWh[104]. In the Netherlands, the power sector is unbundled and legally required to unbundle ownership for energy transmission and distribution. As such, the power sector has a transmission system operator (TSO), 8 Distribution Service Operators (DSO), over 25 producers and 35 electricity retailers. There are more than 8 million connections in the Netherlands, with a total current demand of some 118.6 terawatt hours (TWh)[105].

The Dutch market relies heavily on fossil fuels in terms of its power generation. In the northern part of the Netherlands, there are deposits of natural gas from which most Dutch power plants are run. Only 6% of energy is generated from renewable sources, partly due to

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[103] Government of the Netherlands (2018). "Policy Document on the North Sea 2016-2021 (printversie)".

[104] CBS (2018). "Economy: Figures- Energy". Available at: https://longreads.cbs.nl/trends17-eng/economy/figures/energy/

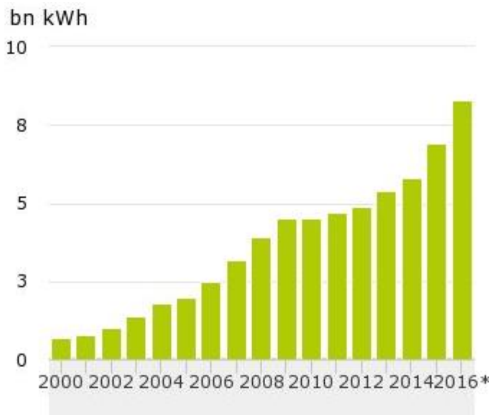
[105] Export.Gov (2018). "Netherlands- Energy". Available at: https://www.export.gov/article?id=Netherlands-Energy

the absence of large-scale hydro generation, solar usage, and onshore wind (due to population density). Most of this renewable energy is derived from biomass, and solar, hydro, and nuclear energy play a minor role[106].

The majority of the nation's electricity is also dominated by fossil fuels (i.e., from natural gas and coal), which accounts for approximately 31.25 gigawatts (GW). However, wind power has experienced the fastest growth over the years, increasing from 0.8 TWh in 2,000 to 7.6 TWh in 2015[107].

The characteristics of the Dutch North Sea make it an ideal location for offshore wind, with shallow water in the southern part (<50 m) and good wind speeds (~10 m/s at 100 m above sea level). In addition, the available research and development (R&D) industry means that the necessary offshore knowledge is available and close by. At present, an estimated 84% of the world's total installed offshore wind capacity is located off the coast of European countries. The Netherlands accounts for an estimated 5.9% of global offshore wind installed capacity[108]. In 2030, around 48 GW of installed capacity is expected to be in the North Sea, representing 40-50% of the total capacity, with 2040 estimates increasing to 70-150 GW[109].

Figure 6: Wind Energy production in the Netherlands from 2000 – 2016



Source: CBS (2018)

In 2017, Dutch offshore wind installations had a total installed capacity of 1,118 MW[110]. Currently, there are six offshore wind farms off the coast of the Netherlands: Egmond aan Zee (108 MW), Eneco Lucterduinen (129 MW), Gemini (600 MW), Princess Amalia (120 MW),

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106 *Ibid*

107 *Ibid*

108 Global Wind Energy Council (GWEC) (2019). "Offshore Wind Power". Available at: https://gwec.net/global-figures/global-offshore/

109 PwC (2018). "De economische bijdrage van windenergie op zee". Available at: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2018/08/31/de-economische-bijdrage-van-windenergie-op-zee/20180606+Economische+bijdrage+van+windenergie+op+zee.pdf

110 Global Wind Energy Council (GWEC) (2018). "Annual Market Update 2017". Global Wind report. Brussels, April 2018. Available for download at: http://files.gwec.net/register?file=/files/GWR2017.pdf

Irene Vorrink (17 MW) and Westermeerwind (144 MW)[111]. The last two wind farms are included within offshore wind energy calculations, however they are located within IJsselmeer and Markermeer, which are an enclosed inland bay and lake within the Netherlands, and are not within the marine EEZ. The Table 8 provides an overview of all existing offshore wind farms in the Netherlands and lists those that are still in pre-construction.

With its current operational offshore wind farms, the Netherlands is the fifth largest offshore wind market in the world[112]. Despite this, the contribution of offshore wind energy to the total energy consumption is still comparably low (0.57% in 2017)[113]. However, there are strong political efforts to increase this in the coming years, in order meet the national goal of increasing the production and consumption of sustainable energy nationwide (see more information in framework conditions section).

Regardless of its energy production, Dutch companies in the offshore and maritime cluster occupy a strong position on the international market, particularly in the installation of wind farms, construction of foundations and seabed research. The economic contribution of the sector is largely driven by the fact that these companies develop offshore wind farms abroad. In recent years, the pipeline has been strengthened with projects off the Dutch coast, which increases the total economic contribution[114].

The Netherlands has a strong history in the offshore sector, partly due to its knowledge and expertise from the oil & gas industry and activities such as dredging. All Dutch parties in this sector have extended their existing activities to the offshore wind sector. Dutch parties have a high share of the European market (around 70%) and are involved in the construction of parks in the UK, Germany, Denmark and, of course, the Netherlands[115].

A few large companies dominate distribution, production, and supply[116]. For design and development, Ørsted and Vattenfall are amongst the largest developers and have branches in the Netherlands. Dutch developers are Shell and Eneco, which have developed a consortium with van Oord and DGE Borssele III & IV. Dutch developers have limited activities in foreign markets. Parts of the value chain are less commercially developed in the Netherlands, particularly the construction and assembly of turbines[117].

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111 Export.Gov (2018); 4C Offshore Windfarms (2018). "Offshore Windfarms: Netherlands". Available at: https://www.4coffshore.com/windfarms/windfarms.aspx?windfarmId=NL32

112 *Ibid*

113 Energieakkoord (2018). "Windenergie op zee". Available at: http://energieopwek.nl/

114 PwC (2018).

115 *Ibid*

116 Export.Gov (2018). "Netherlands- Energy". Available at: https://www.export.gov/article?id=Netherlands-Energy; PwC (2018).

117 PwC (2018)

The turbine market is concentrated and dominated by a few large international players, namely Siemens, MHI Vestas and GE. Production takes place mainly in Denmark and a number of local sites (e.g. for the blades) in Europe. Dutch companies are active in this sector mostly through supply services, such as test centres. However, international players, such as Siemens Gamesa, are active in the Netherlands with design / R&D and maintenance services, mostly engaging local employees. Dutch activity in this area could be further developed, especially considering that a large part of the offshore wind value chain profit can be made here[118].

For substations and cabling, the Netherlands has several active parties, such as Strukton, Heerema and HSM offshore. These parties produce for both the Dutch and international markets. The Netherlands is under represented in submarine cables, which are mainly produced abroad. TenneT is a major player in the Dutch and German markets and is responsible for the grid connection, acting as the main contractor for the construction of substations and cabling[119].

Lastly, offshore wind maintenance is mainly carried out by the turbine manufacturers. In the future, it is expected that other maintenance concepts will be offered, in line with the rapidly growing market. The sector provides a structural source of employment. Dutch parties are active in this sector, but there is still sufficient room for growth[120].

Table 10: Offshore wind farms with in operation or pre-construction phase in the Netherlands[121]

**Offshore wind farms constructed in IJsselmeer and Markermeer, which are closed off inland bay and lake within the Netherlands, and are not within the marine EEZ.*

Name and Status	**Capacity (MW) and Turbine model**	**Developer and Contractor**	**Operator and Owner**	**Operator Offshore transmission**
Borssele 3 and 4 (Pre-Construction)	735.5 V164-9.5 MW (MHI Vestas Offshore Wind)	Bauwwind II Consortium, consisting of Shell Wind Energy Ltd, Eneco, Van Oord Dredging and Marine	TenneT TSO B.V. (Operator Offshore-Transmission) "Bauwwind II Consortium", consisting of Shell Wind Energy Ltd, Eneco, Van	TenneT TSO B.V.

[118] *Ibid*

[119] *Ibid*

[120] *Ibid*

[121] 4C Offshore Windfarms (2018).

		Contractors, Mitsubishi/DGE, Partners Group Van Oord Dredging and Marine Contractors	Oord Dredging and Marine Contractors, Mitsubishi/DGE, Partners Group	
Borssele 1 and 2 (Pre-Construction)	752 SG 8.0-167 DD (Siemens)	Orsted Borssele 1 B.V.	TenneT TSO B.V. (Operator Offshore-Transmission) Orsted A/S	TenneT TSO B.V.
Gemini Windpark (Operational)	600 SWT-4.0-130 (Siemens)	Van Oord NV	Northland Power, Inc. HVC Groep, Northland Power, Inc., Siemens Financial Services	
Eneco Luchterduinen (Operational)	129 V112-3.0 MW Offshore (MHI Vestas Offshore Wind)	Eneco Wind B.V Van Oord NV	Eneco Wind B.V Eneco Wind B.V, Mitsubishi Corporation	
Prinses Amalia Windpark (Operational)	120 V80-2.9 MW (Vestas)	Van Oord NV	Offshore Windpark Q7 Eneco Wind B.V.	
Egmond aan Zee (Operational)	108 V90-3.0 MW Offshore (Vestas)	NoordzeeWind Bouwcombinatie Egmond	NoordzeeWind Nuon, Shell Wind Energy Ltd	
Westermeerwind* (Operational)	144 SWT-3.0-108 (Siemens)	Ventolines BV Siemens Nederland N.V.	Ventolines BV Westermeerwind BV	
Irene Vorrink	16.8	Nuon	Nuon	

(Operational)	NTK 600/43 (Nordtank)			

3.1.10 Framework conditions affecting the production of offshore wind energy in the Netherlands

3.1.10.1 International, national and sub-national governance

The emergence of offshore wind energy in the Netherlands has among other factors been triggered by the country's commitment to climate policy on international and EU level. As a signatory to both the Kyoto Protocol (1997) and the Paris Agreement, which were negotiated under the United Nations Framework Convention on Climate Change (1992), the Netherlands has committed to reduce its greenhouse gas emission. Furthermore, as Member State of the European Commission the country is obliged, by the 2020 climate and energy package, to reduce greenhouse gas emissions by 20% of 1990 levels and to increase the share of renewable energy by 2020. The 2030 Climate and Energy Framework of the European Commission, which was adopted in 2014, operates with a larger time horizon, as it obliges its Member States to increase the share of renewable energy to 27% of total energy consumption by 2030 and to reduce emissions by 40% of the 1990 level by 2030.

Offshore wind energy expansion constitutes an important part of the transition of the Dutch energy sector and thus enjoys high political importance, expressed in an array of policy documents developed over the past five years. By signing the *"Energy Agreement for Sustainable Growth"* in 2013, the Dutch government expressed its ambition to have approximately 4.5 GW of installed capacity by 2023[122]. The Dutch *"Road map towards 4,500 MW offshore wind power"* foresees an annual tendering of 700 MW in the period 2015 – 2019, it is a precondition that the cost of offshore wind power will decrease by 40% in the coming years. The designated lots in the 2023 offshore wind energy roadmap will be allocated to developers through a tender system between 2015 and 2019. The "*Offshore Wind Energy Act*" [123] was drawn up, in 2015 to simplify and accelerate implementation of offshore wind projects in an effort to achieve its 2020 renewable energy targets. The Act enables the Dutch government to take responsibility for the offshore wind spatial planning arrangements and environmental assessments. Furthermore, the Act stipulates connection of these wind farms to the mainland is a government responsibility and not that of the project

[122] Ministry of Economic Affairs of the Netherlands 2013: National Energy Agreement

[123] Overheid.nl (2015). "Wet windenergie op zee". Available at: https://wetten.overheid.nl/BWBR0036752/2015-07-01

developer. Therefore, the government relieves project developers from time and resource investments relating to the selection of a location for development as well as its connection to land based electricity infrastructure. Project developers must obtain a permit from Netherlands Enterprise Agency (RVO.nl) for the realisation of the project, but this is included within the new process of this law[124].

As such, the responsibility for offshore wind spatial planning arrangements, environmental assessments and the connection to the mainland lies with the Dutch government[125], and TenneT, who is operating the national high voltage grid was appointed as manager of the offshore electricity grid by the Ministry of Economic Affairs in 2016. Therefore, it is TenneT who is responsible for long term planning of the national high voltage grid. The 2017 coalition agreement and the "*2030 roadmap*" expressed the objective to have approximately 11.5 GW of installed capacity in the North Sea. Current policy initiatives by the Dutch government regarding offshore wind energy include[126]:

- The elaboration of a so-called "*Roadmap Offshore Wind Energy 2030*", by the Ministry of Economic Affairs and Climate Policy, developed in cooperation with the Ministries for Infrastructure and Water Management, Agriculture, Nature and Food Quality and the Ministry of the Interior and Kingdom Relations
- The drafting of directives for the safe passage of ships, search and rescue provisions and their control and enforcement
- The development of an assessment framework for issuing licenses for the co-use of wind farms (e.g. for fishing, aquaculture or other means of energy generation and nature development)
- A study on the need for adaptation of the legal regime for the adoption of an offshore grid.

3.1.10.2 Economic framework conditions

Relatively, the Netherlands is a late comer to the offshore wind sector, due to its vested interests in the fossil fuel industry and its oil and gas deposits in the North Sea. However, the Netherlands recognises the need for an energy transition away traditional energy sources. As such, the Dutch government, together with the main companies and NGOs, formulated a

[124] Netherlands Enterprise Agency (2015). "Offshore wind energy in the Netherlands: The roadmap from 1000 to 4500 MW offshore wind capacity". Available at: https://www.rvo.nl/sites/default/files/2015/03/Offshore%20wind%20energy%20in%20the%20Netherlands.pdf

[125] Offshore Wind Energy Act (2015)

[126] Brief van de Minister van Economische Zaken en Klimaat aan de Voorzitter van de Tweede Kamer der Staten-Generaal, Den Haag, 27 maart 2018

"*National Energy Agreement*" in 2013, which stipulates the goal to reach the generation of 14% of electricity demand from sustainable energy by 2020 and 16% by 2023[127]. Some proposed policies foresee that after 2023, the share of renewable energy in the will continue to grow to 20.6% by 2030, mainly if the SDE+ scheme[128] that supports the growth of offshore wind and renewable energy is continued[129].

The Netherlands was an active player in early offshore wind development with companies like Shell, but progress in this sector stalled partly because of the presence of Groningen gas. Denmark, on the other hand, made early moves more than 25 years ago, spurred by the country's lack of its own energy sources. When the Danish government ordered the construction of the first offshore wind farms, Shell experts moved to Copenhagen and Danish companies turned to wind turbine technology. These companies have since been acquired and expanded and have developed into the two largest wind turbine manufacturers in the world. Both MHI-Vestas and Siemens-Gamesa have large factories in Denmark and together employ more than 50,000 people worldwide[130].

The Dutch government decided that three offshore wind farm zones will be used for the deployment of the 3,500 MW new offshore wind capacity: *Borssele* (1,400 MW), *Hollandse Kust (zuid)* (1,400 MW) and *Hollandse Kust (noord)* (700 MW)[131].

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[127] SER (2013). "Energieakkoord voor duurzame groei". Den Haag, 09/2013. Available at: https://www.ser.nl/~/media/files/internet/publicaties/overige/2010_2019/2013/energieakkoord-duurzame-groei/energieakkoord-duurzame-groei.ashx

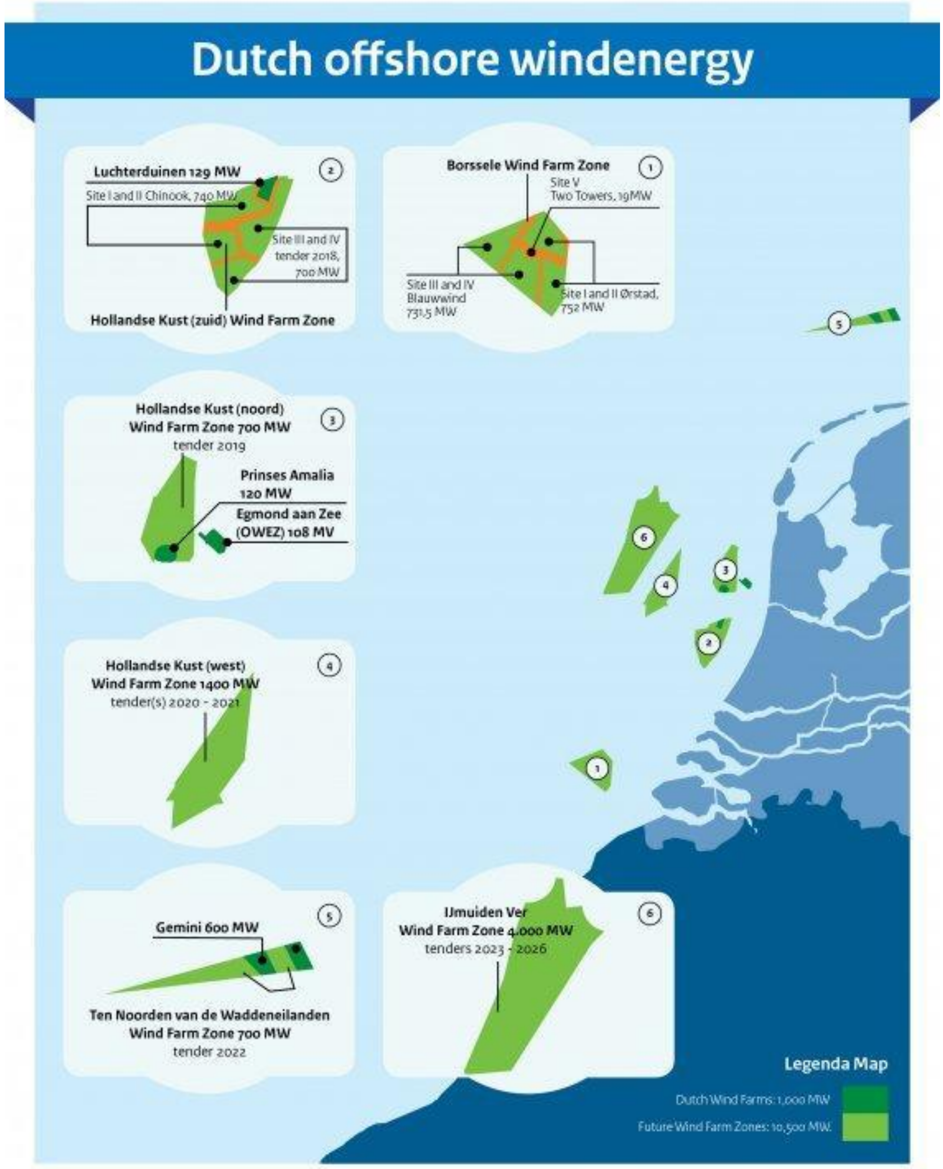
[128] SDE+ (Stimulering Duurzame Energieproductie+) is a support scheme mechanism, more especially, an operating grant. Producers receive financial compensation for the renewable energy they generate

[129] ECN (2016). "National Energy Outlook 2016". Available at: https://www.cbs.nl/en-gb/publication/2016/41/national-energy-outlook-2016

[130] Koster, R. (2018). "Bouw windmolenpark op zee van start, met turbines hoger dan de Euromast". NOS Economie. Available at: https://nos.nl/artikel/2259835-bouw-windmolenpark-op-zee-van-start-met-turbines-hoger-dan-de-euromast.html

[131] Netherlands Enterprise Agency (2015).

Map 8: Designated wind farm zones in the Netherlands continental shelf[132]



The tenders for these offshore wind projects include an SDE+ subsidy (if any), a permit, physical data of the wind areas and a connection to TenneT's offshore electricity grid, which the Ministry of Economic Affairs designated as the grid manager of the offshore grid in 2016. At the end of 2017, the Netherlands issued its first subsidy-free offshore wind tender in hopes of capitalizing on the already booming renewable energy sector. Companies that could fund the project themselves could participate to keep costs low during the transition to more

[132] Netherlands Enterprise Agency (2018). "Offshore Wind Energy". Available at: https://english.rvo.nl/subsidies-programmes/sde/offshore-wind-energy

renewable energy. Chinook, a subsidiary of Nuon, was selected to construct and operate the wind farm at Sites I and II of the *Hollandse Kust (zuid)* in the North Sea[133].

The pipeline for Dutch offshore wind projects was recently reinforced with the stated ambition in the 2017 coalition agreement between the four-party Dutch government and the “2030 roadmap”. The target for 2030 is to have approximately 11.5 GW of installed capacity in the North Sea. The areas *Hollandse Kust (west)*, *IJmuiden Ver* and *Ten Noorden van de Waddeneilande* have already been designated to help realise this ambition. However, to achieve the target, space for approximately 0.9 GW of additional provision still needs to be defined[134].

3.1.11 Key actors in the offshore wind energy value chain

We gathered the most recently available information that was available through the following NACE codes businesses of production of offshore wind energy activities[135]:

Table 11: Production of offshore wind energy activities and their related NACE codes

Sector/Group		**Activity**	**Nace code**
Production of energy	Production of energy	Offshore wind energy	N/A
		Production of electricity	D.35.11
		Transmission services of electricity	D.35.12

We observe that offshore wind energy in Netherlands involves, amongst others, the following Actors within its value chain: Agencies; Associations; Construction & Logistics services; Consultancies; Developers; Energy companies; Operators; Research organizations; Manufacturing Suppliers; Supplier & Operator businesses; Supplier, Construction & Logistics businesses; Testing & Supplier businesses and Universities.

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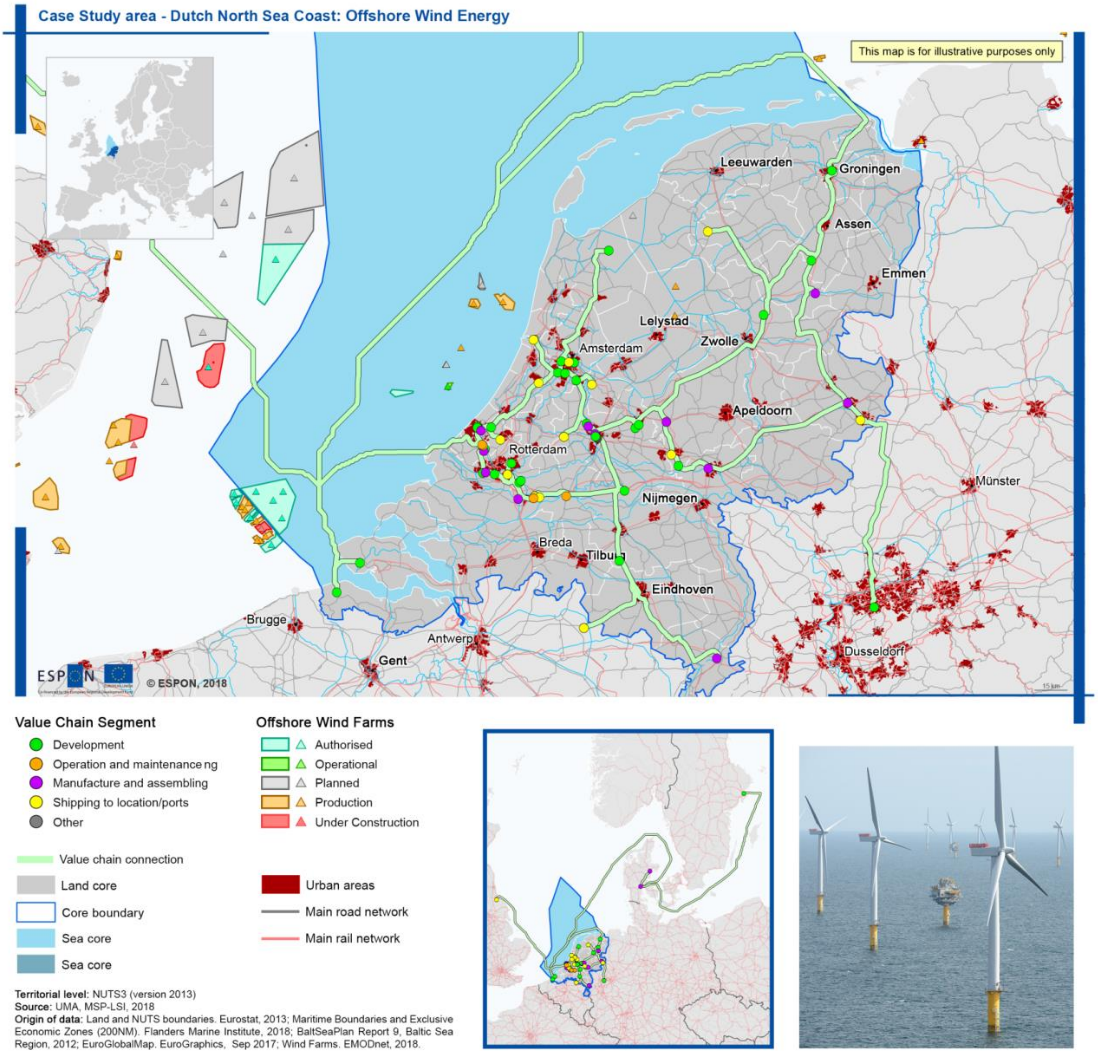
133 Export.Gov (2018).

134 Ministerie van Economische Zaken en Klimaat (2018). “Offshore Wind Energy Roadmap 2030”. Letter to the President of the House of Representatives. Available at: https://english.rvo.nl/sites/default/files/2018/03/Letter-Parliament-Offshore-Wind-Energy-2030.pdf

135 NACE Rev 2 Statistical classification of economic activities in the European Community. 2008. Eurostat Methodologies and working papers, European Commission, Luxembourg. ISBN 978-92-79-04741-1. Availble at https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

Map 9: Key actors of the offshore wind energy Value Chain in the Netherlands



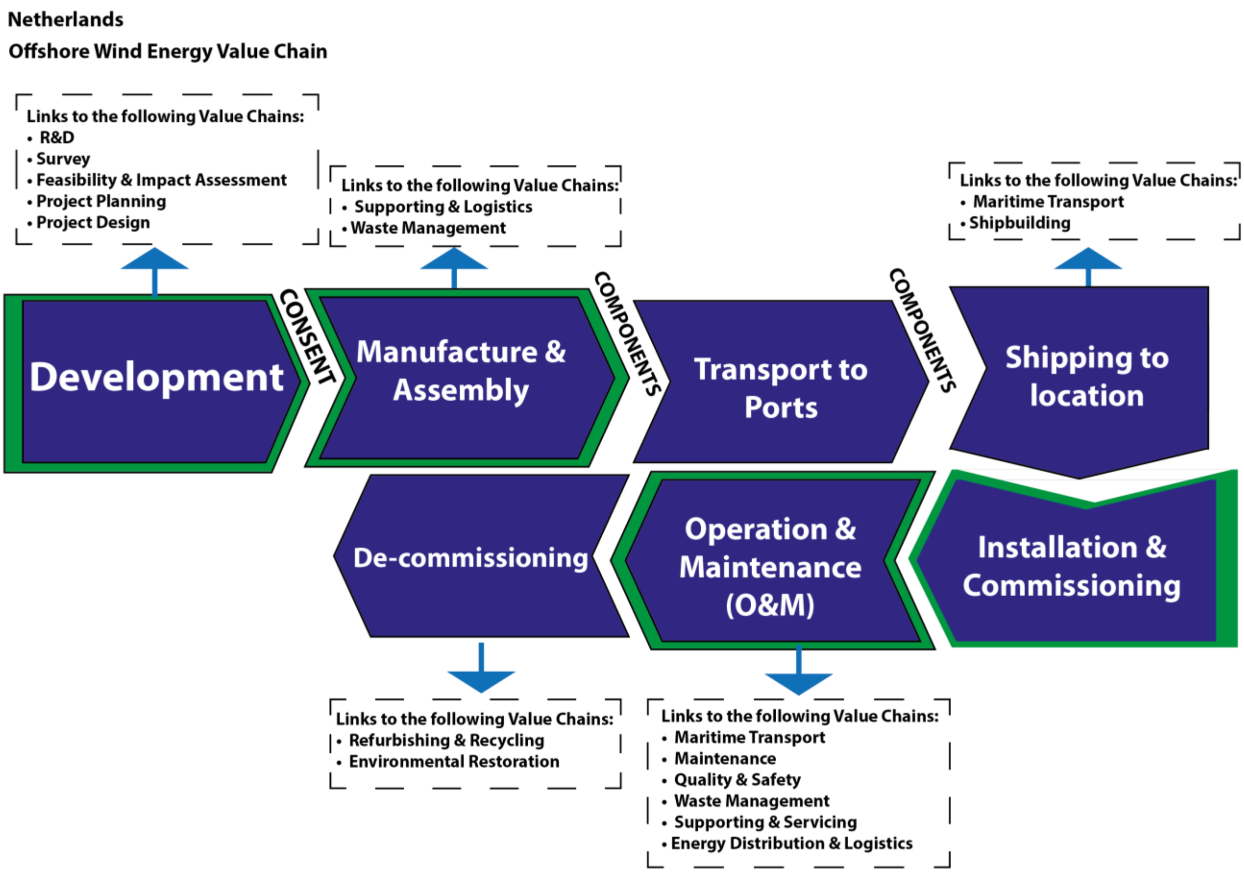
The mapping of the actors allows us to see how the offshore wind energy value chain is concentrated around the main Netherland ports of Rotterdam and Amsterdam and have inland connections even at other countries such as Belgium, Germany, Sweden and Denmark.

A total of 66 Actors were gathered and geo-located to understand the geographical area covered by these actors involved in the offshore wind energy value chain. The map above shows how most of these actors are located around the main Netherland ports of Rotterdam and Amsterdam. However, actors are also found at other areas around the Netherlands such as Groningen, Geldermalse, Schiedam, Ridderkerk, Rouveen, Delft and Den Haag, and even at other countries such as Belgium (construction & logistics services); Germany and Sweden (developers) and Denmark (suppliers).

3.1.12 Tailoring the Offshore Wind Energy Value Chain

The below value chain aims at bringing forward the land-sea component of activities stemming from offshore wind energy in the Netherlands Case Study Area:

Figure 7: Tailored offshore wind energy value chain in the Netherlands



Each segment of the value chain corresponds to specific activities and their land-sea dynamics. Five boxes are depicted within a green frame and in a bigger size than the remaining ones, suggesting that the value chain segments: ‘development’, ‘manufacturing and assembling’, ‘shipping to location’, ‘installation & commissioning’ and ‘operation and maintenance’ are particularly relevant to the Netherlands case study.

The figure above highlights segments 1, 2, 4, 5 and 6 as development, manufacturing and assembling, shipping to location, installation / commissioning, and operation and maintenance steps are those that are more developed in the Netherlands Case Study. Netherlands holds a strong position on the international market, particularly in the installation of wind farms, construction of foundations and seabed research. It is also an important area for the shipbuilding step of the offshore wind energy value chain in terms of building ships that can serve both for the installation and commissioning phases and for the operation and maintenance works (once wind-farms are in place).

Manufacturing and assembling works usually occur at those locations nearby ports so the transport to ports segment of the value chain is not of such importance for this case study area.

3.1.13 Statistical information on the sector

The following section aims at providing additional insight on the key characteristics of the ocean energy sector in the Netherlands. The statistical information has been retrieved from the most recently available sources and generally includes data on economic contribution and, sector employment.

The economic contribution (turnover) of the Dutch offshore wind energy sector in 2017 was approximately 2.2 billion EUR**.** In the same year, the sector employed roughly 6,400 persons. The direct Dutch contribution in the Netherlands is estimated to be 1.5 billion EUR, in in the development, construction and maintenance of wind farms, and indirect contributions add another 0.7 billion EUR[136].

Most of the direct contribution comes from transport & installation (800 million EUR), followed by foundations (300 million EUR). These are the two sectors where the Dutch business community is strong and therefore also benefits from the development of wind farms abroad. Other important sectors that make an economic contribution are substations & cabling (150 million EUR) and development & design (100 million EUR). Turbines (<50 million EUR) and operation & maintenance (<50 million EUR) have a more limited share[137].

An additional 0.7 billion EUR is generated from indirect effects, including turnover generated by companies that do not operate directly in the value chain of offshore wind farms, but do supply services or goods to them. This can vary from the supply of steel or coatings for the construction of foundations, business services such as accounting or legal services or transport and catering services[138].

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[136] PwC (2018).

[137] *Ibid*

[138] *Ibid*

Table 12: Economic contribution and full time equivalents of the Dutch offshore wind energy sector in 2017[139]

Value chain segment		**Direct Turnover (million €)**	**Employment (FTE)**
Development & Design		100	1,000
Manufacture & Assembling	*Turbine*	50	300
	Foundations	300	1,500
	Substations/cables	150	800
Transport to Ports, Shipping to Location, Installation & Commissioning		800	2,700
Operation & Maintenance		50	200

Offshore wind transport & installation generates the largest turnover in the Netherland's offshore sector. Of Europe's total economic contribution of 1,200 million EUR, the Dutch portion equates to 67%.

For offshore wind development and design, the total economic contribution (turnover) of the European economy is 300 million EUR, and the Dutch portion of that equates to 33%. In the field of consultancy, design and R&D, the Dutch sector has a number of leading companies and institutions operating internationally, such as Fugro and Royal Haskoning DHV. These parties build on their offshore expertise and have successfully translated this knowledge into offshore wind energy[140].

Dutch offshore wind foundations make up 20% of the total economic contribution to the European economy (1,500 million EUR). The Netherlands has a leading position in the European market with market leader Sif, who is responsible for the production of monopoles. Sif often works together with Smulders, which produces the associated steelworks. The 5 largest player's together account for 77% of the market. Sif and EEW (Germany) both account for 22%, Bladt (Denmark) for 18%, Smulders (Belgium) for 12% and Steelwind Nordenham for 3.5%. The rest of the market consists of smaller parties with less than 3% market share[141].

Lastly, the development of turbines, substations & cabling and operation & maintenance in the Netherlands is relatively small. Total turnover for turbines is 50 million EUR in the

[139] *Ibid*

[140] *Ibid*

[141] *Ibid*

Netherlands, total economic contribution of 144 million EUR for substations & cabling. Turnover for operation & maintenance activities in the Netherlands is 450 million EUR[142].

Given the current trends, Dutch offshore wind energy could grow from around 2.2 billion EUR in 2017 to around 4 billion EUR in 2030 (direct and indirect effects). In terms of employment, the sector is expected to grow from approximately 6,400 FTEs to 11,800 FTEs by 2030. Such a scenario means that the total installed capacity will grow at an ambitious rate of approximately 13% per year. Because offshore wind energy is largely a project-based industry, this leads to a growth rate of the economic contribution of about 5% per year in the Netherlands. Estimations for 2040 project that the Dutch wind energy at sea could potentially provide cumulative economic value of 100 billion EUR and more than 13,000 FTE[143].

3.1.14 Identification of land-sea interactions of offshore wind energy in the Netherlands

Apart from the coastal and maritime dimension of offshore wind energy, the sector has important onshore components and implications.

Hereafter, we focus our attention on specific land and sea impacts of offshore wind energy, which are very much related to the economic development of the Netherlands. They are organised in three typologies: environmental; socio-economic; technical[144].

Environmental LSIs:

- intensive use of space;
- pollution, noise and species' disturbance;
- collision risk of birds with offshore wind turbines;
- building new offshore and/or landside infrastructure has an impact on marine and coastal habitats;
- impacts on coastal processes (i.e. presence of offshore structures affecting physical process (wave and tidal streams) leading to changes in local coastal processes and potential impacts at the coastline e.g. beach erosion);
- impacts on fish stocks

Socio-economic LSIs:

- impacts on income and job creation in coastal communities (direct employment at the energy platforms (operation and maintenance works), ports, or secondary

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[142] *Ibid*

[143] *Ibid*

[144] As defined in the European Commission Report "Land Sea Interactions in Maritime Spatial Planning Report". 2018. Available at http://ec.europa.eu/environment/iczm/pdf/LSI_FINAL20180417_digital.pdf

from development, manufacture and design of pieces or parts of the energy infrastructures (R&D));

- competition for actual sea and coastal space with sectors such as aquaculture, shipping, recreational activities, fisheries and port development;
- potential displacement of some of these sectors stated above;
- impact on the jobs and income of these competing activities (i.e. potential subsequent impact on fishermen's income, jobs and fishing communities)
- impact on other coastal activities such as coastal tourism through the visual impact of the offshore wind energy infrastructure;

Technical LSIs:

- innovation in terms of infrastructure to limit environmental pressures;
- provision of suitable access to offshore wind energy infrastructures and to coastal infrastructures;
- accessibility to land electricity grid;
- technical capabilities and limitations for cable laying;
- impacts on land infrastructure (increased need for infrastructures at coastal areas).

Table 11 provides additional information on specific land-sea implications per each segment of the offshore wind energy value chain. Each segment has, in fact, direct or indirect land-sea interactions. Naturally, these are more apparent at the land-sea interface where segments of the value chain are occurring. The table highlights key LSIs for four value chain segment of offshore wind energy in the Netherlands: shipping of the material to the offshore wind energy infrastructures site, the works for the installation and commissioning of the infrastructure, the operation and maintenance service works and the potential de-commissioning works (once the lifetime of the infrastructure has reached its limits).

Table 3: LSI linkages to segments of the value chain- Offshore wind energy

Segments of the Value Chain	**Main elements characterizing the LSI**
1) Development	Impact of waste management; Employment and Income generation; Impacts on land infrastructure
2) Manufacture & Assembling	Impact of waste management; Employment and Income generation, Impacts on land infrastructure
3) Transport to ports	Accessibility to Infrastructure; Impact of waste management; Employment and Income generation; Impact on coastal processes; Impact on air quality, Impacts on land infrastructure; Pollution, noise or species' disturbance

4) Shipping to location	**Accessibility to Infrastructure; Impact of waste management; Displacement of other sectors, Employment and Income generation; Impact on coastal processes; Invasive non-native species; Impact on air quality, Impacts on land infrastructure; Pollution, noise or species' disturbance**
5) Installation & Commissioning	**Accessibility to Infrastructure; Impact of waste management; Displacement of other sectors, Employment and Income generation; Impact on coastal processes; Invasive non-native species; Impact on air quality, Impacts on land infrastructure; Pollution, noise or species' disturbance**
6) Operation & Maintenance (O&M)	**Accessibility to Infrastructure; Impact of waste management; Displacement of other sectors, Employment and Income generation; Impact on coastal processes; Invasive non-native species; Impact on air quality, Impacts on land infrastructure; Pollution, noise or species' disturbance**
7) De-commissioning	**Accessibility to Infrastructure; Impact of waste management; Displacement of other sectors, Employment and Income generation; Impact on coastal processes; Invasive non-native species; Impact on air quality, Impacts on land infrastructure; Pollution, noise or species' disturbance**

4 Summary and Outlook

4.1 Governance Analysis

The analysis of spatial planning in the Netherlands at different levels revealed the following.

4.1.1 Spatial Planning on Land

Spatial planning on the land and sea is covered by the same broad legislation (the 2008 Spatial Planning Act) although it is expected that new legislation will be published in 2019 which is intended to streamline and speed up planning procedures. On the land the planning system can be described as mature and detailed legally binding bestemmingsplans are detailed legally binding plans for small areas of land within a municipality designated for development or change. These detailed plans are supported by more strategic visioning documents that can be prepared at a municipal, provincial or national scale. Special land use plans can be prepared by the state, often working with the municipalities to enable offshore wind farms to connect with thee grid

4.1.2 Spatial Planning for the Sea

In the sea IDON plays an important role in co-ordinating the interests of other sectoral ministries. It operates as a co-ordinating body under the auspices of the Ministry of Infrastructure and Water Planning. The marine spatial was prepared as a co-ordinating document with marine transport and renewable energy being the key national priorities. The former has been a longstanding priority given the role of the Netherlands (especially Rotterdam) as a gateway to Europe and the latter has become a newer imperative given the aspiration to decarbonise the energy sector, which has traditionally been focused on coal and natural gas. With a lot of existing competition for space to meet sector needs, fishing, sand and mineral extraction, shipping lane, coastal protection, nature conservation, fishing, tourism etc., MSP has been used as a space where new sea space uses (especially space for renewable energy has been found).

The current MSP is part of the National Water Plan and is intended to operate out until 2021. However there are early indications that preparations are already underway to update this plan with a view to ensuring that there is greater stakeholder collaboration in its preparation, recognising that national and sectoral interests need to be reconciled with more localised interests and concerns. Hence there is an aspiration at least the land sea interactions can be better integrated into policy making through enhanced engagement with provincial and municipal governmental authorities

4.1.3 Addressing LSI

In the Netherlands the importance of analysing and incorporating land sea interaction has been long recognised. Initially the importance of land sea interaction was and remains of critical national importance because of the role that coastal defences have in protecting so much of the land, which is below sea level from the threat of coastal flooding. This is primarily the role of the Water Boards and in part reflected in the fact that the current MSP is formally part of the National Water Plan. Maritime transport has and remains and important sector for the Dutch economy and whilst many of the marine uses for this activity are the result of international agreements, within Dutch marine space, trying to create new opportunities for offshore wind farms, has resulted in MSP activities re-aligning shipping lanes near the coast to create new space for these new activities. The nationally orientated policy aspiration to decarbonise their energy supply system to take advantage of the wind energy potential within the North Sea has led to a concerted effort for integrated and co-ordinated action within MSP often responding to national agendas.

At the immediate land sea interface the municipalities are the responsible bodies for planning the ports (often publically owned) and out into the sea for a distance of 1nm, so many of the LSI agendas are largely land based

That said the current North Sea Policy Document 2016-2021 which provides the visioning framework for MSP has explicitly identified a number of activities that take place on the land and in the sea from various marine orientated sectors and/or designated marine uses. This is a useful check list for both marine and land based authorities when considering this interface.

Finally, within the Dutch policy context, with many land use plans not appearing to have explicitly considered LSI to any great extent a new plan, prepared by the Ministry for Economic Affairs and Ministry for Infrastructure and the Environment in collaboration with relevant municipalities (the so called ‘inpasingsplan’) enables the licencing for the construction of onshore cables and substations for offshore wind farms.

4.2 Value Chain Analysis

4.2.1 Maritime Transport of Cargo

The role of Dutch ports is currently of critical importance both for the national, but also for the wider European economy, as Rotterdam in particular in combination with the other ports on the North Sea coast currently act as the gateway to Europe. Many of the goods landed in Rotterdam are then transhipped to other European destinations and/or re-exported to other parts of the world. Despite this position of relative primacy the Dutch ports are facing increasing competition as the industry more generally adapts. For example, container shipping companies are forming bigger alliances. The Port of Rotterdam Authority is part of this alliance. There is also increasing competition from other Mediterranean ports as they seek to become more prominent gateways to Europe, with associated increase in short sea shipping. Access to and from the port, especially in terms of inland waterways may have to be rethought if climate change scenarios of drier summers adversely affect the navigability of the inland waterways. It is also likely, with the plans to decarbonise the energy market, that there will be significant changes in the volume of coal being imported. Therefore there are many factors that potentially affect the port of Rotterdam and other Dutch ports ability to remain competitive.

Whilst many of the shipping routes within the North Sea are shaped by international agreements, e.g., the Traffic Separation Scheme in the southern North Sea, MSP within the Dutch context has re-aligned some shipping lanes within Dutch waters to facilitate both access to the ports and the designation of space for offshore wind farms. Many of the other activities associated with port re-development, and associated infrastructure facilities are largely the responsibility of land based authorities. However the Dutch government has re-enforced the importance of the Dutch ports maintaining their prominent position as a key national priority.

Whilst many of the key activities associated with maritime transport have a very clear maritime focus, the need for protected and safe shipping lanes, the support for port development/re-development, much of the value of port based activities extends well beyond the coastal strip, and indeed within Rotterdam's case well beyond national boundaries. Therefore the reach or stickability of port based activities extends across wide parts of Europe and this has critical implications when thinking about land sea interactions.

4.2.2 Offshore wind energy

Within the Dutch context a critical national priority has become the need to decarbonise the energy market, which is currently dominated by fossil fuels, coal and gas fired power stations. The North Sea itself has been identified as having huge potential for generating a significant quantity of clean renewable energy and ambitious national targets have been set. In responding to this national imperative, MSP recognising that marine space is limited and there are many competing interests, has engaged in a process of consultation to re-align shipping lanes to help create space for potential wind farm development. This process has been successfully negotiated, but what becomes interesting is that delivery lies beyond the scope of narrowly defined MSP. The licencing of the farms themselves resides with the Ministry of Economic Affairs who has appointed TenneT to be responsible for bringing the energy ashore and connecting the electricity to the national grid. This takes place on land and a special form of land use plan, prepared in consultation with local municipalities, provides the legal certainty for necessary onshore infrastructure (routing on cables onshore and the substations) to be developed. There seems to be good co-ordination between national bodies within marine space (through IDON) to reserve marine space for such activities, land based infrastructure (which is not necessarily on the coast) can be delivered and the other framework conditions to encourage the private sector to tender of various offshore schemes means that new development has occurred quite quickly. In addition there is national expertise in the private sector, based around offshore oil and gas exploration and exportation which means the Dutch engineering technology in this field is of international standing and offers potential for employment growth.

Through national legislation and ensuring that all wind farms are located at least 12nm offshore from the coast, it is hoped that these new developments will not adversely interfere with other most coastal orientated activities such as coastal tourism,.

Assuming that the ambitions for offshore and renewable energy are realised then ultimately this could have implications for onshore infrastructure whereby the space for storage of coal and the coal fired power stations themselves will become redundant.

4.3 Recommendations for Good Management of LSI in the Netherlands

There is a relative maturity of MSP within the Dutch context and good levels of stakeholder integration, especially at a national level. In MSP planning governmental stakeholders with an interest in the sea, co-operate and collaborate, through a co-ordinating body IDON, in the preparation of MSP, which is integrated into a national territorial vision. Furthermore, the existing plan has already acknowledged the importance of LSI both for MSP and land based policy planning. There is also strong recognition that planning must be a continuous process that must be regularly updated to respond to changing opportunities and risk. Within the Dutch context there are already suggestions that the system of planning and the marine spatial plan itself needs to be refreshed.

Taking such perspectives into account, we offer the following conclusions and recommendations that may provide policy makers with some new insights.

Recommendation 1. Whilst the existing national spatial planning framework already recognises land sea interactions and the importance of MSP, the new spatial planning framework offers the potential for an even more holistic and joined-up perspective regarding LSI through further evolution of an integrated territorial approach.

National planning within the Dutch context has already explicitly identified LSI issues that need to be taken into account and has proved adept, both on land and sea, in reserving space for activities deemed to be of national importance. Much of this work has involved the collaborative efforts of national stakeholders, and there is a growing acceptance that perhaps more could be done with local and regional stakeholders (see Recommendation 2). By developing a more spatialized approach to exploring LSI some of the impacts that the maritime sectors are, and will continue to have, on the land might be better understood.

Recommendation 2. The national MSP community should be supported in their efforts to recognise the importance of local level stakeholders and more proactively engage them in MSP processes.

There is recognition that MSP to date has largely responded to national agendas and priorities, but that there are perhaps local implications that have not been properly taken into account. Greater local stakeholder engagement may mean that local plans which are predominantly land based may take more explicit account of the interactions with marine based activities. Perhaps to date, the full implications of LSI have yet to be properly recognised both by the MSP and land based planning communities.

Recommendation 3. Responding more explicitly to climate change resilience should become more prominent and explicit for spatial planning in creating innovative responses to infrastructural needs.

Policy responses designed to decarbonise the Dutch energy markets and recent drier summers have highlighted some of the potential limitations and obsolescence of existing energy and transport infrastructure. For example, offshore wind energy production will mean that some land based infrastructure, space for storing coal and coal fired power stations will become obsolete, providing space for redevelopment, and these places may, or may not be, close to the coast, but will be a potential result of land sea interaction. Similarly, if drier summers mean that Europe’s inland waterways become less navigable this may have enormous implications for land based infrastructure. By MSP considering these LSI issues it could have a significant role in highlighting the importance of a more integrated and holistic territorial approach.

ESPON 2020 – More information

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