Report

Economic description of the Dutch North Sea and coast: 2015, 2017, 2019 and 2021

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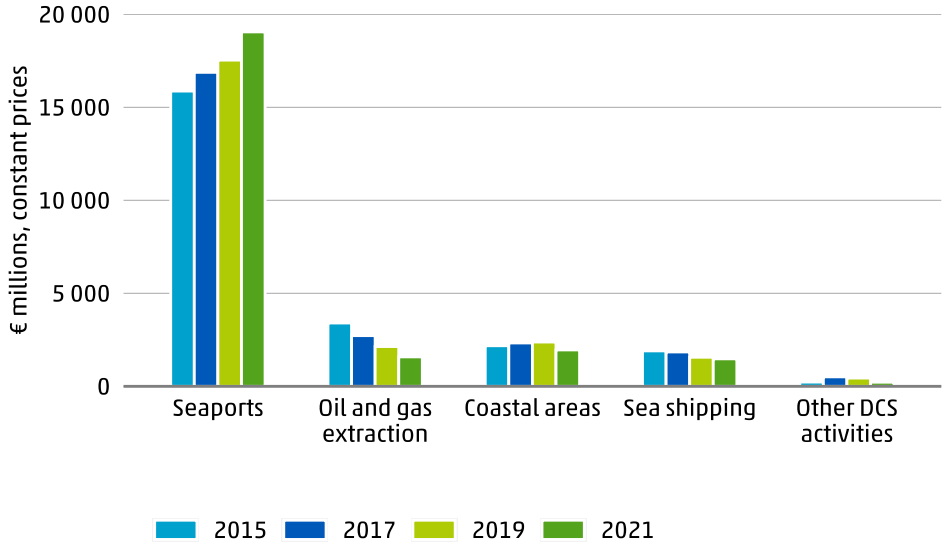
Executive Summary

This study is carried out by Statistics Netherlands in the context of the European Marine Strategy Framework Directive, which requires a social and economic analysis of the use of the marine environment. In this study an economic description of activities related to the Dutch Continental Shelf (DCS) is presented for the years 2015, 2017, 2019 and 2021. The following activities at sea are included: sea shipping, oil and gas extraction, fishing, sand extraction and off-shore wind energy production. Activities on land are also included. These relate to economic activities in seaports and in the coastal area of the North Sea. For the coastal area, fisheries, hotels and restaurants, retail trade and recreational, cultural and sporting activities have been selected. Double counting of fisheries as both an activity on land and at sea is corrected for when totals are analysed. In seaports, the focus is on the following sectors; manufacturing; transport storage and communication; wholesale; construction, and for specific seaports, the electricity and gas sector. In these sectors within seaports, proximity or accessibility to the North Sea is a critical factor. The activities on sea and the activities on land together constitute the Dutch North Sea economy. For all sectors on land and on sea, figures are presented and analysed for production (current prices), intermediate consumption (current prices), GVA (Gross Value Added, both in current and constant prices at the 2015 level), the number of employed persons (FTE), and the total compensation of employees.

Figure 0.1 shows a summary of the size of the economy of the Dutch North Sea in terms of the GVA of its constituent parts.

Figure 0.1 GVA (2015 prices) per sector in the North Sea Economy in 2015, 2017, 2019 and 2021



In general, the results in this study show several interesting trends/patterns, a few of which are summarised here.

– The Dutch North Sea economy is growing at a slower rate than the economy of the Netherlands as a whole. Between 2015 and 2021 the GVA (in constant prices) of the Netherlands grew by 11.9% whereas the economy of the North Sea grew by 3.0%. This is partly because some of the large and fast growing sectors, mainly “professional, scientific

and technical activities" and "administrative and support service activities" are not included in the North Sea Economy.

- The transition from fossil fuels to sustainable energy is having a substantial effect on the economic activities on the DCS. In terms of value added, the oil and gas sector declined by 53% between 2015 and 2021. There has also been a substantial increase in the production of electricity (in KwH) from offshore wind farms of more than 600%. This increase is however not well represented in GVA, partly due to the effects of, and changes to subsidies.
- Between 2015 and 2019, the port of Rotterdam had a greater GVA (2015 prices) than all the other seaports combined. In 2021, however, the GVA (2015 prices) of all the other seaports combined exceeded that of Rotterdam. This is predominantly due to growth in GVA (2015 prices) in the ports of Amsterdam, IJmuiden and Terneuzen.
- The seaports show economic growth (GVA in 2015 prices) for all years in this study. The performance of different sectors varies per seaport. For example, the "transport, storage and communication" in Rotterdam declined slightly between 2017 and 2019 whereas this industry grew in the port of Amsterdam. The manufacturing industry has generally performed best at the smaller seaports such as Terneuzen.
- The coastal area in 2021 was severely affected by the COVID-19 pandemic. "Hotels, restaurants and café" experienced a 33% decline in GVA (2015 prices) between 2019 and 2021 and "recreational, cultural and sporting activities" experienced a 49% decline. However, the "retail trade" sector grew by 7.6% over this period and the number of FTEs in the coastal area (all sectors) only declined marginally (-0.05%).

When interpreting these results, especially at the level of specific sectors in specific regions, it is important to consider the method used to create the results. The results are essentially a national account for the North Sea Economy of the Netherlands. To create this account, national accounts data (at the regional level) form the basis. Data from the National Accounts is generally quite aggregated in terms of its sectoral and spatial detail. Achieving the required level of detail for the North Sea account requires assumptions and sometimes the use of data from other sources. It is particularly important to understand the assumptions made, and the limitations which results from them, when interpreting the results. Future research could investigate ways to improve the quality of the results for the economic activities on the DCS, particularly marine aggregates, and fisheries and offshore wind energy.

1 Introduction

This study has been financed by the Dutch Ministry for Infrastructure and Water Management in the context of the Marine Strategy Framework Directive (Directive 2008/56/EC of the European Parliament and of the Council, 17 June 2008). Article 8 of the Directive stipulates that member states must undertake an economic analysis of the use of their marine waters. This report provides statistics on the economic use of marine waters for the Netherlands.

Specifically, this report considers economic activities on the Dutch Continental Shelf (DCS), which is the area of the North Sea where the Netherlands has exclusive rights. Further, this report also includes economic activities on land in the coastal area and in ports that are directly dependent upon the vicinity to the sea.

This study updates and extends the data and analyses in Statistics Netherlands (2020), Statistics Netherlands (2017) and Statistics Netherlands (2014). In the study of 2020, results were presented for 2010, 2015 and 2017. In the current study, results are presented for the years 2015, 2017, 2019 and 2021.

The current study updates the demarcation of the coastal areas and seaports. This is achieved by creating new maps based on the maps that Statistics Netherlands uses for the Natural Capital Account (NCA). In this way, the coherence with other accounts is improved. The NCA maps contain more detail in ecosystem types. This facilitates a more accurate delineation of the coastal area.

Both this study and the previous Statistics Netherlands studies build on the methodological basis of Brouwer et al. (2005) and Statistics Netherlands (2010). This methodology, known as NAMWARiB (National Accounting Matrix including River Basins) is adapted for analysis of the seaports and the coastal area. The method is also presented and described as the Marine Water Accounts approach in the European guidance document on economic and social analyses for the Marine Strategy Framework Directive (European Commission, 2010).

This report begins with a definition of the system boundaries in Chapter 2 and proceeds to present the methods in Chapter 3. The study employs two distinct methods: one for activities in the coastal area and one for activities at sea. Both are explained in this chapter. The first results are shown in Chapter 4 for the Dutch North Sea economy as a whole. Results are presented in terms of value added, production value, intermediate consumption, employment and compensation of employees. Value added is presented in constant prices (base year 2015) and in current prices. The report then proceeds to provide more detail by considering the constituent parts of the Dutch North Sea economy. Chapter 5 describes the activities on land. These are firstly, the activities in the coastal area, and secondly, the activities in seaports. The results are also disaggregated to specific sectors in order to provide more detail. The results for the activities at sea are shown in Chapter 6. In Chapter 7 the relation between this study and the NCA is discussed. Chapter 8 evaluates the results and provides recommendations for future research.

2 System boundaries and definitions

2.1 National accounts

The main data source used in this study are the Dutch national accounts. All economic results regarding activities on land are taken from the national accounts. For activities at sea, the national accounts data are complemented by data from various other sources. The system of national accounts provides a quantitative overview of the economic activities in a country as well as its economic relations with the rest of the world. At the core of the national accounts is a number of important economic indicators such as gross domestic product (GDP) and national income. The main benefit of using figures from the national accounts is that all variables are linked together in a consistent way. Consistent definitions which underlie the system facilitate comparability both between sectors and over time. International comparability is also guaranteed because all concepts and definitions are based on international guidelines provided by the United Nations, the European Union and other international organisations. The international standards are documented in the United Nations System of National Accounts (UN et al., 2008) and the European System of Accounts (Eurostat, 2010).

From the national accounts the following indicators are derived for the economic description of the Dutch North Sea and coast:

- *Number of employed persons.* All persons who are working for a business unit or private household residing in the Netherlands, including self-employed persons.
- *Compensation of employees.* The total remuneration paid by employers to their employees. Hence, compensation excludes the costs of employing self-employed persons.
- *Production.* The value of all goods produced for sale, including unsold goods, and all receipts for services rendered.
- *Intermediate consumption.* The value of all goods and services used in the production process. This includes for example fuel, raw materials, semi-manufactured goods, communication services, cleansing services and audits by accountants.
- *Gross Value Added (GVA).* The difference between production and intermediate consumption in current prices (nominal terms value added). In the text often referred to as GVA.
- *Gross Value Added (GVA) 2015 prices.* Value added adjusted for inflation, with 2015 as the base year. In the text often referred to as GVA in constant prices (real terms value added).

2.2 Geographical boundaries

This study considers activities on land that relate to the Dutch North Sea and activities that occur on the Dutch North Sea itself. The measurement of activities of Dutch companies on the North Sea in this study is limited to the Dutch part of the Continental Shelf. The DCS is the part of the North Sea, adjoining the Dutch coast, where the Netherlands claims exclusive rights to mineral resources. This Dutch part of the continental shelf in the North Sea is also regarded as part of the economic territory. Figure 2.1 shows a map of the DCS. While the Wadden Sea (Waddenzee) is in fact part of the DCS, it is not part of the North Sea and therefore excluded

from this analysis. In terms of policy, the Wadden Sea falls under the remit of the European Water Framework Directive, not the European Marine Strategy Framework Directive.

Figure 2.1 The Dutch Continental Shelf as defined in this study (excluding the Wadden Sea)

In addition to the activities at sea, this study also considers activities on land. Activities on land are divided into activities in the coastal area and in seaports. The geographical boundaries of the coastal area and seaports in this study are different to those used in in previous studies. In the present study the boundaries have been revised to be consistent with the maps produced for the NCA.

In the previous studies, the boundaries of the seaports were based predominantly on information provided by the relevant Port Authorities. A seaport were thus defined as the area under the jurisdiction of the Port Authority. The NCA maps employ a definition of seaports which is very similar to that which was used in previous studies. The only substantial difference relates to residential areas next to seaports. In previous studies residential areas next to seaports were included if certain businesses connected to the seaport were registered in this residential area. This approach is advantageous because it allocates as much economic activity to the seaports as possible. The disadvantage is that this approach requires yearly checking of the location of specific businesses to ensure consistency in the time series. It has therefore been decided to no longer include residential areas next to seaports. This means that consistency in the time series is guaranteed at the cost of slightly less economic activity being allocated to seaports.

Also, the definition of the coastal area in this study has changed compared to the previous studies. The reason for this is twofold. The first reason is that a more detailed categorization of ecosystem types is available in the NCA maps. Four different ecosystem types are categorized as coastal ecosystems: beach, coastal dunes, salt marsh and dune forest. The area (square kilometers) of these four ecosystem types summed together is greater than the area than that used in previous studies. This is predominantly due to the inclusion of dune forest. Including dune forest extends that the coastal area extends further inland. The second reason comes from an evaluation of the “one km rule” which was applied in the previous studies. Under this rule, the coastal area is defined as a one kilometer (km) wide strip of land behind the beach. This approach however excludes economic activities that may take place on the

beach or in the dunes. Therefore, in the present study, the coastal area is defined as the four coastal ecosystem types plus a one km wide strip in land. While we would expect few businesses to be registered on the beach, in the dunes or in the dune forest, the area is clearly related to the Dutch North Sea and as such should be included. As in previous studies the Wadden Islands (Waddeneilanden) are included in their entirety.

In general, the changes to the method and the use of the NCA maps mean that more economic activity is included under the coastal area and less is included in the seaports. The results are thus no longer consistent with those in previous versions of this study, but consistency with the NCA is improved. This consistency is particularly important as ocean accounting[1)] becomes a more prominent approach to monitoring marine ecosystems and economies.

As in previous versions of this study, the decision to only extend the coastal area to one km behind the four coastal ecosystem types represents a trade-off between a desire to fully represent the Dutch North Sea economy while at the same time, not taking into account economic activities that are not considered to be part of the Dutch North Sea economy. An important example of this trade-off are the economic activities in the city of The Hague and the seaside resort of Scheveningen, which is part of the same agglomeration. Hotels in Scheveningen can easily be considered as part of the North Sea economy. However, hotels further in land receive guests who visit The Hague for a wide variety of purposes unrelated to the proximity of The Hague to the North Sea. The choice of a one km wide strip in this case, aims to ensure that as much of the relevant economic activities are included as possible, without also including irrelevant activities.

The beach and sand dunes were located using a land use map; all dry natural terrain bordering the North Sea has been defined as beach and sand dunes. Appendix 2 shows a map of the location of the coastal area including the one km wide strip.

2.3 Sectors

This study considers specific sectors for the activities on land. Sectors with a strong and clear link to the North Sea are chosen in order to produce a fair estimate of the coastal economy. The selected sectors differ for the coastal area and seaports.

The selected sectors are the same as in previous versions of this study, except for the inclusion of energy companies in seaports. A previous version of this study recommended to attempt to include the coal fired power station at Eemshaven seaport, which falls under the “other seaports” in this study, along with several other small seaports. This power station uses coal imported via sea and therefore has a strong link to the North Sea. As part of this study, it was however found that the situation is more complex. Besides the coal fired power station, there are also two gas fired power stations at Eemshaven seaport. In addition a biomass fired power station and a gas fired power station can be found at Moerdijk seaport which is also included in the “other seaports” category. All these power stations use seawater for cooling and therefore have a strong link to the North Sea.

The situation is however complicated by the categorization of businesses in the data. Power stations cannot be separated in the data from gas supply companies and electricity

1) https://www.oceanaccounts.org/

transmission companies. These businesses have no clear link to the North Sea. However, as far as the “other seaports” are concerned the majority of economic activity takes place at the gas, biomass and coal fired power stations, with a small amount of activity relating to transmission and generation of electricity in wind parks. It has therefore been decided to include all the economic activity from energy companies based in “other seaports”. Energy companies based in the larger seaports are not included because of the prevalence of gas companies and electricity transmission businesses at these locations.

The sectors which are considered in the coastal area are:
- Fisheries
- Hotels and restaurants
- Retail trade
- Recreational, cultural and sporting activities

The sectors which are considered at seaports are:
- Manufacturing
- Wholesale Trade
- Construction (excl. the construction of buildings) [2)]
- Transport, storage and communication
- Energy companies only at “other seaports“

2.4 Residents

An important concept in the national accounts is the resident principle. An institutional unit is said to be resident within the economic territory of a country if it maintains a centre of predominant economic interest in that territory. GDP is an aggregate measure of production by all resident units. However, some of this production may occur abroad and as a result production in the national accounts differs from the sum of all production that takes place within the geographic boundaries of the national economy. All figures in this report represent only activities of resident companies and employees. For example: fishing vessels registered outside the Netherlands active on the DCS, are not included in the estimates of the Dutch production of fisheries in this study, nor are Dutch fisheries active outside the DCS.

[2)] Construction is included because this includes installations for ships and for on- and offshore facilities. Since these businesses are located in the area of interest, construction companies are included even though the port location may be a less critical factor than for some manufacturing or transport companies.

3 Method

3.1 Activities on land

The method used for estimating economic key figures for the areas of interest is based on the NAMWARiB [3)] method used by Statistics Netherlands to calculate the economic figures for different sub-river basins (Brouwer et al., 2005). NAMWARiB provides information about the interactions between the physical water system and the economy at a national and sub-river basin scale. The regional economic accounts are the most geographically detailed national accounting data available at Statistics Netherlands. These accounts present the national accounts at the level of the NUTS-3 region, which are used as the basis for this study. There are 40 NUTS-3 regions in the Netherlands of which 13 are coastal. The regional accounts are definitive for the years 2015, 2017 and 2019. The 2021 data are provisional and therefore subject to change.

In order to produce results for seaports and the coastal strip it is however necessary to use a 'division key' in addition to the regional figures. The division keys are used to calculate which part of the regional economy can be allocated to the coastal area or the seaports. They are deduced from the data of the business register. The business register contains, in general terms, all the businesses in the Netherlands. Of the many variables in the business register, two are particularly useful in this study. These are the postal code of the business [4)] and the number of employees. The method is to select the businesses within seaports or the coastal area by their postal code. It is then possible to calculate the number of employed persons for both the coastal area and seaports and also for the NUTS-3 region as a whole. The division key for the coastal area (or seaport) for a given economic sector is equal to the number of employed persons in the coastal area (or seaport) in that sector divided by the number of employed persons in that sector in the whole region. This division key can then be applied to the regional economic accounts to obtain economic indicators relevant for the coastal area and seaports. Hence, an economic indicator for a seaport is the indicator for the region in which the seaport is located, multiplied by the division key.

In order to apply the above method, it is first necessary to know which postal codes correspond to the different areas. The postal codes are determined from the mapping of coastal areas and the seaports in purely spatial terms (basically, drawing a line on a map) as explained in chapter 2. The map of these boundaries was then overlaid onto a map of postal code areas. All postal code areas that lie fully in the areas of interest (seaports and the coastal strip) are used in the analysis in their entirety. Many postal codes however fall only partially inside the areas of interest. There are two possible ways of dealing with these occurences;
- **Scenario A.** Calculate the share of the postal code which falls into the area of interest and use this share to adjust the number of employed persons. Use the adjusted number of employed persons for the division key.
- **Scenario B.** If a postal code partially falls within the area of interest then use the total number of employed persons within the postal code for the division key.

3) http://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/nationaal/economische-aspecten/namwa/
4) Specifically the postal code of the "Local business unit". This is the most disaggregated unit in the business register. One business may have multiple offices for example. Each office is a local business unit.

To fully understand the distinction between scenario A and scenario B, let us consider an example. In region Y there are four postal codes of which only two are (partly) located in the coastal area. For postal code A, 90% of the surface area of this postal code is located in the coastal area. For postal code B, 10% of the surface area is located in the coastal area. The company register provides that in postal code A, 200 persons are employed in sector X. In postal code B, 500 persons are employed in sector X. There are therefore 230 employed persons allocated to this part of the total coastal area (90% x 200 + 10% x 500= 230). The company register also shows that in the total region Y, 1500 persons are employed in sector X. This means that 15.3% (230/1500) of the economic key figures of this region (production, added value, employees, compensation of employees) are allocated to the coastal area in scenario A. For scenario B this figure is larger because complete postal codes are included. The result for scenario B is thus 700 employees (200+500). This means that 46.6% (700/1500) of the economic key figures of region Y (production, added value, employees, compensation of employees) are allocated to the coastal area in scenario B.

The choice for scenario A or B is made on a case-by-case basis. In principal, scenario A is considered to be methodologically superior, however, the desire to account for as many relevant economic activities as possible, requires that the choice is predominantly determined by the geography of economic activities surrounding the specific area of interest. For example, if a seaport is entirely surrounded by a natural area, then scenario B is preferred because there are no economic activities adjacent to the port which can be incorrectly counted in the port by using the entire postal code. Continuing the port example, if a port is surrounded by an office park, it is prudent to employ scenario A to minimise the effect of the business which occupy a postal code that partially falls into the port area. The case-by-case decisions for scenario A and B are explained in Appendix 4 and the figures on production for both scenarios are provided per area of interest in Appendices 5, 7, 8 and 9.

The exception to the use of scenario A or scenario B is the method for the port of Rotterdam and the port of IJmuiden. Appendix 8 shows the production level per sector and per scenario in the port of Rotterdam. Analysis of the data shows that, although production is located in the defined area of the port, the employees are in some cases registered at office locations in the centre of Rotterdam. Since production is allocated based upon postal codes of the companies where employment is registered, production is also virtually shifted to the centre of Rotterdam. This statistical problem exists for all ports and the coastal area, but is most prominent in the Port of Rotterdam. The activities of a few large companies are very influential on the port as a whole. Missing a just few of these companies, because the registered location differs from the production site, results in a substantial error. To correct for this statistical problem, the total economic figure for the whole NUTS-3 region (Rijnmond) is included for selected sectors, namely:
- Manufacture of petroleum products; cokes, and nuclear fuel
- Manufacture of basic chemicals and man-made fibres
- Transport on water
- Supporting transport activities

3.2 Activities at sea

The method for producing figures for the activities at sea varies depending on the specific activity in question. Where possible, data available at Statistics Netherlands are used. These data are complemented by external data where needed. The approach generally relies on

obtaining suitable division keys to disaggregate the economic statistics. The specific method per activity at sea is described in this section.

3.2.1 Oil and gas extraction

The economic variables for the offshore oil and gas sector are determined primarily by the regional module of the national accounts, with some exceptions. Data on the compensation and the number of employees come from the national accounts, rather than the regional module. In order to split the total number FTEs (full-time equivalents) allocated to the North Sea area and the rest of the country, data on offshore versus onshore exposure hours (see in Appendix 1) has been provided by the State Supervision of Mines[5)]. The exposure hours data refer to the exposure hours of employees at a broader range of sectors than would be ideal. Preferably, the data would refer only to employees of (or contractors working for) the oil and gas extraction sector. However, the data includes "supporting services for crude petroleum and natural gas production" as well as other sectors that supply goods and services to the oil and gas sector such as caterers and installation suppliers.

3.2.2 Fisheries

Macro-economic figures for the entire fishing sector are obtained from the Dutch National Accounts. The fishing sector in the Netherlands consists of cutter fisheries, large-scale high sea fisheries, mussel farming and aquaculture. Mussel farming and aquaculture do not take place on the DSC. Unfortunately Statistics Netherlands does not have sufficient data to isolate aquaculture from fishing and mussel farming. The inclusion of aquaculture in these figures means that they are a slight overestimate for fishing in the Dutch North Sea economy.

A substantial share of Dutch fishing activity takes place outside of the DCS. Therefore division keys are required to allocate a share of Dutch fisheries to the DCS. These have been calculated by Wageningen Economic Research (WEcR) using Vessel Monitoring System (VMS) data. VMS data are collected via satellite monitoring of fishing vessels which shows when and where fishing has occurred. The share of the value of the catch from the DCS to the value of the catch on all waters is used to allocate a share of the fishing sector to the DCS. Not all vessels send data to the VMS, but these vessels only land about 1% or 2% of the value of the catch. Accordingly, their exclusion has a negligible effect on the results. Data from the WEcR was obtained during the previous project (Statistics Netherlands, 2020) and has not been updated to recent years because the division keys showed little variation over the years studied. Division keys for 2019 and 2021 are held constant to the most recent year for which data is available, 2017.

This section has presented the method for fisheries on the DCS. Section 3.1 has presented the method for delineating fisheries in the coastal area. There are therefore two separate methods in this study used for the same sector. Firstly, note that the values for the total North Sea economy are corrected for double counting such that the fisheries sector is never counted twice. Secondly, note that the two methods differ and as such the results differ also. The method for the activities on land includes only fisheries businesses which are registered in the coastal area. No adjustment is made for the extent to which these businesses engage in fishing outside of the DCS. However, by excluding businesses inland of the coastal area, it can be expected that aquaculture businesses are excluded, which is desirable given the focus on

5) As this study makes use of State Supervision of Mines data in order to calculate data on employment, data on employment in this study is not fully consistent with data in the regional accounts.

the North Sea. The method for activities at sea includes all fisheries businesses and takes no account of where the fisheries businesses are registered. However, in this case a correction is made (with VMS data) for the extent to which fishing takes place on the DCS.

3.2.3 Sea shipping

The National Accounts provide macro-economic figures for the Dutch sea shipping sector. Macro-economic data for the sector represent all international and national activities of Dutch sea shipping businesses (residents). The total national figure is used for the valuation of the DCS, because the international accessibility matters, and not so much the DCS itself.

While figures on the number of employees are available for the sector of interest, the number of self-employed is only available at a higher aggregation level (namely, sector "Transportation by water"). The ratio between the self-employed and employees at this level was used to estimate the total number or employed persons for the sea shipping sector.

3.2.4 Marine aggregates

Marine aggregates are part of the "other mining and quarrying" sector. In the previous report, we used data from the UEPG (European Aggregates Association) to estimate the share of marine aggregates in the total of the "other mining and quarrying" sector. The UEPG data were based on early estimates delivered by the Dutch industry association, Cascade. Since 2021, Statistics Netherlands collects the physical extraction of surface minerals, such as sand and gravel, from the Dutch provinces and the Central Government Real Estate Agency (Dutch: RVB) directly. The provinces issue permits to extraction companies, including maximum allowed quantities. These extraction companies report their extraction amounts to the provinces, which in return submit this information to Statistics Netherlands through annual questionnaires.

The production value of sand comes from the national accounts. Data on the intermediate consumption are only available for "other mining and quarrying" as a whole. Sand covers about 33% of the entire output value for this sector. We assume that the same share can be applied to the intermediate costs. This gives estimates for the economic variables of sand extraction in the Netherlands. To determine the share of sand extraction that accrues from the DCS, we assume that the economic structure for marine sand extraction is equal to the economic cost structure of the total sand extraction sector. From the physical extraction data we know the share of the sand extraction that takes place in the North Sea area. This share is used to determine the part of the sand extraction industry that takes place in the DSC

3.2.5 Offshore wind energy

Estimates of the economic indicators on offshore wind energy are based on the amount of energy produced by wind turbines on the DCS. The necessary figures are calculated by combining the physical energy production and capacity with price information on energy, figures on product-based SDE+ subsidies[6)] and information on maintenance and operational costs. The wind energy sector is interesting due to the degree to which it receives government subsidy. The production values presented here include subsidies[7)]. For the calculation of compensation of employees in the offshore wind energy sector, compensation

6) Stimulation of Sustainable Energy Production (SDE+) subsidy.
7) More information on subsidies can be found here: www.rvo.nl/subsidies-regelingen/sde/windenergie-op-zee.

of employees per FTE in the “electricity, gas, steam and air conditioning supply” sector has been used as a proxy.

Intermediate consumption is defined as the sum of the maintenance costs, balancing costs[8)] and the costs of network services. The maintenance costs and other material costs are directly derived using information from the yearly Netherlands Environmental Assessment Agency studies such as Lensink and Schoots (2022). However, in recent years these studies did not include offshore wind energy, because these wind parks are tendered without subsidies. For now, we have assumed the costs per kWh to be constant. The resulting figures refer purely to the production of wind energy and in no way to the production and installation of the turbines and related infrastructure. [9)]

8) Balancing costs are incurred when generators cannot meet their obligations to provide electricity. This can be the case when there is no wind.
9) For more information, see the Statistics Netherlands (2016)

4 Summary results for the Dutch North Sea Economy

The summary results are presented in table 4.1, which gives a picture of the role of the Dutch North Sea Economy in the economy of the Netherlands as a whole.

Table 4.1 Contribution of the North Sea economy to the total economy

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Sector	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	North Sea economy	9,763	173	81,866	58,265	23,601	23,601
	Total economy	330,267	7,015	1,338,856	718,021	620,835	620,835
	Share of total (%)	3	2.5	6.1	8.1	3.8	3.8
2017	North Sea economy	10,074	179	83,977	60,167	23,810	24,301
	Total economy	352,818	7,340	1,431,012	769,446	661,566	651,596
	Share of total (%)	2.9	2.4	5.9	7.8	3.6	3.7
2019	North Sea economy	11,086	188	91,265	66,654	24,611	24,073
	Total economy	388,869	7,751	1,569,815	844,855	724,960	680,167
	Share of total (%)	2.9	2.4	5.8	7.9	3.4	3.5
2021	North Sea economy	11,454	187	99,533	71,735	27,797	24,302
	Total economy	419,764	7,951	1,653,634	891,070	762,564	686,256
	Share of total (%)	2.7	2.3	6	8.1	3.6	3.5

The results show that the size of the Dutch North Sea economy expressed in GVA at 2015 prices accounted for 3.5% of the Dutch economy in 2021, while in 2015 it was 3.8%. This means that the relative importance declined. The Dutch economy as a whole grew by 10.9% between 2015 and 2021, whereas the North Sea economy showed a much smaller growth, of only 3.0% over the same period.

Notable are the trends between 2019 and 2021 due to the effects of inflation. Nationally, nominal GVA increased by 5.2% but the growth in GVA in 2015 prices was only 0.9%. For the North Sea economy, nominal GVA increased by 13.7% but the growth in GVA in 2015 prices was only 1%. Thus, nominal GVA growth was higher for the North Sea economy than for the national economy. However, GVA growth in constant prices in the North Sea economy was very similar to that in the economy as a whole.

The Dutch North Sea economy consists of activities on land (seaports and coastal area) and activities at sea. Table 4.2 shows that activities on land constitute a large share of the Dutch North Sea economy. This is particularly the case for employed persons, compensation and intermediate consumption, but less so for GVA and production (2021). Over time, the share of the activities on land in the total North Sea Economy has increased. This is predominantly due to the consistent decline in the GVA (2015 prices) of the activities at sea, which (as will be shown later) is predominantly due to the decline in oil and gas extraction on the DCS.

Table 4.2 Summary of the economic key figures for activities at sea and on land (selected sectors)

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Sector	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Activities at sea	1,103	15	12,071	6,529	5,542	5,542
	Activities on land	8,661	158	69,796	51,736	18,059	18,060
	Total	9,763	173	81,866	58,265	23,601	23,601
2017	Activities at sea	921	13	10,023	5,783	4,241	5,086
	Activities on land	9,153	166	73,954	54,384	19,570	19,215
	Total	10,074	179	83,977	60,167	23,810	24,301
2019	Activities at sea	938	13	9,784	6,078	3,706	4,150
	Activities on land	10,148	175	81,480	60,575	20,905	19,923
	Total	11,086	188	91,265	66,654	24,611	24,073
2021	Activities at sea	945	13	11,531	6,953	4,578	3,286
	Activities on land	10,509	174	88,001	64,782	23,219	21,016
	Total	11,454	187	99,533	71,735	27,797	24,302

The Dutch North Sea economy can be further split into its constituent parts in order to reveal the contributions of the different activities on land and at sea (see figure 4.1). Seaports not only account for the majority the total GVA of all activities on land, but also for the majority of the Dutch North Sea economy (75.3%). Activities in the coastal area account for only 8.2% GVA (2015 prices) of the Dutch North Sea economy. As is discussed in section 3.1, this figure very much depends on the delineation of the coastal area. If for example the coastal NUTS-3 regions were used to delineate the coastal area, the size of the economy of the coastal zone would increase substantially. This is also demonstrated in Appendix 11. Activities at sea (DCS) account for 16.5% of the North Sea economy and consists of five different activities (as shown in see the right-hand diagram of Figure 4.1). Oil and gas extraction and sea shipping contribute the most to the GVA of the activities at sea; 7.0% and 8.6% respectively.

An analysis of the employment results show that the Dutch North Sea economy contributed for 2.3% to the total Dutch employment in 2021 (see table 4.1). Figure 4.2 shows that this employment is dominated by the seaports: roughly two thirds of the North Sea employment. The coastal areas follow with roughly a quarter of the Dutch North Sea employment. Within the activities on the DCS, sea shipping provides the most employment. Oil and gas extraction provides relatively little employment compared to their GVA.

A comparison between figures 4.1 and 4.2 shows that sectors with higher contributions to the GVA of the Dutch North Sea economy are not necessarily the sectors that contribute the most in terms of employment.

Figure 4.1 Share in total GVA (2015 prices) of different activities on or related to the DCS (2021)

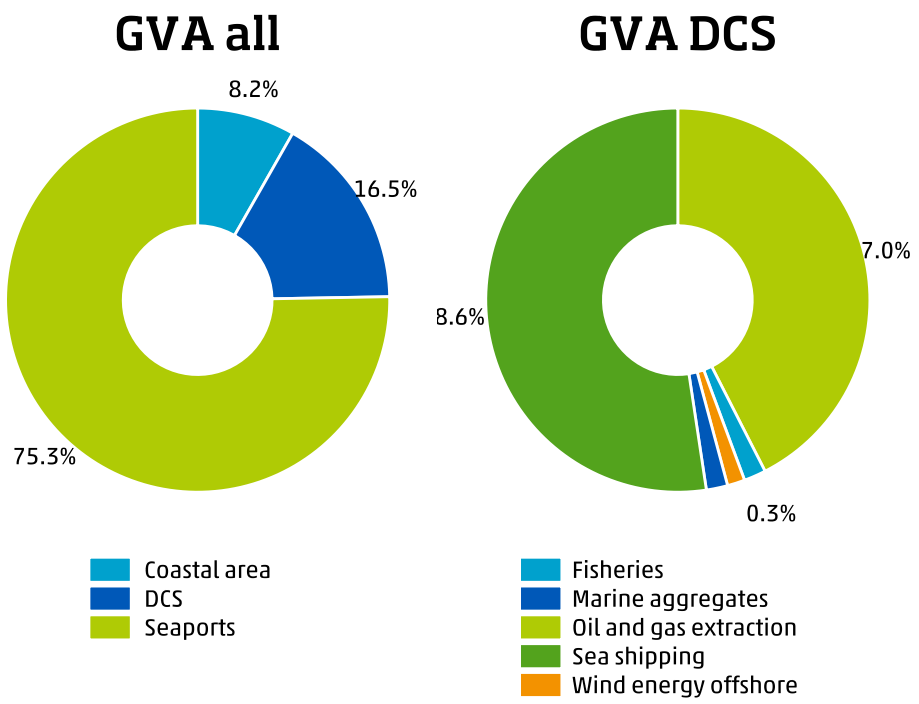


Figure 4.2 Share in total employment of different activities on or related to the DCS (2021)

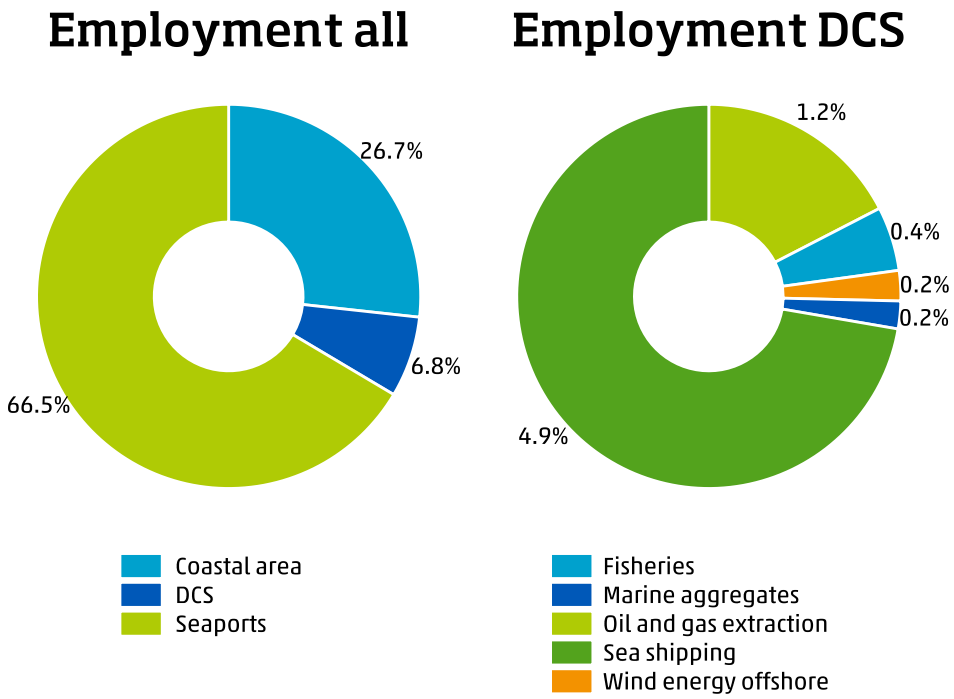
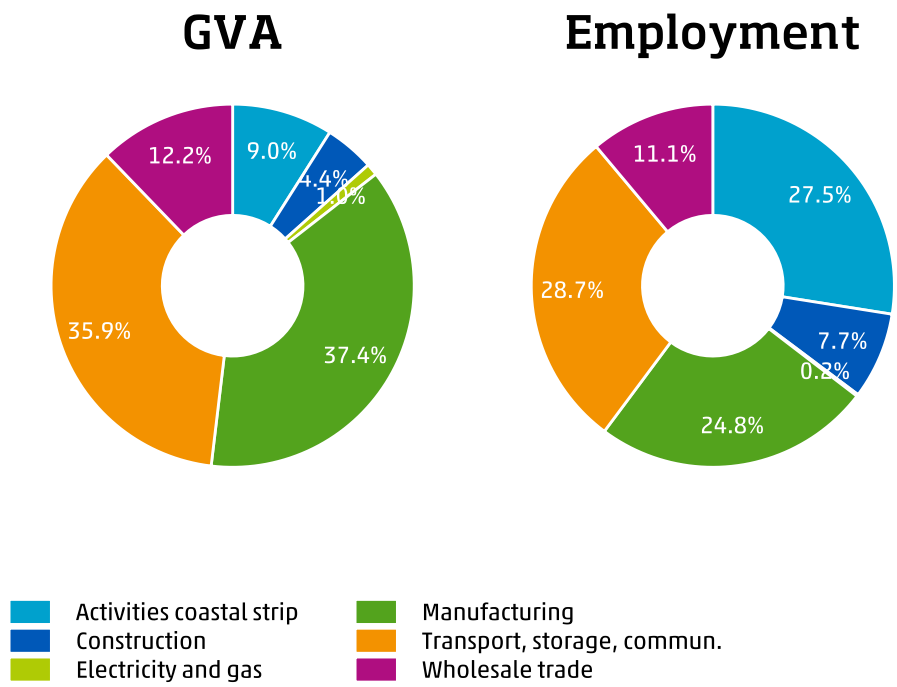


Figure 4.3 compares the contributions of the sectors to GVA and employment in the coastal area and in seaports. Hotels and restaurants and retail trade provide relatively more jobs than GVA. This is due to the labour intensive nature of these sectors. At the opposite end of the spectrum are the capital intensive "transport, storage and communications" and "manufacturing" sectors, which provide relatively few jobs proportional to their GVA.

Figure 4.3 Share in total employment and GVA (2015 prices) of relevant sectors on land (2021)



5 Activities on land

This chapter shows the results for the activities on land for the North Sea economy. In the first section, the key results of the coastal area, the port of Rotterdam and the remaining seaports will be described. In the second section, the coastal area is discussed in more detail. The third section describes the results for the activities in the seaports. The final section summarizes the most important results and draws some conclusions. Additional information is provided in appendix 11, in which the all economic activities in the entire NUTS-3 regions along the coast are summarized.

As mentioned in section 2.2, the method for deriving the coastal area and the seaports has been altered compared to previous reports. Therefore, results cannot be compared to the earlier studies.

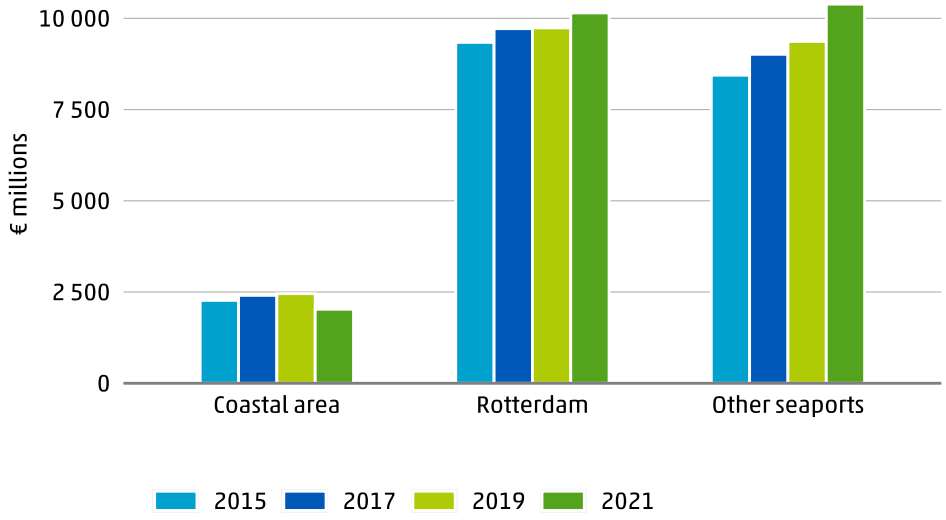
5.1 Key results

This section presents the key results regarding the activities on land. The GVA in 2015 prices of all activities on land grew by 5% in the period 2019-2021. Total growth of all activities over the extended period 2015-2021 was 13%. For both periods, the majority of this growth was due to the growth in GVA in seaports other than Rotterdam.

The GVA growth (2015 prices) of the port of Rotterdam was 4% during the period 2019-2021, while the growth in GVA accelerated in the other seaports (11% from 2019 to 2021). The GVA of the coastal area is small compared to the port areas. GVA growth (2015 prices) steadily declined over the years 2015 to 2019, and then shrank more rapidly (-17%) from 2019 to 2021 due to the effects of the COVID-19 pandemic.

Despite the comparatively larger growth in GVA in constant prices of the other seaports, Rotterdam is still economically dominant. In 2021, the GVA of the selected sectors in the port of Rotterdam is almost equal to that of all the other seaports combined (Figure 5.1). While the port of Rotterdam is still growing in GVA, other seaports were growing at a faster pace. This led to a slight increase in the share of other seaports in the total GVA.

Figure 5.1 GVA (2015 prices) over time for the activities on land



The biggest contributor to the 11% increase in GVA in 2015 prices (2019-2021) of the other seaports was the port of Amsterdam, followed by the port of Terneuzen. Both the port of Amsterdam and Terneuzen saw a substantial increase in manufacturing activities. For the port of Terneuzen manufacturing accounted for nearly all growth in GVA. For the port of Amsterdam, this was roughly equally divided between “transport, storage and communication” and “manufacturing” activities. Other contributors to the GVA growth of other seaports were the port of IJmuiden and, to a lesser extent, Vlissingen. The GVA in constant prices of the port of Drechtsteden remained almost the same in 2019 and 2021.

The port of Rotterdam experienced GVA growth from 2019 to 2021, but at a slower pace than other seaports. Because Rotterdam is a bigger port, the absolute contribution to the total GVA growth was still greater than most of the other seaports. This GVA growth was almost completely attributable to “transport, storage and communication” activities.

While we do not see much direct evidence of the effect of the COVID-19 pandemic in the GVA of ports, the effect of COVID-19 is visible in the results for the coastal area. The effects of the pandemic were greatest in the “hotels and restaurants” sector, but were also substantial for the “recreational, cultural and sport” sector.

Table 5.1 shows the results for the coastal area, the seaport of Rotterdam and the other seaports in more detail. As was mentioned before, the following sectors are included in the coastal area: “fisheries”, “hotels and restaurants”, “retail trade” and “recreational, cultural and sporting activities”. The seaports have a different focus: “manufacturing”, “transport storage and communication”, “wholesale” and “construction”.

In terms of employment, the coastal area and other seaports show a distinct increase in the number of employed persons between 2015 and 2021 (13.3% and 9.9% respectively), while the increase in Rotterdam is smaller (5.5%). However, developments in later years (2019-2021) display a different picture, with no substantial changes in the number of employed persons over this period.

Table 5.1 Indicators for activities on land *

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Coastal area	1,195	45	4,253	1,981	2,272	2,272
	Rotterdam	3,859	53	45,817	36,476	9,342	9,342
	Other seaports	4,169	70	26,480	18,038	8,442	8,442
	Total	9,222	169	76,550	56,494	20,056	20,056
2017	Coastal area	1,326	49	4,779	2,191	2,588	2,409
	Rotterdam	4,037	55	45,908	35,982	9,926	9,717
	Other seaports	4,352	71	29,477	20,639	8,837	9,014
	Total	9,715	176	80,164	58,812	21,351	21,140
2019	Coastal area	1,457	51	5,080	2,337	2,743	2,456
	Rotterdam	4,365	58	50,737	40,410	10,328	9,738
	Other seaports	4,893	76	32,108	22,640	9,468	9,367
	Total	10,715	184	87,925	65,387	22,538	21,560
2021	Coastal area	1,492	51	4,553	2,176	2,377	2,029
	Rotterdam	4,448	56	54,448	42,647	11,801	10,148
	Other seaports	5,179	77	36,494	24,969	11,524	10,390
	Total	11,119	184	95,495	69,793	25,702	22,567

* The selected sectors differ between the coastal area and the seaports. The coastal area includes the sectors: ”fisheries”, ”hotels and restaurants”, ”retail trade and recreational, cultural and sporting activities” . In seaports includes the sectors: ”manufacturing”, ”transport, storage and communication”, ”wholesale” and ”construction”.

As is shown in table 5.1, compensation of employees increases in all three regions over the period 2015-2021. Between 2019 en 2021, increases were marginal for the coastal area and Rotterdam (both 2%), and a little higher for the other seaports (6%).

5.2 North Sea coastal area

This section describes in more detail the activities in the North Sea coastal area. As mentioned before, the coastal area appears to have been affected by the COVID-19 pandemic. From 2015 up to 2019, the coastal area was experiencing GVA growth. The magnitude of decline in GVA from 2019 to 2021 (-17%) led to an overall decrease in GVA (2015 prices) during the period 2015-2021. The sectors “hotels and restaurants” and “recreational, cultural and sporting activities” were struck by the COVID-19 pandemic, consequently GVA (2015 prices) declined by 33% and 50% respectively over the period 2019 to 2021. Retail trade and fishing, on the other hand, increased by 8 and 5% respectively over this period.

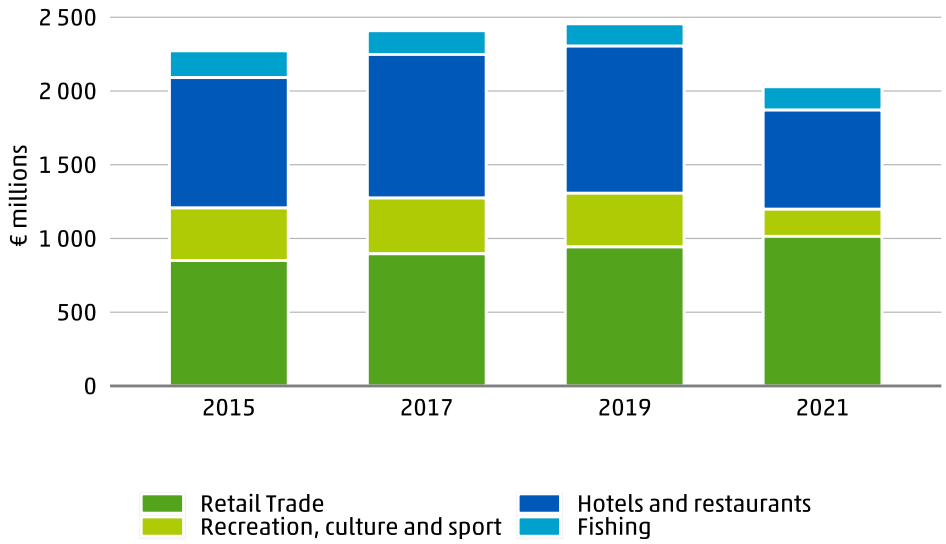
Over the longer period 2015 to 2021 the growth of the GVA of fishing activities was negative (-13%), largely attributable to the period 2015 to 2019 and the strong performance of the fisheries sector in 2015. The effect in the total GVA was limited because the share of the fishing sector in the coastal area in the total of all sectors included the coastal area is between 6% and 8%.

The Dutch fishery industry has experienced some problems in recent years. Rights to catch fish rose slightly between 2015 and 2017, then declined sharply between 2017 and 2019 and

remained relatively stable between 2019 and 2021[10]. Furthermore, Brexit led to a new division of fishing rights. The European Union had to transfer fishing rights to the United Kingdom for several of the fish quotes up to 2026. As a consequence, less fishing was allowed for Dutch fishermen. Due to the high total allowable catch (TACS) for 2021 however, the impact of Brexit was less noticeable in 2021. Nonetheless, 2021 is considered to be particularly poor year for fishing on the DCS (Wienhoven et al., 2023). Also the Netherlands no longer has catch rights for Common Dab and Flounder as of 2018. Moreover, the ban (from July 2021) on pulse-fishery particularly affected Dutch fishery[11]. The data of this study show that the GVA (2015 prices) for fishing activities in the coastal area grew by 5% in the period 2019 to 2021. In the years 2015 to 2019, however there was a decrease GVA in constant prices. This led to a decrease in GVA over the extended period 2015 to 2021. These results are further discussed and evaluated in the final chapter.

Retail activities performed well in all periods. The sector was the second largest sector in the coastal area up to 2019 and became the largest sector in 2021. This was partly due to the decline in the "hotels and restaurants" sector, but also because retail itself grew between 2019 and 2021 despite the COVID-19 pandemic.

Figure 5.2 GVA (2015 prices) in the coastal area for the relevant sectors



The overall value added of the total Dutch tourism sector declined by over 50% in 2020, with only a slight recovery of 11% in 2021 (Statistics Netherlands, 2022). In this study, the years 2020 and 2021 are not distinguished. However, COVID-19 measures, such as temporary lockdowns and limits on the number of visitors had an impact on the hotels, and restaurants and recreational activities in the coastal area. Moreover, overnight stays in the coastal areas declined 33% 2020, which was only partly offset in 2021[12].

One aspect of table 5.2 which stands out is the number of FTEs. The number FTEs stayed relatively constant between 2019 and 2021 despite a reduction in production over this period.

10) https://www.agrimatie.nl/PublicatiePage.aspx?subpubID=2526&sectorID=2860&themaID=2859&indicatorID%20=%202880
11) https://www.agrimatie.nl/PublicatiePage.aspx?subpubID=2526&themaID=2286&indicatorID=2880&sectorID=2862
12) https://opendata.cbs.nl/#/CBS/en/dataset/82061ENG/table?dl=7AA63

This is related to the possibility for companies to apply for financial support from the government when they were affected by COVID-19 measures. This allowed employers to retain their labor force. There was a small decline in the number of FTEs in the "hotels and restaurants" sector but this was compensated for by roughly equally sized increase in the number of FTEs in retail trade.

Table 5.2 Indicators of the relevant sectors in the North Sea coastal area

Employment figures x 1000 FTE, monetary values x €1,000,000

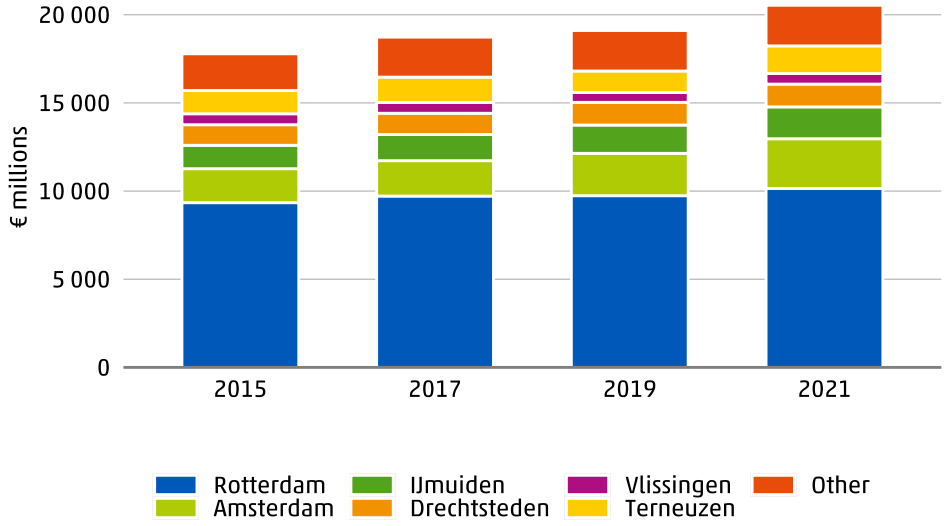
Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Fishing	47	1	312	130	182	182
	Hotels and restaurants	471	20	1,816	931	884	884
	Recreation, culture and sport	184	6	732	376	356	356
	Retail Trade	493	18	1,393	543	850	850
	Total	1,195	45	4,253	1,981	2,272	2,272
2017	Fishing	47	1	316	117	199	161
	Hotels and restaurants	550	23	2,153	1,095	1,058	974
	Recreation, culture and sport	202	7	785	400	385	378
	Retail Trade	528	19	1,524	578	946	896
	Total	1,326	49	4,779	2,191	2,588	2,409
2019	Fishing	50	1	281	112	169	151
	Hotels and restaurants	620	24	2,356	1,199	1,156	998
	Recreation, culture and sport	212	7	775	395	380	364
	Retail Trade	574	19	1,667	630	1,037	942
	Total	1,457	51	5,080	2,337	2,743	2,456
2021	Fishing	62	1	314	126	189	158
	Hotels and restaurants	584	22	1,897	1,040	857	672
	Recreation, culture and sport	215	7	490	280	209	184
	Retail Trade	632	21	1,852	730	1,121	1,014
	Total	1,492	51	4,553	2,176	2,377	2,029

5.3 Seaports

Chapter 5.1 already showed that seaports contribute the most to the Dutch North Sea economy and Rotterdam has the greatest impact overall. This section will provide a more detailed analysis of all the seaports. First, the results of GVA of the separate seaports and sectors over time are shown. Next, we will discuss the results of each distinct seaport in more detail.

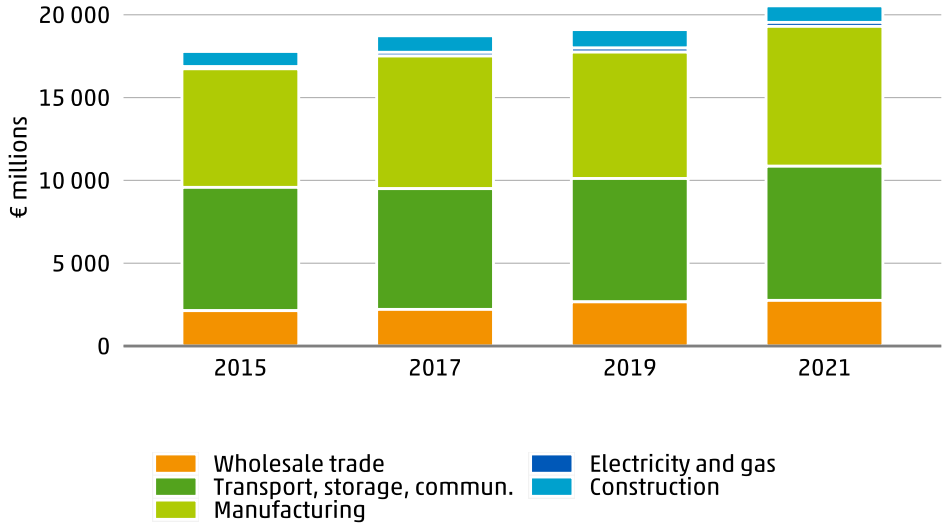
Figure 5.3 displays GVA over time per seaport and figure 5.4 displays GVA over time per sector. As figure 5.3 clearly shows, the seaports contribute to varying degrees to the total GVA of seaports, with the port of Rotterdam as the largest contributor (49% in the period 2019-2021), although the share of other seaports increased somewhat over the years.

Figure 5.3 GVA (2015 prices) per seaport



As shown in figures 5.3 and 5.4, total GVA increased between 2015 and 2021. The GVA growth in the total of seaports can primarily be attributed to an increase in the largest sector "manufacturing" (18% over the period 2015-2021). The sector "transport, storage and communication" has also grown; by 9%.

Figure 5.4 GVA (2015 prices) per sector in seaports



All other sectors have also experienced growth between 2015 and 2021. Noteworthy trends include the growth of GVA (2015 prices) of 7.5% between 2019 and 2021 despite the COVID-19 pandemic. All sectors, except "construction" grew; the biggest contributors were "manufacturing" and "transport, storage and communication". Furthermore, "manufacturing" performed well during the period 2015 to 2017 but declined slightly in the period 2017 to 2019. This decline is related to the increase in intermediate consumption in the manufacturing industry that was greater than the increase in production. This suggests that price increases for intermediate products lead to a reduction in GVA.

The text box below provides a short explanation about the differences between the results in this chapter and the CBS rapport “Port Monitor” (Haven monitor). After this text box, the results of each of the seaports will be shown in more detail in the following subparagraphs.

Differences to the Port Monitor (Haven monitor)

Since 2004 the Port Monitor (Haven monitor) is published annually. The Port Monitor includes economic figures on seaports. The objective of the Port Monitor overlaps partially with the objective this study. Both studies present figures on employment and value added in the seaports, but results differ. In this textbox a brief explanation of the differences between the Port Monitor (Streng et al., 2022) and the figures presented for seaports in the current study is provided.

The estimate of total (direct) value added for all seaports in this study is slightly smaller than the value added estimated in the Port Monitor. The estimates for total production and number of employees are also lower than in the Port Monitor but to a greater extent than for value added. The largest part of the difference is explained by different geographical boundaries. In this study seaports are limited to industrial areas surrounding these ports only. The Port Monitor in multiple cases, e.g. Rotterdam and Amsterdam, includes relevant enterprises in complete municipalities. E.g., an office of an enterprise in the centre of Rotterdam that is known to be important for the port. The geographical boundaries set in the Port Monitor are therefore broader than the boundaries set in the current study. Another difference is the sectors selected. The Port Monitor is based on a list of businesses which are connected to the harbor and not on a selection of sectors. Finally direct transport activities are calculated differently. In the current study direct transport activities are estimated like all other sectors based on location, whereas the Port Monitor makes use of data on transport performances.

5.3.1 Port of Rotterdam

Not only is Rotterdam the largest port (in terms of GVA) in the Netherlands, it also has the highest GVA per FTE of all Dutch ports. The detailed results of the activities in the port of Rotterdam are shown in table 5.3. GVA per FTE in 2019 was approximately €169,000 and has risen to €180,000 in 2021. This is largely due to an increase in production per FTE in the "manufacturing" and "transport storage and communication" sectors. In 2021 this sector is responsible for more than half of the GVA and the FTEs in the port of Rotterdam.

For the total of all seaports except Rotterdam, the figure is about €157,000. When we look at the same sectors ("construction", "manufacturing", "transport, storage and communication" and "wholesale trade") in the Dutch economy as a whole we find a GVA per FTE of €87,000. Seaports are thus in general terms very productive per unit of labour with Rotterdam as being the most productive of the seaports. Increased automation (Dekker et al., 2021), smart solution and the use of big data may be factors that contributes to the high productivity per FTE in the port of Rotterdam.

Table 5.3 Key indicators for selected sectors in the port of Rotterdam

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	185	4	908	622	286	286
	Manufacturing	1,231	14	31,846	28,568	3,278	3,278
	Transport, storage, commun.	2,174	31	12,001	6,797	5,204	5,204
	Wholesale trade	269	4	1,062	490	573	573
	Total	3,859	53	45,817	36,476	9,342	9,342
2017	Construction	196	4	1,062	737	325	331
	Manufacturing	1,312	15	31,546	27,754	3,792	3,654
	Transport, storage, commun.	2,251	32	12,176	6,963	5,213	5,136
	Wholesale trade	278	4	1,126	529	597	595
	Total	4,037	55	45,908	35,982	9,926	9,717
2019	Construction	202	5	1,152	793	359	337
	Manufacturing	1,385	15	35,748	31,879	3,869	3,576
	Transport, storage, commun.	2,454	33	12,525	7,138	5,388	5,141
	Wholesale trade	324	5	1,312	600	712	683
	Total	4,365	58	50,737	40,410	10,328	9,738
2021	Construction	186	4	1,096	760	337	288
	Manufacturing	1,339	14	37,713	33,410	4,303	3,625
	Transport, storage, commun.	2,609	34	14,366	7,905	6,461	5,587
	Wholesale trade	314	5	1,273	573	700	649
	Total	4,448	56	54,448	42,647	11,801	10,148

Between 2019 en 2021, the "transport, storage and communication" sector grew by 9% in GVA (2015 prices) and contributed to nearly all growth in GVA. The manufacturing sector increased by 1% whereas "construction" and "wholesale trade" declined by 15% and 5% respectively. Both sectors only have a small share, but did slightly offset the growth in GVA of the "transport, storage and communication" sector. Notably, the employed persons in all sectors grew less or decreased at a higher rate than the GVA (2015 prices). For all sectors combined, GVA (2015 prices) grew by 4.2% while employment declined by 3.4%. Over the period 2015 to 2021 GVA (2015 prices) grew by 8.6%, while employment increased by 5.6%. "Manufacturing", "transport, storage and communication" contributed the most.

5.3.2 Port of Amsterdam

The port of Amsterdam is the second largest port in the Netherlands for the (trans)shipment of goods and is also highly diversified in terms of economic activities (see appendix 9). More detailed results with other key indicators are shown in table 5.4.

Table 5.4 Key indicators for selected sectors in the Port of Amsterdam

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	99	3	533	370	162	162
	Manufacturing	159	3	1,150	846	304	304
	Transport, storage, commun.	381	6	2,078	1,205	873	873
	Wholesale trade	285	5	1,108	520	589	589
	Total	923	16	4,868	2,940	1,928	1,928
2017	Construction	92	2	539	377	162	167
	Manufacturing	173	3	1,307	949	358	350
	Transport, storage, commun.	398	6	2,157	1,275	882	883
	Wholesale trade	291	5	1,162	554	608	606
	Total	954	16	5,165	3,156	2,010	2,007
2019	Construction	114	3	728	511	217	206
	Manufacturing	162	2	1,798	1,474	324	310
	Transport, storage, commun.	474	7	2,688	1,638	1,050	1,036
	Wholesale trade	409	6	1,642	756	886	851
	Total	1,159	19	6,856	4,378	2,477	2,402
2021	Construction	107	3	702	492	210	179
	Manufacturing	232	3	2,798	2,312	485	481
	Transport, storage, commun.	536	8	3,100	1,775	1,324	1,219
	Wholesale trade	462	6	1,847	841	1,006	940
	Total	1,338	20	8,447	5,421	3,026	2,819

The economy of the port of Amsterdam has increased significantly between 2019 and 2021 (17%). By far the biggest grower was “manufacturing” with 55%. This in turn is predominantly due to growth in the sector “manufacture of computer, electronic and optical products. As a result, the share of this sector rebounded after a negative development in 2017 to 2019 (-12%). The second largest contributors to growth were “transport, storage and communication”,” and “wholesale trade” (18% and 11% respectively). “Construction” experienced a decline of 13%.

Over the period 2015 to 2021, the GVA (2015 prices) of the port of Amsterdam has grown by 46%. ”Manufacturing”, “wholesale trade” and “transport, storage and communication” have grown substantially (58%, 60% and 40% resp.). As a result, almost half of all GVA (2015 prices) is generated by the “transport, storage and communication” sector.

The number of FTEs in “manufacturing” increased far less from 2019 to 2021 than the growth in GVA (2015 prices), resulting in a 52% growth in GVA per FTE. This was also true, though at a lower rate, for “transport, storage and communication” and “wholesale trade” (7% and 23% growth respectively).

5.3.3 Port of IJmuiden

Close to the North Sea, along the canal that connects Amsterdam to the sea, there is a cluster of ports and industrial areas including the cities of IJmuiden, Beverwijk and Velsen-Noord. Production of steel is the biggest sector in this area (basic metal industry).

The key indicators for the port of IJmuiden are shown in table 5.5. GVA (2015 prices) grew almost at the same pace as that of the port of Amsterdam with 13% over the period 2019-2021. The increase in “manufacturing” (16%) was the most important in absolute terms. The share of this sector is currently 88%, indicating the importance of amongst other, the metal industry. Contrary to some other ports, several other sectors declined, such as “transport, storage and communication”, “wholesale trade” and “construction” (-4%, -2%, -14%). Because of the large role of -and growth- in ”manufacturing”, total GVA (2015 prices) still increased from 2019 to 2021. Over the period 2015 to 2021, total GVA (2015 prices) grew by 36%, the increasing importance and growth of “manufacturing” was equally notable (44%).

GVA (2015 prices) per FTE of “manufacturing” rose by 19% from 2019 to 2021. Total GVA (2015 prices) per FTE consequently increased by 15%. Over the period 2015 to 2021 GVA per FTE rose with 31%, also mainly due to “manufacturing”.

Table 5.5 Key indicators for selected sectors in the Port of IJmuiden

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	24	1	137	94	43	43
	Manufacturing	726	10	3,945	2,843	1,102	1,102
	Transport, storage, commun.	36	1	202	116	86	86
	Wholesale trade	45	1	179	84	95	95
	Total	831	12	4,463	3,137	1,326	1,326
2017	Construction	23	1	139	96	43	45
	Manufacturing	779	10	4,968	3,749	1,219	1,283
	Transport, storage, commun.	30	1	162	93	69	67
	Wholesale trade	43	1	174	84	90	90
	Total	874	12	5,443	4,022	1,421	1,485
2019	Construction	28	1	183	125	58	56
	Manufacturing	854	10	4,807	3,619	1,188	1,375
	Transport, storage, commun.	39	1	196	112	84	77
	Wholesale trade	47	1	190	88	101	97
	Total	968	13	5,375	3,944	1,431	1,604
2021	Construction	26	1	176	121	55	48
	Manufacturing	867	10	5,967	4,478	1,489	1,590
	Transport, storage, commun.	38	1	197	112	85	74
	Wholesale trade	47	1	190	88	102	95
	Total	979	13	6,530	4,799	1,731	1,807

5.3.4 Port of Drechtsteden

This port consists of eight spatially distinct ports in the vicinity of the city of Dordrecht. The results for the economic key figures for the relevant selected sectors are presented in table 5.6.

The total GVA (2015) growth of Drechtsteden over 2015 to 2021 was 11%, this was a more moderate development than all other ports. The 0.4% increase in GVA from 2019 to 2021 was also very moderate. This was primarily due to the drop in construction activities by 8%. Growth in other sectors could not compensate for this decline. “Wholesale” and “Manufacturing” grew by 1% each, and are still the number one and two sectors in Drechtsteden. “Transport, storage and communication” grew by 6% between 2015 and 2021, despite a decline between 2015 and 2017 of 16%, thanks to a growth in GVA (2015 prices) of 21% between 2017 and 2019.

Table 5.6 Key indicators for selected sectors in the port of Drechtsteden

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	114	2	567	395	172	172
	Manufacturing	206	4	1,334	983	351	351
	Transport, storage, commun.	77	2	352	205	148	148
	Wholesale trade	227	4	914	418	497	497
	Total	624	11	3,168	2,001	1,167	1,167
2017	Construction	113	2	621	437	184	186
	Manufacturing	222	4	1,472	1,081	392	392
	Transport, storage, commun.	72	1	307	178	128	124
	Wholesale trade	228	4	944	438	506	503
	Total	634	11	3,344	2,134	1,210	1,205
2019	Construction	130	2	751	527	224	209
	Manufacturing	232	4	1,471	1,085	385	377
	Transport, storage, commun.	91	2	384	223	162	149
	Wholesale trade	254	4	1,049	473	576	552
	Total	707	12	3,655	2,308	1,347	1,288
2021	Construction	128	2	752	530	222	192
	Manufacturing	243	4	1,664	1,259	405	381
	Transport, storage, commun.	99	2	439	261	178	158
	Wholesale trade	263	4	1,099	481	618	561
	Total	732	12	3,954	2,531	1,423	1,292

5.3.5 Port of Vlissingen

GVA (2015 prices) in the port of Vlissingen expanded by 8% over the period 2019 to 2021. This occurred after a period of reduced GVA (2015 prices) between 2015 and 2017. The total GVA growth from 2015 to 2021 was -4%. In Vlissingen, “manufacturing” has the greatest share, followed by “transport, storage and communication”, which grew by 0.4%.

The port of Vlissingen is the only port where construction activities grew substantially between 2019 and 2021 (26%). However, this is only a small sector in the total GVA of the port of Vlissingen. Further this growth was insufficient to compensate for the decline between 2015 and 2019, meaning that construction in Vlissingen is yet to have returned to its 2015 levels.

Table 5.7 Key indicators for selected sectors in the port of Vlissingen

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	21	1	113	77	35	35
	Manufacturing	177	3	2,684	2,370	314	314
	Transport, storage, commun.	96	2	461	235	226	226
	Wholesale trade	22	1	88	43	46	46
	Total	316	6	3,346	2,725	621	621
2017	Construction	16	1	96	67	29	30
	Manufacturing	184	3	2,577	2,241	336	343
	Transport, storage, commun.	88	2	415	216	200	193
	Wholesale trade	24	1	96	47	49	49
	Total	312	6	3,184	2,570	614	615
2019	Construction	15	0	94	65	29	27
	Manufacturing	188	3	3,066	2,747	319	297
	Transport, storage, commun.	85	2	377	193	185	175
	Wholesale trade	27	1	111	53	58	56
	Total	315	6	3,648	3,057	591	556
2021	Construction	20	1	130	90	40	34
	Manufacturing	191	3	3,305	3,016	289	298
	Transport, storage, commun.	98	2	460	231	229	209
	Wholesale trade	28	1	114	53	61	56
	Total	338	6	4,008	3,389	619	598

5.3.6 Port of Terneuzen

Terneuzen is located near to Vlissingen; both ports are managed by Zeeland Seaports. The port area of Terneuzen is spread along the Ghent-Terneuzen Canal and the Western Scheldt. The port of Terneuzen is economically important principally due to the presence of large chemical businesses. Just like IJmuiden, the manufacturing sector in Terneuzen has the greatest share of GVA (around 70%). Manufacturing has also been the predominant driver of decline or growth in the port. Between 2017 and 2019, a 15% reduction in GVA of the port as a whole was predominantly caused by 15% decline in GVA of "manufacturing". Between 2019 and 2021 however, "manufacturing" grew by 46%. This lead to a 28% increase in GVA for the port as a whole. This growth between 2019 and 2021 is shown in Table 5.8 is partly caused by a reduction in intermediate consumption during this period.

Table 5.8 Key indicators for selected sectors in the port of Terneuzen

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	70	2	349	234	115	115
	Manufacturing	407	5	2,990	2,059	931	931
	Transport, storage, commun.	87	2	503	285	218	218
	Wholesale trade	28	1	111	55	56	56
	Total	592	9	3,953	2,633	1,319	1,319
2017	Construction	69	2	370	250	120	123
	Manufacturing	465	6	3,393	2,482	911	1,013
	Transport, storage, commun.	95	2	484	258	226	220
	Wholesale trade	38	1	154	76	78	77
	Total	666	10	4,400	3,065	1,335	1,433
2019	Construction	83	2	475	320	155	147
	Manufacturing	488	6	3,693	2,960	734	773
	Transport, storage, commun.	101	2	498	265	233	221
	Wholesale trade	40	1	163	78	85	81
	Total	713	10	4,829	3,622	1,207	1,222
2021	Construction	85	2	496	334	162	139
	Manufacturing	530	6	4,024	2,620	1,404	1,126
	Transport, storage, commun.	107	2	529	287	242	217
	Wholesale trade	45	1	179	84	96	87
	Total	767	10	5,228	3,324	1,904	1,569

5.3.7 Other smaller seaports

The other seaports are five smaller ports: Moerdijk, Den Helder (main port for the Royal Navy of the Netherlands [13)]), Harlingen, Eemshaven and Delfzijl. The port of Moerdijk is located in the south of the Netherlands (close to the port of Drechtsteden). The other four smaller ports are located in the north of The Netherlands. The results for the other smaller seaports are presented in table 5.9

The port of Moerdijk has the largest production of the "other smaller seaports", followed by Den Helder and Delfzijl. Moerdijk is known for the presence of businesses in the "manufacture of basic chemicals" sector. The five ports together show a small increase of value added (0,4%) over the period 2019 to 2021. This is primarily due to the increase in the sector "wholesale trade" (6%) and "manufacturing" (2%). The growth was barely enough to compensate for the decrease in GVA of 9% of construction activities and "transport, storage and communication" (-2%).

Over 2015 to 2021 total GVA growth was 7%. GVA (2015 prices) per FTE generally rose from 2015 to 2019 with the exception of the "transport, storage and communication" in which GVA per FTE dropped by 12%.

The other seaports are the only seaports for which it has been possible to meaningfully present data on the electricity and gas sector in as far as that sector is related to the North Sea. The results are surprising in that the electricity and gas companies only account for about 10% of the GVA in these seaports when one would expect electricity and gas companies to account for a much greater share. This is a consequence of the method of using employees as a division key. Relatively few energy company employees are registered at the power stations themselves, being instead registered at the headquarters, in for example the city of Groningen. An obvious solution to this problem is to include activity in the entire NUTS-3 region, and thus including activity in the city of Groningen. Such a solution has already been applied for Rotterdam by including the entire Rijnmond NUTS-3 region. However, in this case, this solution is not applicable because this would lead to much greater inclusion gas companies and energy transmission companies, which have no link to the North Sea. In this way, the methodological choice is between a substantial underestimate and a substantial overestimate. In this, it is preferred to make underestimate because this allows us to better stay within the system boundaries and definitions as explained in chapter 2.

[13)] The number of employees working in the Royal Navy in Den Helder cannot be published because of confidentiality. All employees working in the sector "defense are registered centrally in The Hague in the company register of Statistics Netherlands.

Table 5.9 Key indicators for selected sectors in other sea ports

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Construction	65	2	336	230	106	106
	Manufacturing	398	6	3,616	2,736	880	880
	Transport, storage, commun.	269	5	1,884	1,196	688	688
	Wholesale trade	135	3	529	250	280	280
	Electricity and gas	16	0	317	190	127	127
	Total	882	16	6,682	4,602	2,080	2,080
2017	Construction	65	2	372	257	115	118
	Manufacturing	401	6	4,684	3,702	981	972
	Transport, storage, commun.	279	5	1,812	1,154	658	667
	Wholesale trade	140	3	564	270	294	292
	Electricity and gas	26	0	509	308	201	222
	Total	911	16	7,940	5,691	2,248	2,270
2019	Construction	73	2	445	307	138	131
	Manufacturing	451	6	4,142	3,178	964	922
	Transport, storage, commun.	310	5	1,901	1,223	678	649
	Wholesale trade	167	3	678	315	362	346
	Electricity and gas	29	0	580	307	273	246
	Total	1,031	17	7,745	5,330	2,415	2,295
2021	Construction	71	2	448	309	139	120
	Manufacturing	431	6	4,350	3,204	1,146	941
	Transport, storage, commun.	311	5	2,238	1,391	847	637
	Wholesale trade	183	3	738	335	402	369
	Electricity and gas	30	0	553	266	288	238
	Total	1,025	17	8,327	5,505	2,822	2,305

5.4 Conclusion

Despite the dominance of the port of Rotterdam, the majority of the growth in GVA (2015 prices) on land was due to the growth in GVA in seaports other than Rotterdam. The biggest contributor to the 11% increase in GVA (2019-2021) of the other seaports was the port of Amsterdam, followed closely by the port of Terneuzen.

Both the port of Amsterdam and Terneuzen saw a substantial increase in manufacturing activities. For the port of Terneuzen “manufacturing” accounted for nearly all growth in GVA. For the port of Amsterdam, this was almost equally divided between “transport, storage and communication” and “manufacturing” activities.For all the ports combined, “manufacturing” has been the largest sector in terms of GVA (2015 prices) since 2017, marginally surpassing “transport, storage and communication”.

The GVA of the coastal area (which consists of different sectors than the seaports) is far less than the GVA of the seaports. Coastal areas experienced a decline in GVA (2015 prices) of 17% between 2019 and 2021. This decline was responsible for the negative trend in GVA (2015 prices) over the extended period 2015-2021 (-11%). The decline in activities related to tourism and recreation were the main reason for the drop in GVA (2015 prices) from 2019 to 2021. This was related to the COVID-19 pandemic.

6 Activities at sea

This chapter describes the economic activities taking place on the DCS by Dutch resident companies. It includes the extraction of oil and gas, fisheries, sea shipping, marine aggregates and the production of offshore wind energy. Section 6.1 presents an overview of all activities at sea together (i.e. key results), followed by a more detailed description of the different activities.

6.1 Key results

Activities at sea account for 14% of the real terms GVA of the North Sea economy and 0.7% of the total economy in 2021. An analysis of the composition of activities at sea and the trend over time will be presented in this chapter.

Figure 6.1 GVA (2015 prices) of activities at sea

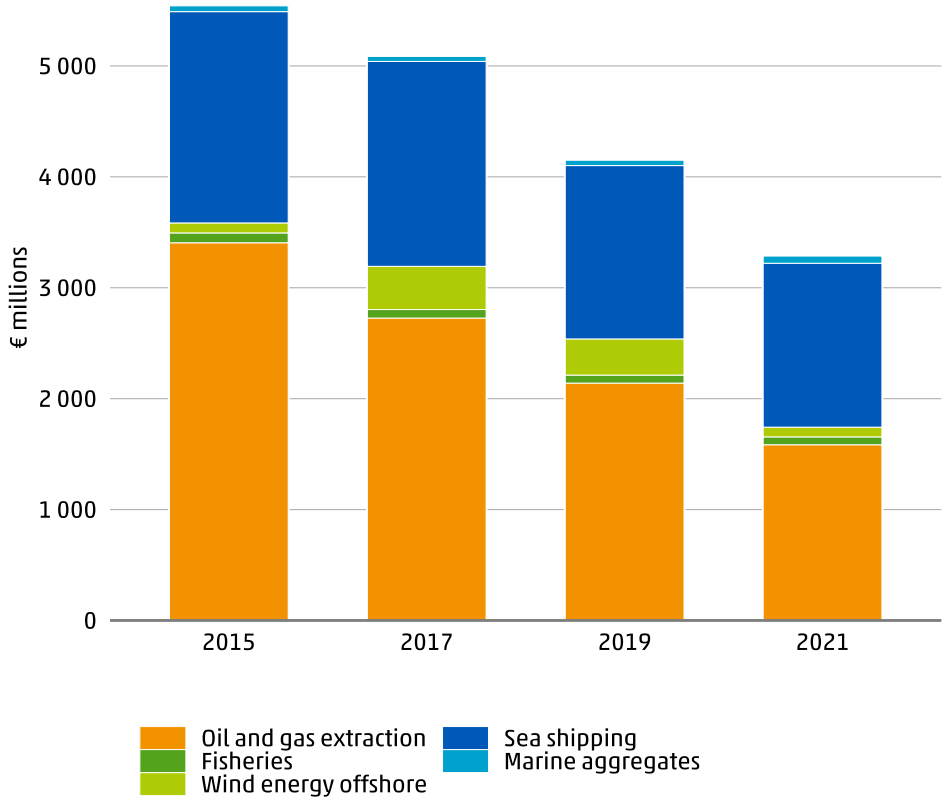


Figure 6.1 shows that the size of the North Sea economy in terms of the activities at sea has shrunk in real terms between 2015 and 2021. In 2021, the GVA was €3.3 billion, which is a 40% reduction compared to the €5.5 billion in 2015. The above figure shows that this reduction is mainly caused by reductions in GVA in the "oil and gas extraction" sector (which includes exploration activities). This is due to a drop in the production of oil and gas over this same period. Between 2015 and 2021, the GVA of the "sea shipping" sector grew 26% in

nominal terms, but GVA in 2015 prices shrank by 22% between 2015 and 2021[14]. Inflation mainly affected performance between 2019 and 2021. In this period the results show a substantial increase in production and GVA (both nominal terms). This suggests that increases in the prices for which the industry sells its services are having a greater influence on the GVA in 2015 prices than inflation in the prices of intermediate goods. A sharp decline of GVA (2015 prices) is found in offshore wind energy. The GVA (2015 prices) of this sector shrunk from €339 million in 2019 to €67 million in 2021, mainly due to the phasing out of subsidies.

6.2 Oil and gas extraction

The Netherlands has significant reserves of natural gas as well as some smaller oil deposits. Since their discovery, these stocks have been exploited to meet the demand in the Dutch economy and to facilitate exports to foreign countries, thus contributing to the Dutch balance of payments over the past decades.

On the DCS, mainly natural gas is extracted, as well as some oil. The value of production, intermediate consumption and value added of these activities is published annually in the Dutch Regional Accounts. In these accounts, an 'extra-territorial region' is defined, which comprises the territorial waters, the Dutch part of the continental shelf in the North Sea, and the so-called territorial enclaves situated abroad (Dutch embassies, consulates, military bases, etc.)[15]. For oil and gas extraction, only the DCS is relevant. Table 6.1 shows key economic figures for oil and gas extraction on the DCS.

Table 6.1 Indicators for the oil and gas extraction on the Dutch Continental Shelf

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	519	4	5,013	1,608	3,405	3,405
2017	332	3	3,144	1,072	2,071	2,727
2019	339	3	2,649	972	1,676	2,140
2021	278	2	3,272	1,327	1,945	1,584

Compensation of employees and the number of employed persons decreased significantly between 2015 and 2021, as did intermediate consumption. This can be partially explained by a price drop in oil and natural gas that manifested itself in the autumn of 2015. The prices reached their minimum at the beginning of 2016. However, GVA (2015 prices) in 2017 shows that there was also a decline in real terms. This can be explained by the declining production and reserves of North Sea Oil and Gas (EBN, 2016). The GVA between 2019 and 2021 increased in nominal terms, but declined sharp in real terms. This is due to the price increases, which are observed in almost all economic activities at sea.

[14] Sea shipping is included in the "transport, storage and communication" sector under sea ports. The performance of the sector as a whole is not necessarily correlated with the performance of the sector within individual sea ports.

[15] The Dutch national accounts refer to the economic territory of the Kingdom of the Netherlands in Europe. The Dutch section of the continental shelf in the North Sea is also regarded as a part of that economic territory. The economies of the countries of the Kingdom of the Netherlands outside Europe (Curaçao, Sint Maarten and Aruba) are not described in the Dutch national accounts. The islands Bonaire, Sint Eustatius and Saba are indeed part of the Netherlands but are also not included in the national accounts.

6.3 Fisheries

As is shown in table 6.2., the Dutch fishing industry is much larger than just the fisheries that take place at the Dutch part of the continental shelf. Dutch vessels are also active outside of Dutch waters both within and outside of the North Sea area. Further, fisheries in other geographical areas, such as those exploited off the west coast of Africa, involve different fish species and different production technologies. Therefore, the Dutch DCS fishery is not representative of the whole Dutch fishing sector.

Table 6.2 Indicators for fisheries on the DSC and the fishing sector as a whole

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	DCS	19	0.8	153	64	89	89
	Total Netherlands	63	2.5	500	209	291	290
2017	DCS	19	0.7	151	56	95	77
	Total Netherlands	71	2.6	569	211	358	289
2019	DCS	20	0.7	135	54	81	72
	Total Netherlands	76	2.5	509	203	306	273
2021	DCS	23	0.7	142	57	85	71
	Total Netherlands	87	2.6	535	214	321	268

For the DCS, the trend is influenced by the fact that 2015 was a good year for fishing on the DCS due to fluctuations in prawn prices. In general though, we see that the fishing industry on the DSC has seen a decrease in terms of GVA in 2015 prices. This decline was most pronounced between 2015 and 2017 but was also present between 2017 and 2019. GVA (2015 prices) only declined slightly between 2019 and 2021.

As mentioned in section 5.2, Dutch North Sea fisheries have had several challenges in recent years. Accordingly, we would expect to see a large contraction in the DSC fisheries. While we do so a decrease in GVA (2015) prices for all years, it is not as pronounced a decline as would be expected between 2019 and 2021. This is because the results are predominantly determined by the performance of the fisheries sector as a whole. These results should therefore be considered as rough estimates. Some possible options for improving the method are discussed in the final chapter.

6.4 Sea shipping

The Dutch part of the North Sea is important for marine traffic. Its shipping lanes are among the busiest in the world. Sea shipping includes the transport of both cargo and passengers. Although inland vessels may sometimes use the DCS, their share in the total DCS usage not substantial and is hence not considered.

The vessels of the Dutch operators may be registered in (may fly the flag of) another territory. The ownership of the vessels operated by Dutch residents can therefore be with a foreign company. Ships operated by foreign companies use the DCS for transport to and from Dutch seaports, as well as for sailing through. The value of these activities is however not included in the economic figures, as foreign activities do not contribute to Dutch GDP.

Unlike in the case of, e.g., oil and gas sector, the sea shipping sector is assigned the total national figure on sea shipping, i.e. without the need to assign part of the total figure to onshore and part to offshore activities. This is because the DCS provides the international accessibility which facilitates the entire Dutch sea shipping sector.

Table 6.3 Indicators for the sea shipping sector

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	542	9.5	6,601	4,694	1,907	1,907
2017	543	9.2	6,059	4,372	1,687	1,848
2019	547	8.7	6,310	4,758	1,552	1,565
2021	587	9.2	7,352	4,954	2,398	1,479

Between 2019 and 2021 there was an increase in nominal GVA and a decrease in the GVA in 2015 prices. We also see a substantial increase in nominal production between 2019 and 2021 while intermediate consumption and the number of FTEs increased only slightly. This indicates that the increase in production is to a large extent the result of price increases. This explains the declining GVA in 2015 prices. That the number of employed persons and their compensation remained relatively stable.

6.5 Marine aggregates

Table 6.4 shows estimated economic figures on extraction of marine aggregates on the DCS. This shows a slight decline in production, value added and compensation of employees in 2017, compared to 2015. In 2019 and 2021, however, a clear increase in all above-mentioned indicators is visible, compared to 2017. As explained in the chapter 3, the assumptions used mean that there is a relatively large degree of uncertainty margins around these figures. However, the increase can be explained by the growing demand for sand for the purpose of protecting the coastline, because of the expected sea level rise in the future[16)]. Sand is used at, for example, the sand motor in Delfland and the Hondsbossche and Pettemer sea defences (Wienhoven, 2023).

16) https://www.noordzeeloket.nl/en/functions-and-use/artikel-baseline/

Table 6.4 Indicators for marine aggregates on the DCS

Employment figures x 1000 FTE, monetary values x €1,000,000

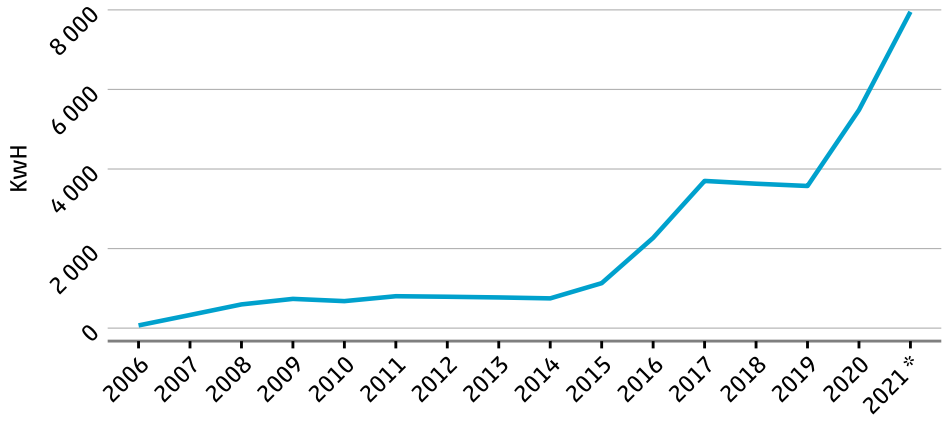
Year	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	18.1	0.3	145.3	93.4	52.0	52.0
2017	15.8	0.2	122.5	76.0	46.5	44.9
2019	20.6	0.2	149.1	91.2	57.9	48.0
2021	27.1	0.3	213.5	131.1	82.3	64.8

6.6 Offshore wind energy

The Netherlands has been using the DCS for the generation of offshore wind energy since 2006. Since then, the DCS has become increasingly important for the total wind energy production. The Netherlands is one of Europe's largest producers of wind energy (Wienhoven et al., 2023). The share of offshore production in the total wind energy production was initially 2% (in 2006) and was relatively stable between 2010-2015 (about 15%). In 2016, it jumped to 28% and reached 44% in 2021.

Figure 6.2 Production of wind energy on DCS in petajoules

* Preliminary data



The developments in the economic indicators in table 6.5 are predominantly determined by the increase in the production of energy from offshore windfarms, as shown in Figure 6.2. All economic indicators have been growing between 2015 and 2019 (including the GVA in 2015 prices). The change between 2017 and 2015 is the most remarkable, with production and GVA more than tripled. The real change in the GVA in those years is even larger than in nominal terms, which is due to a decrease in electricity prices. Between 2019 and 2021 the production (in KwH) of offshore wind energy increased sharply, which is reflected in the production value. The increase in production (in KwH) leads to an increase in intermediate consumption, which is based on the physical production and capacity as described in the methodology. However, the phasing out of SDE++ subsidies, which are part of the production value have caused the GVA to decline, in both real and nominal terms. Without subsidies, the GVA would even be negative for most years. It is important to note that underlying data regarding the SDE++ subsidies are provisional and will be revised in the second half of 2023.

The number of employed persons only includes those who are directly involved with the operation and maintenance of the turbines. Both the small size of this activity and its capital intensive nature explain why this activity does not contribute much to employment. Energy production requires relatively high-skill labour, with wages being higher than on average in the whole economy. The number of people employed and their compensation show an upward trend.

Table 6.5 Indicators for offshore wind energy

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	5	0.06	158	70	88	88
2017	12	0.14	547	207	341	389
2019	12	0.13	541	203	339	324
2021	30	0.32	552	485	67	86

7 Natural Capital Accounts

This report describes a series of economic indicators for the Dutch North Sea, the coastal zone and the Dutch seaports. However, knowledge and data are still fragmented across sectors and institutions, where a lack of standardization limits the ability to collate data in a coherent and transparent manner. One way to solve this problem is by compiling ocean accounts for the Dutch North Sea. Ocean accounts integrate a range of data concerning ocean environment assets (e.g., extent/condition of salt marshes), economic activity (e.g., sale of fish) and social conditions (e.g., coastal employment). An advantage is that this framework is aligned with existing international accounting standards, such as the System of Environmental Economic Accounting (SEEA) and System of National Accounts (SNA) [17)].

Statistics Netherlands is currently working on the development of a series of Ecosystem Accounts for the Dutch part of the North Sea. This study explores the potential use of these accounts as an instrument to monitor and support sustainable development in the Dutch part of the North Sea. These ecosystem accounts and the ocean economy in this report can be seen as part of the broader ocean accounts. Many economic activities at sea are related to the ecosystem services within the ecosystem accounts of the North Sea. The North Sea economy is valued according to the standard economic indicators such as output value, added value and compensation for employees, while the ecosystem services are valued according to a range of monetary valuation techniques described in the SEEA EA (UN, 2021).

The economic services that relate to the economic sectors in the present study (fisheries, marine aggregates, offshore wind energy and oil and gas extraction) are valued according to the resource rent method. The resource rent (also known as economic rent) is defined as a surplus value, i.e. the difference between the price at which a resource, or the output from it, can be sold and its respective extraction and/or production costs, including normal returns. It is therefore sometimes called 'supernormal profit' or 'super-profit'. These estimates are lower compared to the GVA that is found in the report. The GVA still includes consumption of fixed capital (depreciation), normal returns and compensation for employees.

Another difference between the current study and the Natural Capital Accounts (NCA) is the treatment of the environmental pressures such as pollution; oil leaks; eutrophication; underwater noise from shipping and construction; adverse ecological impacts of offshore wind farms; disturbance by beam trawling fishery etc. Because many environmental pressures on the North Sea are caused by economic activities that themselves are involved in the use of ecosystem services (fishing; wind energy; transport; recreation), it makes sense to treat environmental pressures as a mirror flow of ecosystem services. This is the approach adopted in the (experimental) environmental pressure account which is part of the ecosystem account for the Dutch North Sea, which will be published in 2023 by Statistics Netherlands.

A logical (future) extension of this approach would be to compile an environmental pressure account which reflects the pressures caused by the economic activities discussed in this report. For the offshore sectors, this would be relatively straightforward, but for the onshore part, i.e. the non-marine-focused economic activities within the coastal zone, it would require

17) https://www.unescap.org/blog/ocean-accounts-inform-evidence-based-sustainable-development-ocean-economy?ref=the-global-ocean-accounts-partnership

regionalization of e.g. emission statistics, which are currently only available on the national scale.

8 Evaluation of methodology and recommendations

8.1 Activities on land and at sea

There is a number of strengths and weaknesses in the methodology used in this report. In this chapter, these strengths and weaknesses are discussed, with a particular focus on ways to address the weaknesses and strengthen the methodology.

The figures presented in this report are based on figures from the national accounts or the regional accounts. The national or regional figures are recalculated to specific geographical areas: the Dutch Continental Shelf, the selected seaports or the coastal area. An important strength of this study comes from using data from the national accounts. This means that the concepts and definitions are consistent and based on international standards. Other advantages are that the data sources are produced regularly and that time series are available. Because data are published per sector, it is possible to analyse the economic structure of the areas of interest.

In general, a disadvantage of the method used for the activities on land is that it allocates production to the location where employees are recorded in the 'company register' of Statistics Netherlands. When the 'administrative location' differs from the actual production site, the results may not be precise. Especially for seaports, where large companies with multiple locations are present, this is likely to result in an underestimation of the economic value generated in this region for these economic activities. This problem is partly solved by allocating total figures for the larger region (NUTS-3) to a seaport for some relevant sectors. This methodological problem is less substantial for the river basin analysis because these geographical areas are much larger. The case of energy companies is particularly problematic. The results for energy companies are an underestimate because of the allocation of employees to headquarters instead of the power plants themselves. Unfortunately, the solution of using total figures for the larger NUTS-3 region is not suitable in this case because this would result in activities being included which are not related to the North Sea (gas and transmission companies). In conclusion, although the method leads to an underestimate, the method seems to be the best method available. However, it may be useful to research in the future if alternative sources of data can be used to improve the method.

In general, it is difficult create statistics for the economic activities taking place on the DCS. For example, we have not been able to isolate the economic activities surrounding the construction of wind turbines at sea because National Accounts data does not extend to this level of detail. However, a separate study could be carried out in the future to determine if data at this level of detail could be derived. The results for offshore wind energy could potentially be improved by gathering more accurate and up-to-date cost data, including factors such as maintenance, investment, and potential changes in technology. Related to the production of offshore wind energy are construction activities at sea (predominantly of wind farms). It may be possible to include construction activities on the DCS. Data regarding investment on the DCS is available and this can be used as a basis with which to determine the other economic variables.

The method to determine the economic activities of the fisheries sector on the DCS relies heavily on the statistics regarding the fisheries sector as a whole. One possibility to improve the quality of the results is to estimate the contribution of catch per ton per species on the DCS (using VMS data) to, for example, GVA. The values per species per ton could then be multiplied with the catch data (specifically for the DCS) in a year. In any case, VMS data should in the future always be used to determine per year the share of catch which takes place on the DCS. Shortcomings with the method for marine aggregates on the DCS also exist. In that case however, the possibilities to improve the quality of the results is limited.

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Appendices

Appendix 1: Exposure hours for companies and contractors in crude petroleum and natural gas production and support activities

Year	2015	2017	2019	2021
ONSHORE				
Exposure hours Company	4,191,242	2,758,232	2,580,573	2,444,176
Exposure hours Contractors	5,318,943	3,072,850	2,251,024	2,199,252
Total exposure hours Company and Contractors	9,510,185	5,831,082	4,831,597	4,643,428
OFFSHORE				
Exposure hours Company	1,960,719	800,337	1,020,771	630,972
Exposure hours Contractors	6,146,107	4,178,101	4,324,897	3,229,951
Total exposure hours Company and Contractors	8,106,826	4,978,438	5,345,668	3,860,923
Total general exposure hours	17,617,011	10,809,520	10,177,265	8,504,351

Appendix 2: Map of the coastal area

Appendix 3: Map of the selected seaports

Appendix 4: Selected scenarios

Selected scenarios

Area of Interest	Selected scenario	Explanation
Coastal area	B	The one kilometre wide strip used to define the coastal area is a pragmatic decision based on topography and geography of economic activity in the Netherlands. As the partition of a postal code can be disputed, the more flexible scenario B is chosen.
Seaports		
Rotterdam	A	The area of interest has been increased by including more postal codes than only the port itself. Hence, the stricter scenario A is preferred, whereby a portion of the economic activity in the relevant postal area is included in the totals.
Amsterdam	A	Scenario A is preferred because of the intensive economic use of the area surrounding the port for diverse economic activities.
IJmuiden cluster	A	Because the most important sector 'basic metal' has already been fully included, the downsides of choosing scenario A are negated.
Drechtsteden	A	Since this port consists of a few small geographical areas within an urbanised region, scenario A is preferred. This scenario may result in a better estimate for postal codes which are included for a small part in the port.
Vlissingen	B	Option B is preferred because the port of Vlissingen is surrounded by agricultural land. This suggests that including all the activity in the relevant postcodes in the best way to represent economic activity in the relevant port sectors.
Terneuzen	B	Two of the three main port areas are predominantly surrounded by non-urban land. Therefore, like the port of Vlissingen scenario B is preferred.
Other seaports		
Eemshaven	B	For all five seaports discussed in this section scenario B is preferred over A. For small ports areas the share of the surface area of the port in the postal codes concerned is generally small. In scenario A this results in the allocation of a small share of the companies located in the postal code to the seaport.
Harlingen	B	
Moerdijk	B	
Delfzijl	B	
Den Helder	B	

Appendix 5: Production in selected ports according to the two scenarios

Production (x €1,000,000)

Year	Area	Port of IJmuiden, Scenario A	Port of IJmuiden, Scenario B	Port of Drechtsteden, Scenario A	Port of Drechtsteden, Scenario B
2015	Manufacturing	3,945	4,363	1,334	4,328
	Wholesale trade	179	445	914	2,392
	Transport, storage and communication	202	465	352	1,197
	Construction	137	356	567	2,178
	Other sectors	896	2,263	587	3,137
	Total	5,358	7,892	3,755	13,232
2017	Manufacturing	4,968	5,406	1,472	4,525
	Wholesale trade	174	423	944	2,433
	Transport, storage and communication	162	384	307	1,074
	Construction	139	368	621	2,413
	Other sectors	630	1,536	665	3,230
	Total	6,074	8,118	4,009	13,675
2019	Manufacturing	4,807	5,373	1,471	4,461
	Wholesale trade	190	475	1,049	2,637
	Transport, storage and communication	196	474	384	1,336
	Construction	183	504	751	2,862
	Other sectors	579	1,408	813	3,595
	Total	5,954	8,234	4,468	14,891
2021	Manufacturing	5,967	6,524	1,664	4,915
	Wholesale trade	190	497	1,099	2,760
	Transport, storage and communication	197	505	439	1,412
	Construction	176	495	752	2,836
	Other sectors	627	1,481	872	4,028
	Total	7,157	9,502	4,825	15,951

Year	Area	Port of Vlissingen, Scenario A	Port of Vlissingen, Scenario B	Port of Terneuzen, Scenario A	Port of Terneuzen, Scenario B
2015	Manufacturing	1,200	2,684	555	2,990
	Wholesale trade	27	88	37	111
	Transport, storage and communication	164	461	114	503
	Construction	34	113	115	349
	Other sectors	254	822	173	852
	Total	1,679	4,169	993	4,804
2017	Manufacturing	1,128	2,577	616	3,393
	Wholesale trade	30	96	40	154
	Transport, storage and communication	146	415	105	484
	Construction	25	96	107	370
	Other sectors	245	793	203	1,130
	Total	1,574	3,977	1,072	5,530
2019	Manufacturing	1,328	3,066	624	3,693
	Wholesale trade	36	111	33	163
	Transport, storage and communication	137	377	85	498
	Construction	28	94	84	475
	Other sectors	245	783	207	1,353
	Total	1,773	4,431	1,033	6,182
2021	Manufacturing	1,463	3,305	689	4,024
	Wholesale trade	37	114	37	179
	Transport, storage and communication	162	460	100	529
	Construction	40	130	86	496
	Other sectors	250	791	221	1,454
	Total	1,951	4,799	1,134	6,683

Year	Area	Producten, Scenario A	Producten, Scenario B
2015	Haven Delfzijl	602	2,451
	Haven Den Helder	283	1,030
	Haven Eemshaven	76	253
	Haven Harlingen	284	1,546
	Haven Moerdijk	1,437	4,140
	Total	2,682	9,420
2017	Haven Delfzijl	675	2,579
	Haven Den Helder	282	947
	Haven Eemshaven	76	247
	Haven Harlingen	194	1,308
	Haven Moerdijk	1,966	5,401
	Total	3,193	10,482
2019	Haven Delfzijl	790	2,839
	Haven Den Helder	316	1,038
	Haven Eemshaven	87	282
	Haven Harlingen	182	1,252
	Haven Moerdijk	1,632	4,813
	Total	3,007	10,224
2021	Haven Delfzijl	884	3,216
	Haven Den Helder	1,112	2,761
	Haven Eemshaven	121	358
	Haven Harlingen	203	1,366
	Haven Moerdijk	1,698	4,986
	Total	4,017	12,688

Appendix 6: Overview of sectors

Sector	Sector name
01	Agriculture
02	Forestry and logging
03	Fishing and aquaculture
04	Mining and quarrying
05	Manufacture of food products, beverages and tobacco products
06	Manufacture of textiles, wearing apparel and leather products
07	Manufacture of wood and of products of wood and cork,except furniture; manufacture of articles of straw and plaiting materials
08	Manufacture of paper and paper products
09	Printing and reproduction of recorded media
10	Manufacture of coke and refined petroleum products
11	Manufacture of chemicals and chemical products
12	Manufacture of basic pharmaceutical products and pharmaceutical preparations
13	Manufacture of rubber and plastics products
14	Manufacture of other non-metallic mineral products
15	Manufacture of basic metals
16	Manufacture of fabricated metal products, except machinery and equipment
17	Manufacture of computer, electronic and optical products
18	Manufacture of electrical equipment
19	Manufacture of machinery and equipment n.e.c.
20	Manufacture of motor vehicles, trailers and semi-trailers
21	Manufacture of other transport equipment
22	Manufacture of furniture; other manufacturing
23	Repair and installation of machinery and equipment
24	Electricity, gas, steam and air conditioning supply
25	Water collection, treatment and supply
26	Recycling and sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
27	Construction
28	Wholesale and retail trade and repair of motor vehicles and motorcycles
29	Wholesale trade, except of motor vehicles and motorcycles
30	Retail trade, except of motor vehicles and motorcycles
31	Land transport and transport via pipelines
32	Water transport
33	Air transport
34	Warehousing and support activities for transportation
35	Postal and courier activities
36	Accommodation; food and beverage service activities
37	Publishing activities
38	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
39	Telecommunications
40	Computer programming, consultancy and related activities; information service activities
41	Financial service activities, except insurance and pension funding
42	Insurance, reinsurance and pension funding, except compulsory social security
43	Activities auxiliary to financial services and insurance activities
44	Real estate activities
45	Legal and accounting activities; activities of head offices; management consultancy activities
46	Architecture and engineering activities; technical testing and analysis
47	Scientific research and development
48	Advertising and market research
49	Other professional, scientific and technical activities; veterinary activities
50	Rental and leasing activities
51	Employment activities
52	Travel agency, tour operator reservation service and related activities
53	Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support
54	Public administration and defence; compulsory social security
55	Education
56	Human health activities
57	Social work activities
58	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities
59	Sports activities and amusement and recreation activities
60	Activities of membership organisations
61	Repair of computers and personal and household goods
62	Other personal service activities

Appendix 7: Production in the coastal area

Sector names located in Appendix 6

Sector	Scenario A, 2015	Scenario A, 2017	Scenario A, 2019	Scenario A, 2021	Scenario B, 2015	Scenario B, 2017	Scenario B, 2019	Scenario B, 2021
01	532.5	568.6	548.5	619.7	1,361.5	1,453.9	1,470.7	1,553.3
02	1.7	1.3	.	1.9	4.7	3.7	.	7.7
03	276.9	281.4	243.7	272.7	311.9	316.3	281.3	314.5
04	256.5	76.7	34.7	30.3	468.7	202.6	67.2	68.2
05	419.9	451.2	505.1	497.5	1,121.5	999.5	1,071.5	1,168.6
06	17.2	17.8	22.4	27.7	25.4	26.6	36.0	43.1
07	11.8	11.6	12.8	13.0	39.6	37.5	35.3	42.9
08	48.6	54.2	50.0	54.4	137.9	165.9	169.7	174.2
09	22.6	20.3	15.1	13.0	69.4	66.4	45.1	37.6
10	.	.	.	.	.	.	.	.
11	325.3	404.2	457.7	488.5	1,860.5	2,058.0	2,285.9	2,362.6
12	296.6	333.5	423.4	499.6	343.0	360.1	443.4	523.3
13	52.9	55.9	66.7	91.8	89.6	100.7	99.5	129.3
14	25.7	23.7	29.8	35.7	52.4	53.1	69.8	81.2
15	1,276.9	1,628.3	1,569.0	2,028.4	3,574.9	4,550.0	4,381.0	5,588.3
16	174.7	217.7	207.6	236.4	450.3	525.5	478.9	539.7
17	11.9	4.8	6.8	3.6	67.2	35.4	53.4	10.7
18	64.8	83.1	55.9	54.9	109.4	138.8	85.1	121.7
19	145.2	152.3	150.4	151.1	340.0	379.5	344.4	380.4
20	11.9	25.5	25.5	26.8	58.3	97.2	114.1	100.1
21	410.8	391.6	527.8	525.8	482.9	457.2	599.8	598.0
22	97.6	96.5	105.4	120.3	236.0	237.4	249.3	291.0
23	89.4	101.7	132.2	130.7	251.2	276.4	285.7	279.4
24	273.2	217.8	243.7	343.6	792.7	643.8	684.2	968.6
25	93.5	53.2	50.2	49.8	100.3	58.3	54.5	54.2
26	110.1	82.6	91.8	99.3	339.1	253.7	260.7	305.7
27	1,115.1	1,305.7	1,528.1	1,660.0	2,343.1	2,661.4	3,126.4	3,389.0
28	181.7	185.3	201.8	211.1	441.1	448.2	486.9	502.2
29	837.0	905.7	1,002.5	1,063.9	2,184.2	2,483.7	2,758.6	3,004.4
30	808.9	881.6	938.1	1,047.9	1,393.1	1,524.0	1,667.2	1,851.5
31	786.9	745.8	833.8	666.7	1,229.2	1,202.8	1,348.7	1,109.3
32	407.0	327.7	419.1	465.1	1,059.0	903.3	1,027.7	1,189.2
33	10.6	25.8	10.1	2.7	173.6	188.2	25.6	13.3
34	578.2	643.6	815.1	918.1	1,850.5	2,125.1	2,271.2	2,615.7
35	26.0	21.2	24.4	46.3	53.0	48.3	47.1	95.3
36	1,330.6	1,572.9	1,703.2	1,365.0	1,815.7	2,153.3	2,355.8	1,897.0
37	62.2	60.2	58.9	50.1	104.0	98.9	91.5	85.6
38	46.5	72.6	97.1	62.3	74.5	126.5	176.5	114.4
39	86.5	36.3	92.4	27.9	168.8	160.3	203.5	187.2
40	224.9	303.7	333.0	380.9	453.3	612.2	669.9	784.4
41	879.5	607.3	550.5	554.6	1,659.6	1,145.1	1,046.2	1,092.4
42	16.1	34.9	10.4	45.4	46.1	81.9	22.5	62.2
43	153.8	115.4	137.2	153.9	284.6	232.0	287.8	337.1
44	2,581.3	2,489.2	2,357.6	2,467.1	4,419.6	4,446.2	4,362.1	4,787.9
45	1,666.1	1,602.5	1,881.6	1,826.4	4,212.2	3,810.0	4,394.3	4,152.9
46	200.3	238.6	261.9	281.3	429.7	538.1	572.7	608.0
47	148.0	173.0	210.6	166.3	229.6	261.2	267.9	247.0
48	95.6	97.7	97.8	96.8	187.4	199.1	208.6	210.0
49	98.1	99.7	127.1	149.9	192.6	193.3	246.0	283.9
50	133.6	161.3	213.9	233.2	332.9	459.8	543.9	441.7
51	176.0	222.7	286.5	244.1	636.9	637.5	770.0	626.0
52	210.2	225.3	204.1	90.9	576.1	617.2	556.0	261.6
53	174.7	196.2	211.3	239.8	497.6	542.8	486.6	518.6
54	1,400.5	1,235.6	1,160.3	998.3	2,237.2	1,858.4	1,648.3	1,343.9
55	719.0	792.0	829.5	923.9	1,088.9	1,193.3	1,339.0	1,471.5
56	749.9	1,012.2	1,070.6	1,065.0	1,250.8	1,619.9	1,759.6	1,927.3
57	787.9	803.9	946.8	1,042.7	1,238.3	1,258.3	1,508.1	1,697.3
58	235.2	248.1	242.0	128.6	400.7	435.4	436.2	245.2
59	211.3	223.9	227.1	157.0	331.5	349.6	339.1	244.8
60	91.8	101.2	116.0	96.1	239.8	218.2	246.6	215.1
61	14.2	19.3	18.8	18.8	25.9	35.2	34.2	37.1
62	120.8	116.6	118.7	116.9	221.8	217.4	221.4	216.8

Appendix 8: Production in the Port of Rotterdam

Sector names located in Appendix 6

Sector	Scenario A, 2015	Scenario A, 2017	Scenario A, 2019	Scenario A, 2021	Scenario B, 2015	Scenario B, 2017	Scenario B, 2019	Scenario B, 2021
01	6.5	4.2	8.4	37.9	61.1	50.5	67.3	136.7
03	.	.	.	.	.	.	.	.
04	156.6	67.4	41.1	35.0	281.8	129.9	75.4	65.7
05	572.6	528.8	572.1	608.5	761.7	725.7	765.6	834.0
06	5.1	4.9	4.9	4.3	12.4	10.8	11.6	10.9
07	8.8	8.7	4.3	3.0	15.2	16.1	9.9	6.5
08	.	.	22.6	24.7	.	.	39.1	42.3
09	7.7	5.6	7.0	8.1	18.9	13.3	13.9	16.2
10	21,200.6	19,977.7	23,183.1	24,584.5	21,200.6	19,977.7	23,183.1	24,584.5
11	8,890.9	9,557.9	10,585.1	11,120.3	8,890.9	9,557.9	10,585.1	11,120.3
13	2.9	26.7	5.9	10.0	7.2	36.6	15.7	19.7
14	86.1	84.1	36.3	25.5	105.1	104.0	53.2	40.3
15	.	.	.	120.6	.	.	.	142.4
16	143.2	137.5	160.5	159.9	273.3	256.5	276.5	274.0
17	3.3	0.4	1.8	0.7	10.9	1.4	3.5	1.0
18	65.9	80.3	109.3	83.3	81.4	101.5	141.7	106.9
19	329.1	400.6	308.6	361.0	597.2	620.0	501.6	580.5
20	64.4	89.6	64.3	53.4	109.9	139.4	124.5	74.7
21	22.2	14.9	72.3	38.1	27.1	17.7	87.5	47.6
22	11.4	88.0	122.4	122.8	32.4	119.8	169.6	173.0
23	320.7	376.5	386.0	384.5	504.9	692.4	725.3	632.6
24	333.9	324.0	406.3	452.9	521.7	372.5	447.5	504.9
25	.	.	.	.	.	.	.	.
26	298.3	309.6	329.6	361.0	389.2	403.6	445.4	494.8
27	908.2	1,061.7	1,151.9	1,096.4	1,771.4	2,059.4	2,176.3	2,151.1
28	85.6	89.6	105.4	98.1	250.4	270.2	307.3	300.4
29	976.9	1,036.0	1,206.7	1,174.7	1,749.3	1,747.1	1,976.5	2,019.4
30	2,546.7	2,777.3	3,022.4	3,360.0	2,546.7	2,777.3	3,022.4	3,360.0
31	484.8	480.2	546.3	505.0	754.5	761.3	859.7	802.1
32	3,771.1	3,820.0	3,831.6	4,383.0	3,771.1	3,820.0	3,831.6	4,383.0
33	.	10.6	15.4	13.1	.	15.8	19.2	15.5
34	7,593.6	7,763.6	8,075.3	9,408.6	7,593.6	7,763.6	8,075.3	9,408.6
35	72.8	83.5	32.4	35.4	107.9	122.7	51.0	52.0
36	96.2	75.7	76.2	68.3	206.1	180.3	202.9	174.1
37	1.8	2.4	3.7	1.8	3.7	5.1	9.8	3.8
38	3.8	5.4	8.2	5.8	31.6	48.7	42.2	26.0
39	23.0	9.9	12.2	.	41.1	16.0	20.1	.
40	68.6	83.2	117.6	134.4	191.1	243.5	289.9	311.8
41	239.1	169.3	641.1	474.3	385.5	326.8	726.8	559.7
42	12.6	1.5	11.2	24.4	16.0	5.7	14.6	26.3
43	63.5	70.8	71.0	79.0	82.7	92.7	96.8	106.3
44	217.3	161.0	244.8	253.8	517.5	396.0	521.1	566.4
45	505.2	459.1	540.1	570.2	736.5	677.1	778.3	846.6
46	203.5	139.5	153.2	196.7	340.5	292.1	301.8	327.7
47	86.2	69.2	36.9	49.7	173.5	136.7	47.6	64.9
48	15.5	15.7	16.6	19.8	59.2	59.5	69.9	75.0
49	12.3	15.1	14.1	12.7	35.3	41.4	45.3	41.8
50	165.1	221.9	181.7	140.8	242.7	323.1	254.4	266.9
51	327.1	470.7	240.0	198.1	480.2	633.5	477.4	394.9
52	13.8	15.0	11.9	3.8	41.9	34.0	31.2	16.2
53	244.8	236.0	223.0	242.7	423.1	421.7	436.5	557.2
54	597.4	644.3	664.1	723.1	626.1	675.1	696.1	757.6
55	120.0	141.6	174.2	163.9	303.0	362.2	403.6	375.9
56	39.9	28.4	32.0	42.7	124.3	108.5	132.4	173.4
57	37.8	39.2	83.2	76.8	168.8	164.2	267.6	252.1
58	66.1	56.6	62.9	30.6	105.7	97.2	105.5	52.3
59	10.0	11.0	6.0	5.9	41.6	46.7	37.7	31.0
60	11.2	11.7	16.7	16.7	16.8	16.5	22.3	23.8
61	0.3	0.4	0.7	0.8	1.7	2.3	3.2	4.1
62	6.2	4.6	5.2	5.3	32.8	29.7	33.5	32.4

Appendix 9: Production in the Port of Amsterdam

Sector names located in Appendix 6

Sector	Scenario A, 2015	Scenario A, 2017	Scenario A, 2019	Scenario A, 2021	Scenario B, 2015	Scenario B, 2017	Scenario B, 2019	Scenario B, 2021
01	0.2	0.3	0.3	0.9	1.3	2.2	1.9	3.5
02	.	.	.	.	.	.	.	.
03	.	.	.	.	.	.	.	.
04	.	.	.	.	.	.	.	.
05	354.3	418.4	370.5	420.8	923.3	1,059.4	979.2	1,238.4
06	6.5	5.0	4.6	6.2	16.3	11.8	11.1	14.8
07	5.0	5.2	10.0	10.7	15.1	15.9	28.3	30.1
08	.	.	.	.	.	.	.	.
09	33.8	25.3	26.9	20.7	107.1	87.1	89.7	73.7
10	.	.	.	.	.	.	.	.
11	329.8	370.2	245.4	216.7	582.2	625.1	510.7	430.3
13	41.5	71.1	72.5	82.6	93.6	138.3	152.6	169.9
14	42.7	49.2	68.3	71.5	60.5	64.1	94.0	107.9
15	.	.	.	.	.	.	.	.
16	84.0	85.6	86.3	96.4	213.8	218.9	232.0	251.7
17	28.7	56.4	138.3	276.8	81.3	159.2	262.3	679.9
18	.	.	.	85.2	.	.	.	291.0
19	106.0	117.5	108.1	120.0	202.9	229.4	267.6	294.1
20	.	.	14.4	.	.	.	19.3	.
21	17.1	9.1	3.2	3.4	42.7	21.4	7.4	8.0
22	32.0	25.4	7.7	11.1	65.0	68.5	22.7	33.1
23	35.4	47.4	46.4	45.3	83.6	110.6	113.1	111.7
24	.	84.0	210.6	142.5	.	203.8	532.2	357.9
25	.	.	.	.	.	.	.	.
26	853.0	927.8	849.9	924.0	1,027.3	1,135.4	1,070.4	1,127.8
27	532.6	539.3	727.9	701.5	1,287.2	1,265.4	1,687.4	1,580.8
28	120.0	121.2	122.4	142.1	247.7	253.4	273.9	313.4
29	988.4	1,041.1	1,519.6	1,705.3	2,018.3	2,194.4	3,384.7	3,828.1
30	119.9	178.6	185.8	201.7	368.7	481.0	497.9	578.0
31	153.6	139.4	174.0	147.8	332.3	272.9	339.8	301.2
32	597.3	562.2	810.8	897.5	719.5	677.6	921.9	1,020.1
33	.	.	.	.	.	.	.	.
34	467.1	519.1	556.3	705.5	782.3	868.5	924.5	1,216.0
35	100.0	110.3	113.4	137.8	172.5	194.5	200.6	278.1
36	92.4	120.6	128.4	120.7	243.5	314.6	348.7	325.1
37	276.4	368.4	447.3	448.4	699.9	917.6	1,111.4	1,134.2
38	90.1	166.2	287.1	216.7	239.5	426.0	743.2	557.7
39	379.6	291.2	298.9	539.1	888.3	769.6	880.2	1,459.0
40	312.8	364.1	601.7	815.4	827.3	985.0	1,606.9	2,153.4
41	358.8	343.1	337.6	397.7	927.4	890.3	895.9	1,061.3
42	359.8	.	.	75.2	908.5	.	.	200.4
43	29.4	159.0	112.7	168.8	76.0	405.1	308.8	463.1
44	341.6	438.5	470.5	492.7	911.2	1,190.5	1,290.4	1,330.9
45	403.9	435.3	472.0	564.1	1,090.9	1,188.2	1,299.4	1,545.9
46	55.6	73.3	119.6	144.9	130.5	173.9	269.2	328.5
47	14.7	12.0	17.1	26.7	41.1	33.8	50.2	66.9
48	145.1	183.3	167.3	159.5	371.6	481.6	439.1	408.3
49	40.0	48.8	54.2	67.4	98.7	122.7	141.6	176.7
50	66.4	99.1	275.2	158.1	132.7	187.0	526.0	361.2
51	116.8	135.1	193.2	234.3	306.3	355.8	540.7	653.3
52	146.2	647.0	585.6	786.7	280.7	1,501.6	1,341.2	1,907.9
53	181.8	196.3	195.5	228.6	515.5	549.1	550.3	647.9
54	933.8	948.8	1,204.3	1,786.2	1,517.1	2,418.9	3,075.6	4,484.5
55	59.8	68.5	68.0	82.2	156.4	181.4	190.3	231.8
56	109.7	113.6	132.8	153.5	323.2	322.3	373.1	425.2
57	55.7	33.5	61.2	73.9	154.7	91.9	186.5	223.9
58	57.3	63.4	76.4	37.5	145.1	162.6	198.7	97.9
59	14.8	13.7	16.6	10.9	38.5	35.1	43.8	28.3
60	50.5	63.5	36.5	38.2	128.9	161.7	93.1	96.5
61	3.4	5.6	10.3	4.3	8.5	13.4	25.4	12.6
62	14.7	17.5	16.5	17.1	43.0	48.0	44.6	46.0

Appendix 10: Summary of the results for selected activities on the DCS, in seaports and in the coastal area

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Sector	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Seaports (excl. seashipping)	7,485	114	65,696	49,820	15,876	15,876
	Coastal areas (excl. fishing)	1,175	44	4,100	1,916	2,183	2,183
	Oil and gas extraction	519	4	5,013	1,608	3,405	3,405
	Fisheries	19	1	153	64	89	89
	Offshore wind energy	5	0	158	70	88	88
	Marine aggregates	18	0	145	93	52	52
	Sea shipping	542	9	6,601	4,694	1,907	1,907
	Total activities at sea	1,103	15	12,071	6,529	5,542	5,542
	The North Sea economy	9,763	173	81,866	58,265	23,601	23,601
	Total activities on land	8,661	158	69,796	51,736	18,059	18,060
2017	Seaports (excl. seashipping)	7,846	117	69,326	52,250	17,076	16,883
	Coastal areas (excl. fishing)	1,308	48	4,628	2,135	2,493	2,332
	Oil and gas extraction	332	3	3,144	1,072	2,071	2,727
	Fisheries	19	1	151	56	95	77
	Offshore wind energy	12	0	547	207	341	389
	Marine aggregates	16	0	122	76	46	45
	Sea shipping	543	9	6,059	4,372	1,687	1,848
	Total activities at sea	921	13	10,023	5,783	4,241	5,086
	The North Sea economy	10,074	179	83,977	60,167	23,810	24,301
	Total activities on land	9,153	166	73,954	54,384	19,570	19,215
2019	Seaports (excl. seashipping)	8,711	125	76,536	58,292	18,244	17,540
	Coastal areas (excl. fishing)	1,437	50	4,945	2,283	2,662	2,383
	Oil and gas extraction	339	3	2,649	972	1,676	2,140
	Fisheries	20	1	135	54	81	72
	Offshore wind energy	12	0	541	203	339	324
	Marine aggregates	21	0	149	91	58	48
	Sea shipping	547	9	6,310	4,758	1,552	1,565
	Total activities at sea	938	13	9,784	6,078	3,706	4,150
	The North Sea economy	11,086	188	91,265	66,654	24,611	24,073
	Total activities on land	10,148	175	81,480	60,575	20,905	19,923
2021	Seaports (excl. seashipping)	9,040	124	83,590	62,663	20,927	19,058
	Coastal areas (excl. fishing)	1,469	50	4,411	2,120	2,292	1,958
	Oil and gas extraction	278	2	3,272	1,327	1,945	1,584
	Fisheries	23	1	142	57	85	71
	Offshore wind energy	30	0	552	485	67	86
	Marine aggregates	27	0	213	131	82	65
	Sea shipping	587	9	7,352	4,954	2,398	1,479
	Total activities at sea	945	13	11,531	6,953	4,578	3,286
	The North Sea economy	11,454	187	99,533	71,735	27,797	24,302
	Total activities on land	10,509	174	88,001	64,782	23,219	21,016

Appendix 11: Key indicators for the coastal NUTS-3 regions

Table .1 Key indicators for the coastal NUTS-3 regions

Employment figures x 1000 FTE, monetary values x €1,000,000

Year	Area	Compensation	Employed persons	Production	Intermediate cons.	GVA	GVA 2015 prices
2015	Overig Groningen	7,226	159	32,510	14,234	18,276	18,276
	Noord-Friesland	4,366	112	17,072	8,663	8,410	8,410
	Kop van Noord-Holland	5,024	132	19,183	9,944	9,239	9,239
	Alkmaar e.o.	3,702	87	13,401	6,678	6,723	6,723
	IJmond	3,151	66	13,687	7,870	5,817	5,817
	Agglomeratie Haarlem	3,233	77	11,553	5,636	5,917	5,917
	Agglomeratie Leiden en Bollenstreek	7,230	152	27,270	13,938	13,332	13,332
	Agglomeratie's-Gravenhage (Excl. Zoetermeer)	16,447	310	54,288	25,817	28,471	28,471
	Delft en Westland	4,915	108	17,925	8,765	9,160	9,160
	Rijnmond	27,342	526	127,933	76,677	51,255	51,255
	Overig Groot-Rijnmond	2,221	55	10,037	5,480	4,557	4,557
	Zeeuwsch-Vlaanderen	1,694	38	8,226	4,765	3,461	3,461
	Overig Zeeland	4,030	100	18,377	10,714	7,663	7,663
	Total	90,582	1,922	371,461	199,180	172,281	172,281
2017	Overig Groningen	7,840	169	31,828	14,752	17,077	18,092
	Noord-Friesland	4,547	114	17,438	9,020	8,418	8,340
	Kop van Noord-Holland	5,270	136	19,987	10,329	9,658	9,351
	Alkmaar e.o.	3,839	89	13,794	6,824	6,971	6,793
	IJmond	3,193	67	14,252	8,471	5,781	5,718
	Agglomeratie Haarlem	3,471	81	12,253	5,831	6,422	6,192
	Agglomeratie Leiden en Bollenstreek	7,457	156	27,887	14,229	13,658	13,275
	Agglomeratie 's-Gravenhage (Excl. Zoetermeer)	17,082	319	55,072	26,133	28,939	28,385
	Delft en Westland	5,409	117	19,427	9,474	9,953	9,679
	Rijnmond	28,930	547	132,367	78,153	54,214	53,124
	Overig Groot-Rijnmond	2,310	56	10,554	5,708	4,846	4,694
	Zeeuwsch-Vlaanderen	1,780	39	8,715	5,177	3,538	3,541
	Overig Zeeland	4,208	103	18,773	10,709	8,063	7,848
	Total	95,335	1,992	382,348	204,810	177,538	175,032
2019	Overig Groningen	8,528	177	33,417	15,847	17,569	17,048
	Noord-Friesland	5,047	120	19,375	10,081	9,294	8,688
	Kop van Noord-Holland	5,822	142	21,714	11,274	10,440	9,605
	Alkmaar e.o.	4,151	93	15,374	7,617	7,757	7,174
	IJmond	3,436	69	14,885	8,784	6,101	5,890
	Agglomeratie Haarlem	3,628	81	12,722	5,911	6,811	6,231
	Agglomeratie Leiden en Bollenstreek	8,056	164	30,114	15,471	14,643	13,515
	Agglomeratie 's-Gravenhage (Excl. Zoetermeer)	18,926	346	60,249	28,657	31,592	29,453
	Delft en Westland	6,046	125	21,389	10,466	10,923	10,125
	Rijnmond	31,537	578	145,379	86,594	58,785	54,664
	Overig Groot-Rijnmond	2,561	60	11,691	6,380	5,311	4,887
	Zeeuwsch-Vlaanderen	2,013	41	9,757	6,035	3,722	3,488
	Overig Zeeland	4,621	108	21,049	12,076	8,973	8,210
	Total	104,372	2,103	417,114	225,192	191,921	178,977
2021	Overig Groningen	9,252	183	34,271	16,473	17,798	15,617
	Noord-Friesland	5,506	125	20,906	11,058	9,848	8,779
	Kop van Noord-Holland	6,276	146	23,310	12,215	11,095	9,713
	Alkmaar e.o.	4,576	97	16,628	8,366	8,263	7,283
	IJmond	3,628	71	16,741	9,994	6,747	6,173
	Agglomeratie Haarlem	3,885	83	13,387	6,237	7,150	6,251
	Agglomeratie Leiden en Bollenstreek	8,797	171	31,884	16,684	15,199	13,429
	Agglomeratie 's-Gravenhage (Excl. Zoetermeer)	20,493	359	62,420	29,600	32,821	29,426
	Delft en Westland	6,668	130	23,516	11,533	11,983	10,551
	Rijnmond	33,903	592	156,980	93,226	63,753	56,230
	Overig Groot-Rijnmond	2,790	62	12,485	6,828	5,657	4,992
	Zeeuwsch-Vlaanderen	2,142	42	10,449	5,944	4,505	3,812
	Overig Zeeland	4,988	111	22,827	13,197	9,630	8,470
	Total	112,906	2,172	445,804	241,355	204,449	180,726

Appendix 12: Glossary

Employed persons: are all persons who are working for a business unit or private household residing in the Netherlands. Employed persons include all persons who: - have a paid job for at least one hour a week. - perform a job of which the payment is withheld from registration of tax and/or social insurance authorities, while the work itself is legal. - are temporarily not working (due to illness, bad weather, etc.), but who continue to receive their remuneration. - have taken a temporarily unpaid leave. Employed persons may either be employees or self-employed.

Self-employed: individual that earns his/her income by performing labour on his/her own (company, profession) or who cooperate in the business of their family. The latter are not counted as self-employed if there is an employment contract

Compensation of employees: The total remuneration paid by employers to their employees in return for work done, even if they are actually withheld by the employer and paid directly to tax authorities, social security schemes and pension schemes.

Full-time equivalent job: Labour input in full-time equivalent jobs is calculated by expressing all jobs (be it full-time, part-time or flexible) to full-time equivalents. The full-time equivalent is obtained by dividing the annual contractual hours of the job by the annual contractual hours considered full-time (in the same branch of industry). Two half-time jobs thus add up to one full-time equivalent. For self-employed (mostly not included in the figures in this paper) the full-time equivalent is the quotient of the usual weekly work hours of that job and the average weekly work hours of self-employed with 37 or more normal weekly hours (in the same branch of industry).

Production / Output: The value of all goods produced for sale, including unsold goods, and all receipts for services rendered.

Intermediate consumption: All goods and services used up in the production process in the accounting period, regardless the date of purchase. This includes for example fuel, raw materials, semi-manufactured goods, communication services, cleansing services and audits by accountants.

Value added: The difference between output and intermediate consumption.