

Fish clusters in the Netherlands (baseline): size and dependence of the chain and supply industry on North Sea fisheries

Impact analysis of policy decisions on the chain of Dutch fishing regions



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This study is a sub-study of the overarching socio-economic impact analysis of fisheries. The central research question is: what is the socio-economic size of the fish clusters per fishing region and to what extent do these fish clusters depend on Dutch fisheries? This study is a baseline measurement. Not only the effects of policy decisions but also the impact of current developments are included in this study, such as the energy crisis due to the war in Ukraine and uncertainty about the future due to the announced decommissioning of the Dutch cutter fleet (2022-2023). Of the total population, 346 companies belonged to the Dutch fish cluster with a total turnover of €6.6bn and 13,550 employees (8,350 FTEs) in 2021. Of these, 314 companies were dependent on North Sea fisheries, ranging from 5% to 100% for turnover. With an average 40-50% dependence on North Sea fisheries for turnover, about half (€2.9bn) was directly attributable to North Sea fisheries. The chain and supply industry in all six defined fishing regions saw negative impacts of policy decisions on North Sea fisheries, although the impact was caused by a stacking of both national and European policy decisions and market developments (such as high fuel prices). The fishing regions that experienced the greatest negative impacts were IJmuiden, Urk, Kop van Noord-Holland and Zuidwest-Nederland. In contrast, negative impacts for fish clusters in the Katwijk-Scheveningen and Wadden coast regions were less significant. Fish auctions and fishing cooperatives are most dependent on North Sea fisheries. Unlike the other links in the chain, fish auctions and fishery cooperatives have little or no diversion options in the event of a shrinking cutter fleet and decreasing supply. In the opinion of the companies in the fish clusters, the biggest concerns are: (1) the loss of staff and thus the hard-to-replace specialist professional knowledge built up for years in practice from generation to generation, (2) the worsened competitive position due to the loss of the distinctiveness of fresh North Sea fish compared to imported farmed fish, (3) the loss of the identity of fishing regions as a cultural commons and (4) feelings of uncertainty about the future as the companies experience opposition towards North Sea fisheries from nature conservation organisations and feel that they receive little timely financial and moral support from the government. Data were collected through digital survey, interviews and regional workshops supplemented by public data sources. Starting in 2023, monitoring will take place as a follow-up study to the baseline measurement, analysing the socio-economic effects of policy decisions and current developments on fish clusters.

Deze studie is een deelonderzoek van de overkoepelende sociaal-economische impactanalyse visserij. De centrale onderzoeksvraag is: wat is de sociaal-economische omvang van de visclusters per visserijregio en in welke mate zijn deze visclusters afhankelijk van de Nederlandse visserij? Deze studie is een nulmeting. Niet alleen de effecten van beleidsbeslissingen maar ook de impact van actuele ontwikkelingen zijn meegenomen in deze studie, zoals de energiecrisis door de oorlog in Oekraïne en de onzekerheid over de toekomst vanwege de aangekondigde sanering voor de Nederlandse kottervloot (2022-2023). Van de totale populatie behoorden 346 bedrijven tot het Nederlandse viscluster met een totale omzet van € 6,6 mld. en 13.550 werkzame personen (8.350 fte) in 2021. Daarvan waren 314 bedrijven afhankelijk van Noordzeevisserij variërend van 5 tot 100% voor de omzet. Met een gemiddelde 40-50% afhankelijkheid van Noordzeevisserij voor de omzet was ongeveer de helft (€ 2,9 mld.) direct toe te wijzen aan Noordzeevisserij. De keten en toeleverende industrie in alle zes gedefinieerde visserijregio's zagen negatieve invloeden van beleidsbeslissingen over de Noordzeevisserij, al werd de impact door een stapeling van zowel nationale als Europese beleidsbeslissingen en martkontwikkelingen (zoals hoge brandstofprijzen) veroorzaakt. De visserijregio's die de grootste negatieve impact ervaarden waren IJmuiden, Urk, Kop van Noord-Holland en Zuidwest-Nederland. Daartegen waren de negatieve invloeden voor visclusters in de regio's Katwijk-Scheveningen en de Waddenkust minder groot. Visafslagen en visserijcoöperaties zijn het meest afhankelijk van de Noordzeevisserij. In tegenstelling tot de andere schakels in de keten hebben visafslagen en visserijcooperaties weinig tot geen uitwijkmogelijkheden bij een krimpende kottervloot en afnemende aanvoer. Volgens de bedrijven in de visclusters zijn de grootste zorgen: (1) het verliezen van personeel en daarmee de moeilijk vervangbare specialistische vakkennis jarenlang opgebouwd in de praktijk van generatie op generatie, (2) de verslechterde concurrentiepositie door het wegvallen van het onderscheidend vermogen van verse Noordzeevis ten opzichte van geïmporteerde kweekvis, (3) het verlies van de identiteit van visserijregio's als cultureel gemeengoed en (4) gevoelens van onzekerheid over de toekomst doordat de bedrijven oppositie richting de Noordzeevisserij ervaren vanuit natuurbeschermingsorganisaties en weinig tijdige financiële en morele steun voelen van de overheid. De gegevens zijn verzameld via digitale enquête, interviews en regionale workshops aangevuld met openbare databronnen. In de periode vanaf 2023 zal een monitoring als vervolgonderzoek op de nulmeting plaatsvinden waarbij de sociaal-economische effecten van beleidsbeslissingen en actuele ontwikkelingen op visclusters geanalyseerd worden.

Keywords: fish cluster, fish processing, chain, supply industry, impact analysis, socio-economic, policy decisions, baseline, fishing region

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Reading guide and context

The structure of the report by chapter

The main aim of this study is to provide a baseline measurement of the size of Dutch fish clusters by fishing region. Furthermore, an answer had to be given on the second part of the main question in this study. Specifically, what is the dependence of the chain and supply industry per fishing region on North Sea fish so that the effects of policy decisions can be determined? Chapters 2 and 3 describe the size and characteristics of fish clusters per fishing region. Chapters 4 and 5 provide insight into the socio-economic dependency of fish clusters per fishing region on North Sea fish. Chapter 4 is mainly based on numerical results from this study, while Chapter 5 uses insights from qualitatively collected data to examine in more detail the initial effects of policy decisions and current developments for fish clusters. Chapter 6 discusses the limitations of this study and recommendations for future research.

Context of policy decisions

When reading this report, it is important to be aware of the context of the policy decisions identified and the degree of dependence on North Sea fisheries in this baseline study. The influences of policy decisions on the fish clusters include both decisions taken by the Dutch government and European governments. For example, the Brexit agreement and the pulse ban are policy decisions taken at European level. In contrast, the VisWad is an example of a national government decision. Of course, there are also many national decisions initiated at European level. Ultimately, both national and European policy decisions can have effects on fish clusters in the Netherlands. In particular, the stacking of policy decisions was the direct cause of the motions adopted in the House of Representatives.¹ The motions led to the

¹ Von Martels motion adopted: <u>https://www.tweedekamer.nl/kamerstukken/detail?id=2020Z24275&did=2020D50982</u> and Lodders c.s. motion adopted: https://www.tweedekamer.nl/kamerstukken/moties/detail?id=2020D52724&did=2020D52724 Ministry of Agriculture, Nature and Food Quality (LNV) commissioning this study.

Current developments alongside policy decisions

Determining the context of socio-economic impact for a sector is never static and is not only determined by government decisions. At the time this research started, several developments caused negative socio-economic impacts on the Dutch North Sea fishery with impact on the chain and supply industry. Consider developments in the market economy such as the high fuel prices caused by the war in Ukraine and the related inflation in Europe. These are developments that do not involve policy decisions by Dutch or European governments, but reinforce negative consequences of government decisions or even completely dominate the socio-economic situation of fish clusters in the Netherlands. Developments such as high fuel prices and the uncertainty arising from the announced decommissioning of Dutch cutters played out particularly in 2022. These developments and their effects are reflected in the results of the survey among companies, interviews and regional workshops (see Chapter S.3 Methodology). It is important to note that the effects of policy decisions alone are very difficult, if not almost impossible, to distinguish from actual developments. One enhances the other in the socio-economic impact on fish clusters.

Distinction between objective outcomes and opinions or feelings from the participating companies

This study distinguished between objective outcomes and opinions or feelings of participants from the companies active in the fishing clusters. The opinions or feelings are shown as text in italics. The objective outcomes are represented by the non-cursive text.

Baseline measurement versus monitoring as a follow-up study

This study is a baseline measurement. It is the first time, as far as known from the literature, that systematic research per fishing region has been conducted into the socio-economic size of the Dutch fish clusters and dependence of the chain and supply industry per fishing region on North Sea fisheries. Of several policy decisions and developments, the actual impact has yet to be analysed as they extend beyond 2022 or have only recently come into effect. For example, the socio-economic impact of the decommissioning of the Dutch cutter fleet cannot be determined until it is clear how many fishing vessels per fishing region have actually made use of the scheme. The baseline measurement has identified initial effects of policy decisions and developments on the fish cluster. This gives reason and need for follow-up research where the effects of policy decisions are monitored, all the more so because of the dynamic context in which the Dutch fishery has been. Brexit and the Covid-19 crisis had only recently passed or the war in Ukraine caused historically high fuel prices. In addition, Dutch North Sea fishermen experience a lot of uncertainty about the future for their operations due to many social and political discussions taking place that could further constrain fisheries. Think of political decision-making in The Hague and Brussels for further expansion of offshore wind farms (Rijksoverheid, 2022a) and protecting nature in the North Sea and Wadden Sea from bottom trawling (RD, 2021) and the stated reduction of nitrogen emissions by fishing vessels (particularly shrimp fishermen in Natura 2000) in order to get permits (such as the Nature Conservation Act permit) granted again (NH Nieuws, 2022; Tweede Kamer, 2022; Omrop Fryslan, 2022). From 2023, follow-up research to the baseline measurement is planned in which socio-economic effects on the fish clusters will be monitored and analysed.

The baseline measurement is a sub-study of the impact analysis.² Besides the planned monitoring to analyse the socio-economic effects of policy decisions and developments on the chain, a fisheries model is being developed to estimate the socio-economic effects of policy measures and external developments on fisheries for the future. The monitoring and model

development are planned as follow-up research starting in the second half of 2023.

² Socio-economic impact analysis fish clusters and fishing regions: Socio-economic impact of policy decisions on fleet, fish chain and fishing communities: <u>https://www.wur.nl/nl/onderzoek-resultaten/onderzoeksprojecten-lnv/soorten-</u> <u>onderzoek/kennisonline/sociaal-economische-gevolgen-van-beleidsbeslissingen-op-vloot-</u> <u>visketen-en-visserijgemeenschappen.htm#_ftn1</u>

Preface

Dutch fisheries have been increasingly constrained in recent years by developments in (fisheries) policy in the North Sea. The socio-economic consequences of these developments are only partly clear for the Dutch fishery. Furthermore, it is unknown how these changes in policy and Dutch fisheries translate into socio-economic effects on the chain and fishing regions.

Policy decisions, such as: the North Sea Agreement, the Wadden Agenda, the Cutter Vision and Brexit, including area closures and restrictions in space use by offshore wind farms, nitrogen legislation and nature reserves, have major consequences for Dutch fisheries. The adopted motions Lodders and Von Martels³ requested from the House of Representatives an impact analysis of these policy decisions for the Dutch fishery, the fish chain (including fish processing industry) and the economy of regions where North Sea fishery is an important part.

Part of this impact analysis is to do a baseline measurement. Little was yet known about the interdependence of North Sea fisheries for the supply industry and the fish chain and the total size of these fish clusters. The fish chain refers to the assemblage of fish auctions, transport, fish processing and fish wholesale in the various fishing regions. This report has mapped the various activities for each region and quantified interdependencies as accurately as possible. For this baseline measurement, we received data from various representatives from all regions and from all links in the fishery chain. A representative group of companies and individuals was surveyed through a digital survey, interviews and during regional workshops. We would like to sincerely thank everyone who participated.

(Old) Hietbrink

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³ Von Martels motion adopted: <u>https://www.tweedekamer.nl/kamerstukken/detail?id=2020Z24275&did=2020D50982</u> and Lodders c.s. motion adopted: https://www.tweedekamer.nl/kamerstukken/moties/detail?id=2020D52724&did=2020D52724

Glossary

- **Fishing region** = a region with a clearly present fishing cluster, fishing ports with supply industry, trade and processing and associated fishing municipalities and communities. The following six fishing regions are defined, based on the study 'Impact analysis of policy decisions on the chain of Dutch fishing regions' (Quirijns et al., 2019):
- Wadden coast (provinces of Friesland and Groningen) in Dutch written as Waddenkust
- Kop van Noord-Holland (including Den Helder, Texel, Den Oever, Wieringen)
- IJmuiden
- Katwijk-Scheveningen
- Zuidwest-Nederland (including Stellendam, Ouddorp, Goedereede, Vlissingen, Arnemuiden, Breskens)
- Urk
- **Fish cluster** = The fishery, processing chain and supply industry within fishing regions. This report focuses on the socio-economic size of the fish processing chain and supply industry. The size of the Dutch fisheries are approached in the other sub-studies of the impact analysis (Hamon et al., 2023) and the annual Visserij in Cijfers (2022) presentation. Fish clusters in this report are considered the total of companies in the fish processing chain (such as auctions, transport, processing, fish wholesale) and the supply industry (shipbuilding, port services, technical services such as electricians, ship carpenters, etc.). Several fish clusters are regionally distributed in the Netherlands. This report alternately refers to the Dutch fish cluster (singular as being all regional fish clusters together) and fish clusters (plural, as the individual regional fish clusters). Fish clusters refer to companies that provide both processing or supplying services and products from North Sea fisheries and non-North Sea fisheries such as imported fish products. To determine dependence on North Sea fishery, the focus is on the companies within fish clusters that had at least 5% of their annual turnover from North Sea fishery in 2021. This excludes companies that had little or no (0-5% of annual turnover) dependence on North Sea fisheries.
- Chain = All activities taking place in links by various organisations and parties where value is added to the product or service between the stage of production and consumption. The chain in this study is defined as: all activities from the landing of North Sea fish to the processing and trade of fish products. Wholesalers not specialised in only fish products but in food products broadly such as fruit and vegetables, meat, fish, fish retail (fish mongers and itinerant fish stalls), supermarkets, distribution and catering are also part of the North Sea fish product chain. However, these links in the chain were left out of consideration or only qualitatively included because of the too large number of companies, hardly or any distinguishable economic relations with North Sea fish or because little or no quantitative data on them can be collected within this study. In general, the further downstream the link or activity in the chain towards the end use of the product or service (here: production of North Sea fish products or supplying services), the more difficult it becomes to establish economic relationships with the primary link (here: North Sea fisheries).
- **Supply industry** = The (often technical) companies that provide services or products to the fishery or chain so that they can be operational in producing the North Sea fish product. For example: shipyards, port service companies, technical installation companies such as fishing cooperatives, ship carpenters, electricians, gas oil suppliers, the frozen or refrigerated stock and storage of raw materials (raw fish products) or already processed fish products, supply of equipment for ships or fish processing companies, consultancy and other services for the fishery or chain, ship builders
- **Other stakeholders** = interest groups such as umbrella/branch and producer organisations, non-governmental organisation (abbreviated as NGOs), fisheries education, ship brokers, etc.

- Fish species = Whenever fish species are mentioned in this report, this includes crustaceans and molluscs. The following categories of commercial fish, crustaceans and molluscs caught in the North Sea or Wadden coast are included in this study:
- Shrimp (the grey North Sea shrimp also known as Dutch shrimp Crangon crangon, the scientific Latin name)
- Flatfish (species such as plaice, sole, turbot, brill)
- Demersal roundfish (red gurnard, mullet, cod, whiting)
- Langoustine (Norwegian lobsters)
- Other fish (including molluscs such as squid, cuttlefish)
- Pelagic fish (herring, mackerel, blue whiting, horse mackerel)
- Fish preparation and preservation = In this report, fish processing refers to both preparation and preservation in one. In fact, there is a difference between preparation and preservation. Fish preservation are operations that substantially alter the original product (including heating and smoking). Fish preparation refers to the activities that make the original fish product change its shape and texture less substantially or hardly at all. These include cooling, freezing, slicing (filleting and portioning), dividing, grinding and peeling (NVWA, n.d.).
- **Fishing cooperative** = Established by and for fishermen with the aim of saving costs by jointly purchasing vessel supplies (such as fuel) and fishing materials (fishing nets). Nowadays, most fishing cooperatives also provide technical services such as maintenance of cutters, changing of fishing nets and gear (such as beam trawl or sumwing) and installation of machinery on board such as boilers, processing lines (scales, sorting bins, processing lines). A list of fishing cooperatives can be found through the United European Fisheries Cooperatives (VEVC) website.⁴
- **Direct employment** = Those activities in the chain where the work is directly related to the production or creation of a North Sea fish product. For example, the supply industry, fish processing, fish wholesale, transport and auctioning at auctions.

- **Indirect employment** = Those activities in the chain that do not directly contribute to the production or realisation of a North Sea fish product. Yet, from a longer-term perspective, North Sea fish products could not be produced without these activities. Think of fishery education where fishermen and fish processors are trained to catch and process North Sea fish, but also of producer organisations (POs) that take care of measures on behalf of their members (affiliated fishermen) to promote the rationale of fishing and to improve the conditions for selling fishery products.
- **SBI** = Standard Business Classification is a 4- or 5-digit number and indicates the activity of a business. For example, SBI code 1020 is fish processing and SBI code 4723 describes fish mongers.
- **Key person** = a person with a national representative role (such as at a trade association, producer organisation) or with extensive (over)visibility of the local fish chain and supply industry through, for example, board positions or years of experience as an entrepreneur active in a fishing region.
- **Cutter Decommissioning** = Fishing Vessel Decommissioning Scheme (SVV) from the Brexit Adjustment Reserve (BAR) fund. The BAR aims to mitigate the impact of Brexit.⁵
- Shrimp remediation = Tender scheme Shrimp fishery Wadden Sea.⁶

⁶ <u>https://rijkewaddenzee.nl/nieuws/opkoopregeling-garnalenvisserij-waddenzee/</u>

⁴ <u>http://www.vevc.nl/nl/civ-visserij-coooperaties-vevc</u>

⁵ <u>https://open.overheid.nl/repository/ronl-</u> <u>30c1f885f95f2a5e07184c582821e1f3973eb69c/1/pdf/openstelling-saneringsregeling-</u> <u>visserij.pdf</u> and <u>https://www.rvo.nl/subsidies-financiering/svv</u>

Summary

S.1 Key question

What is the socio-economic size of the fish clusters per fishing region and to what extent do these fish clusters depend on Dutch fisheries? Dutch fishery here means all Dutch companies active in sea fishery, including cutter fisheries (demersal fisheries including shrimp fisheries), pelagic fisheries and smallscale coastal fisheries. These are the categories of fish species: shrimp, flatfish, demersal roundfish, nephrops, pelagic fish and other fish (including squid, crabs and lobsters). The chains dependent on these fisheries belong to the (regional) fish clusters. Shellfish such as mussels and oysters are included in another standalone economic monitoring study outside the impact analysis.

S.2 Message

To the best of our knowledge, this study established for the first time the socio-economic size (such as turnover and employment) of fishing clusters as a baseline for six fishing regions in the Netherlands. The six fishing regions used based on the study by Quirijns et al. (2019) are:

- Wadden coast (provinces of Friesland and Groningen) in Dutch written as Waddenkust
- Kop van Noord-Holland (including Den Helder, Texel, Den Oever, Wieringen)
- IJmuiden
- Katwijk-Scheveningen
- Zuidwest-Nederland (including Stellendam, Ouddorp, Goedereede, Vlissingen, Arnemuiden, Breskens)
- Urk.

In addition, there are companies that belong to fishing clusters but do not fall within these six defined fishing regions. An 'other' category has been created for these businesses (see Table 3.2 in Chapter 3).

In 2021, a total of 346 companies belonged to the Dutch fish cluster, consisting of companies active in the fish-processing chain and supply industry. The total turnover of this fish cluster was €6.6bn with a around 13,550 employees (8,350 FTEs) in 2021. Of these 346 companies, 314 were dependent on North Sea fisheries ranging from low (at least 5%) to high (maximum 100%) for turnover (Table 3.3 in Chapter 3). The 314 companies combined had a total turnover of €5.8bn and 12,600 employees (8,150 FTEs) in 2021, with an average 40-50% dependence on North Sea fisheries for turnover (Table 3.1 in Chapter 3). In other words, about half (\notin 2.9bn) of that was directly attributable to North Sea fisheries with an estimated direct employment of around 4,100 FTEs and 5,250 FTEs if indirect employment is also included (Table 3.1). Specifically, an estimated 1,150 FTE of indirect jobs were linked to North Sea fisheries such as workers in fish shops, fishery teachers or persons employed by a fishery producer organisation or trade association (Section 3.5). The 314 companies with dependence on North Sea fisheries consisted of 12 auctions, 19 fish transport companies, 109 suppliers and 174 fish processing and wholesale companies. Here, 5% dependence on North Sea fishery for turnover was chosen as the lower limit because this was the lowest percentage among digital survey respondents (Table 3.3 in Chapter 3). This excludes those companies in the fish cluster that had little or no dependence (less than 5% of turnover) on North Sea fisheries. Respondents expect that the majority among the 314 companies have already partly diversified into fish species and industries other than North Sea fisheries, over the past two to three decades. This swerve, according to the companies, has been driven by a long-term trend of shrinking fishing fleet and supply in North Sea fish.

This study is a baseline measurement (with figures for 2021) and assessment of the dependence of North Sea fisheries on fish clusters. From 2023, follow-up research will analyse the effects of policy decisions for North Sea fisheries on fish clusters and monitor developments. Through a model to be developed, effects of policy decisions and external developments can be estimated for fish clusters and fishing regions. In almost all cases, policy decisions applying to the Dutch North Sea fishery have negative socio-economic effects on the fish clusters within the six fishing regions. The world does not stand still. The context of socio-economic impact analysis for a sector is never static and is not only determined by government decisions. At the time this research started, several developments were causing negative socio-economic impacts on the Dutch North Sea fishery with the chain and supply industry behind it. Some examples of developments in the market economy are the high fuel prices caused by the war in Ukraine and the related inflation in Europe. These are developments that do not involve policy decisions by Dutch or European governments, but do reinforce negative consequences of government decisions and therefore sometimes even completely dominate the socio-economic situation of fish clusters in the Netherlands. In this study, it became clear that fish clusters experience negative socio-economic impacts due to challenges in North Sea fisheries. The negative impacts were not only caused by the policy decisions, but also by the combination with developments such as high fuel prices and the expected high interest in the decommissioning scheme among Dutch cutter fishing companies in 2022-2023. The accumulation of both policy decisions and external developments are expected to impact the fish processing chain and supply industry dependent on North Sea fisheries. This report mainly focused on socio-economic impacts at group level of companies nationwide and by fishing region. At group level, impacts may be different from those for companies at individual level, as does the degree of dependence on North Sea fisheries.





¹ Landings of fish, shellfish and crustaceans by Dutch-flagged cutters and freezer trawlers in live weight (x 1,000 kilograms). Source: Visserij in cijfers, 2022.

² Imports in dead and/or processed weight (x 1,000 kilograms). This includes both whole fish and already processed fish products. Source: Eurostat, 2022.

³ The total available volume of fish (both North Sea and non-North Sea fish) for the Dutch processing chain is unknown. It could theoretically be calculated by

converting the catch¹ and import² per fish product to the weight as whole fish live (Whole Fish Equivalent) via conversion factors.

⁴ Exports consist of whole fish and already prepared/preserved fish products such as fillets (x 1,000 kilograms). Source: Eurostat, 2022.

In socio-economic terms, the fishing regions of Kop van Noord-Holland, IJmuiden, Urk and Zuidwest-Nederland are most negatively affected by the sum of policy decisions and market developments. The fuel price crisis since the war in Ukraine is the market development with the most impact. Particularly for the largest length category of cutters fishing for flatfish as these vessels consume relatively high amounts of fuel per kilogram of fish caught. These four fishing regions are mainly characterised by a close association with cutter fishing and fresh landings of North Sea fish. They are important fishing clusters for the transport and processing of fresh North Sea fish and supply services to the cutters. The fishery regions Wadden coast and Katwijk-Scheveningen are affected socio-economically to a lesser extent, as the activities and chains here are more focused on the shrimp and pelagic (aka: big sea) fisheries, respectively. These two fisheries are also expected to have negative socio-economic effects but to a lesser extent than cutter fishing. The cutter fishery is expected to face more negative effects due to a greater accumulation of policy decisions and market developments that have a negative impact (Deetman et al., 2022; Visserij in cijfers, 2022).

Of the links in the chain and supply industry, fish auctions and fishing cooperatives are largely or even completely dependent on North Sea fisheries. Both have little or no diversion options in the event of a shrinking cutter fleet and supply volumes of North Sea fish (Chapter 4). The other links and stakeholders in the chain and supply industry such as transport, fish processing/wholesale and suppliers have more diversion options and are therefore less vulnerable in socio-economic terms. Because these links can seize more diversion opportunities, these companies have already diversified over the past two to three decades to fish species other than North Sea fish to be processed and traded or by expanding supplying services towards other maritime and/or non-maritime industries. The actual impact of North Sea fishery policy decisions and their socio-economic knock-on effects on fish clusters has thus been gradually muted and absorbed by the relocation of chain companies over the past 20 to 30 years.

Companies in the fish clusters indicated in the research through survey and through interviews that the biggest negative effects and concerns besides declining turnover in North Sea fisheries are those effects that cannot be expressed in a number or figure such as turnover or employment. A particular example ishuman capital, such as the loss of skilled personnel with years of accumulated practical knowledge, from generation to generation, from the technical supply services to North Sea fisheries or the specialist processing of North Sea fish. Fishing and similarly the activities in the processing chain and supply industry are more than a profession and a source of income. The negative effects affect those employed in North Sea fisheries and the chain behind it, the livelihood and socio-cultural identity of fishing communities. Similar for other primary food producers such as farmers, herders and gardeners, the profession of fishing is often more than just work for the individuals involved. 'It is their life and livelihood. They derive their identity from it' (Kraan, 2023).

The results show that the accumulation of socio-economic effects makes it extra challenging to find future prospects for the businesses. In this study, many emotions were expressed from the companies consulted in the fishing regions. Companies perceived a lack of timely financial support and moral backing from the government. Unanimously, companies expressed their concern and lack of understanding about the increasingly restricted North Sea fisheries. The companies hardly understand why, in their opinion, policy is focusing too one-sidedly and solely on the shrinkage of the fishing fleet through the announced decommissioning (2022-2023) for Dutch cutters. Many companies indicated that they find it frustrating that financial support from the Dutch government fails to compensate for the high fuel prices while in other EU member states this compensation is offered (Visserijnieuws, 2022a). According to the companies there is a lot of communication from the Dutch government about the various funds meant to stimulate innovation and sustainability among the Dutch fishery and chain. However, the companies indicate that they do not understand why it takes so long for these financial subsidy schemes to become accessible for Dutch companies to claim. A further frequently heard emotion from companies is the lack of understanding of the perceived opposition by nature conservation organisations. The companies see the catching and processing of North Sea fish as an important social contribution to healthy and sustainable food. In the opinion of the companies active in the fish clusters, nature and fisheries go well together, while the nature conservation organisations advocate the opposite. According to the companies, it is not unwillingness to become more sustainable, but they are asking for sufficient space, time and financial support from policy in this necessary transition to sustainability. According to the companies, there are also other effects that cannot be directly expressed in figures, which have a negative impact on the

chain and supply industry. According to the companies, the main concerns are: (1) the loss of personnel and with them the hard-to-replace specialist knowhow built up over many years in practice, (2) the deterioration of the competitive position due to the loss of the distinctive character of fresh North Sea fish compared to imported farmed fish and (3) the loss of the identity of fishery regions as cultural commons. Thinking from a scenario of ever further shrinkage in North Sea fish landings, one risk is that machine manufacturers may no longer offer machines specifically for processing North Sea fish such as plaice in the future.

Delineation of the study

The focus of the study is on cutter fisheries (including shrimp fisheries), pelagic fisheries, small-scale coastal fisheries and the chains dependent on these fisheries. Shellfish fishery/farming is excluded because it involves substantively different issues and also a different administrative setting. The 346 companies active in the fish cluster in 2021 (Figure S1) do include shellfish processing and trading companies. The dependencies (Chapter 4) and developments and trends (Chapter 5) do not include these shellfish processing and trading companies. Freshwater fish species caught and landed by inland fisheries (e.g. on IJsselmeer, Markermeer and rivers) have also not been included.

The delineation of the chain and supply industry is defined and delineated as the activities from initial landing (e.g. unloading of the catch and transport by forklift and sometimes by truck to fish auction or cold-storage and freezer warehouse) to the distribution of North Sea fish products from fish processing and fish wholesale companies to domestic or foreign buyers (such as food wholesalers, catering, fish retail and supermarkets) (Figure S2).



Figure S2 The chain and supply industry of North Sea fisheries simplistically depicted. The delineation of the links included in this study fall within the blue outlined box

The latter buyers are not included in this study because these companies are not located within the region and therefore do not belong directly to the fishing clusters in the fishing regions. Another reason is that core activities and socioeconomic importance of these companies are hardly related to North Sea fish. A third reason for excluding these links and associated companies in this study is because of the limited availability of data. In general, the closer the activities and links are to primary and secondary production, the more targeted data can be collected that can be related to the specific product (here: North Sea fish). This may imply that the closer the links and activities in a chain are to the consumption or end use of the product, the more complex it becomes to collect data at all and, in addition, allocate it to North Sea fish and its impact on fishing regions. Distinguishing and allocating data such as turnover, employment and volumes to fish and then particularly North Sea fish products is very complex and almost impossible for food wholesalers, restaurants and supermarkets. For fish retail, this will be easier, but for this the size (number of fish shops) is very large with some 900-1,000 fish shops in the Netherlands. In addition, fish shops are often located more inland and not necessarily part of the chain infrastructure of fish clusters within fishing regions. Given the often high socio-economic importance of North Sea fish for fish retailing, this link in the chain is briefly mentioned but, unlike the earlier links in the North Sea fish chain, no collection of representative socio-economic data was available.

Furthermore, this study mainly focused on Dutch fisheries and companies in the chain and supply industry. Foreign flag cutters and pelagic trawlers as well as foreign subsidiaries of chain companies or suppliers were not included in the quantitative analyses. First, because this study was commissioned by the Dutch government (Ministry of Agriculture, Nature and Food Quality) and, second, because there are hardly any or no known figures on foreign companies. Nonetheless, the importance of foreign flag cutters and pelagic trawlers have been qualitatively included in this report because the chain and supply industry in certain fishing regions are socio-economically highly dependent on the landings and assignments (technical maintenance and services) of these vessels. The landings of these foreign-flagged vessels in Dutch ports are covered by imports in the trade statistics. These figures are included in this study (Figure S1).

Besides the companies in the chain and supply industry directly dependent on North Sea fishery, there are other parties that owe their existence indirectly to the Dutch fishery. Examples include fisheries education, producer organisations (POs) and marketing communication agencies such as the Dutch Fish Agency (het Nederlands Visbureau). There are also independent bodies that have no socio-economic relationship with North Sea fisheries, but exist because there is a fisheries sector. Such as NVWA inspectors or fishery researchers affiliated with knowledge institutions. This so-called indirect employment is not always easy to determine because concrete figures are not available, as is the case for Dutch companies registered with a Chamber of Commerce. Therefore, this report will try to describe this indirect employment qualitatively and, where possible, estimate it with numbers.

S.3 Methodology

Both qualitative and quantitative data were collected for this study. Below is a list of the sources and in brackets what data was collected for each source.

Qualitative:

• Six regional workshops were held to identify the characteristics of each fishing region, interactions with other fishing regions, the level of dependence on North Sea fisheries, the critical lower limit in terms of

landings (volume) of North Sea fish or clientele in number of cutters, outlets, developments and trends.

- Interviews by phone or physically with key people (requested were characteristics per link in the chain, supply industry nationwide and by fishing region, developments and trends).
- Literature such as scientific publications, professional journals and current media reports were consulted to determine the main developments and trends (Chapter 5).

Quantitative:

- NOVA (National Fish Auction Consultative Committee) fish auction data were received (landing volume, fish species and turnover per fish auction).
- Public data was received from CBS (number of fish shops in the Netherlands).
- SBI codes were checked with the Chamber of Commerce for each company to determine its core activities and classify them according to the relevant link in the chain, turnover and employment data at employment companies through filed annual accounts retrieved.
- Data on landing volumes and number of active cutters per port were obtained from Agrimatie WUR (Visserij in cijfers, 2022).
- Through the above online survey of 314 Dutch companies in the fish chain and supply industry, a lot of quantitative data was collected on turnover, employment, dependence on North Sea fisheries and financial situation.
- Fish consumption figures for the Netherlands have been collected through the Dutch Fish Agency.
- Lists of registered fish processing companies were consulted at the NVWA to establish the list of fish processing companies active in the Netherlands.
- From the Yearbook of Fisheries, the business register index was used to establish the list of active companies in the supply industry.
- Buyer lists were received from NOVA to determine active companies in the fish chain and supply industry.
- A total of 635 companies were identified on the gross list as potentially belonging to the Dutch fish cluster (Table S1). Of these 635 companies, many dropped out because they were no longer active in the fish processing chain or supply industry, bankruptcy or wrongly selected as active in the fish chain or supply industry. Chamber of Commerce data, website data, SBI codes and expert judgement were applied for this purpose. In the end, 346 companies remained belonging to the Dutch fish cluster in 2021. Of

these, 314 companies were dependent on North Sea fisheries with a minimum dependency ranging from 5% to 100%. Of these 314 companies approached by email and telephone, 105 companies (33%) participated in the online survey. Questions included estimates on critical lower limits of North Sea fish landings or clientele in number of cutters, diversion options, developments and trends.

The response rate to the digital survey exceeded the minimum required representativeness of 25% for each link (Table S1) and by fishing region (Figure S3) in the chain and supply industry.

For a more detailed explanation of data collection and choices of selection for the active companies within the methodology, see Appendix 4.

Link in chain	Pre-identified as possibly belonging to the total population of fish clusters	Total populatio n belonging to the fish cluster	Stratum a)	Response	rate
Fish auctions	12	12	12	4	33%
Suppliers	323	109	109	40	37%
Transport	22	19	19	6	32%
Fish processing/ fish wholesaling	206	206	174	47	27%
Fish (retail) trade b)	72			8	
	635	346	314	105	33%

Table S1Response rate to digital survey for chain and supply industry bylink

a) At least 5% dependence in turnover on North Sea fisheries; b) Fish (retail) trade is not officially part of the scope of the study, as the chain is defined up to and including fish processing/fish wholesale. However, several companies initially had doubts whether they met the objective criteria of fish processing/fish wholesale. Therefore, a survey was conducted among those companies.



Figure S3 Response rate to the digital survey for the chain and supply industry by fishing region, in absolute number and percentage out of the total number of businesses in the stratum

Baseline-measurement structure fish cluster and dependencies

1 Background and objectives

1.1 Background and objectives

The world around fishing has changed rapidly in recent years. The landing obligation, the pulse ban and the construction of offshore wind farms are a few of the developments that are having a major impact on the space for offshore fisheries and for anyone who would like to continue working in fisheries. These huge changes for fishermen do not only affect the fishery, but they also affect the chain. Besides economic consequences, there are also social consequences, which go beyond the direct impact on the fishermen themselves and affect fishing communities. In 2021, two motions were adopted (Lodders and Von Martels)⁷ asking for an impact analysis of the North Sea Agreement, the Wadden Agenda, the Cutter Vision and Brexit, including area closures/restrictions by offshore wind farms and nature reserves, for the Dutch fishery, the fish chain (including fish processing industry) and the economy of regions where North Sea fishery has an important share (hereafter referred to as fishing regions).

Wageningen Economic Research was commissioned in January 2022 to conduct this socio-economic impact analysis⁸ (Appendix 1). Within the impact analysis, three studies will be reported on in the first half of 2023. These are:

- 1. Fish clusters in the Netherlands (baseline measurement): size and dependence for the chain and supply industry of North Sea fisheries. How big are the regional fish clusters and how dependent are they on Dutch fisheries? Hoekstra et al (2023).
- 2. Impact analysis socio-cultural value and impacts on fishing communities: What is the socio-cultural value of fisheries in the Netherlands and what

⁷ Von Martels motion adopted:

effects of policy changes do we foresee for fishing communities? Kraan et al. (2023).

3. Impact analysis clean-up cutter fishery and shrimp fishery: What are the economic effects of the two clean-ups on the fish cluster? Note that two reports will be delivered for this part of the impact analysis. A report on the clean-up in the shrimp fishery (Hamon et al., 2023) and a report on the clean-up in the cutter fishery (expected later in 2023).

Starting in the second half of 2023, follow-up research is planned to include the monitoring of socio-economic effects and the development of a fisheries model. This model will allow the socio-economic effects of policy measures and external developments on fisheries to be estimated for the future. These planned activities translate to:

- Activity 3.1: Monitoring developments and situation in the cluster: How are the developed indicators developing.
- Activity 3.2: Develop/adapt fisheries model to determine economic impacts of policy measures on the fisheries sector.
- Activity 3.3: Fish cluster impact analysis: What are the indirect economic effects of policy measures on fish processing in the regions.

 $[\]label{eq:https://www.tweedekamer.nl/kamerstukken/detail?id=2020Z24275&did=2020D50982 and Lodders c.s. motion adopted:$

https://www.tweedekamer.nl/kamerstukken/moties/detail?id=2020D52724&did=2020D52724

⁸ Socio-economic impact analysis fish clusters and fishing regions: Socio-economic impact of policy decisions on fleet, fish chain and fishing communities: <u>https://www.wur.nl/nl/onderzoek-resultaten/onderzoeksprojecten-lnv/soorten-</u> <u>onderzoek/kennisonline/sociaal-economische-gevolgen-van-beleidsbeslissingen-op-vloot-</u> <u>visketen-en-visserijgemeenschappen.htm#_ftn1</u>

Regarding the overarching impact analysis (i.e. the sub-studies mentioned above), the policy analysis was carried out as completely as possible. However, not all possible policy decisions could be included. Therefore, the following policy decisions were included:

- Agreements following the North Sea Consultation:
- area closures
- remediation
- Brexit: reduction in fishing rights and the impact of the temporary nature of the agreement
- VisWad: closing areas for shrimp fishing and reducing fishing effort
- Projects for the southern part of the Wadden Sea, Voordeltatraject, Vlakte van der Raan and Natura 2000 sites
- VIBEG: closure areas in the North Sea coastal zone and sustainable innovation
- Landing duty
- Banning pulse trawl as a fishing technique
- Possible ban on lint
- Fuel duty and Fit for 55
- Nitrogen measures

Regarding the baseline measurement, little is still known about the total size and interdependencies of the supply industry, fish processing and trade of North Sea fisheries in the different fishing regions. This report details the various activities for each region and explains interdependencies.

1.2 Subquestions and key question

The key question of this baseline survey is:

What is the socio-economic size of the fish clusters per fishing region and to what extent are these fish clusters dependent on Dutch fisheries?

The following subquestions are derived from this:

- Subquestion 1: What are the characteristics of the chain and supply industry for regional fish clusters dependent on North Sea fisheries?
- Sub-subquestion 1.1: What chains and suppliers are there around North Sea fish?

- Sub-subquestion 1.2: How are those activities of the chains and supplying industries regionally distributed?
- Subquestion 2: What is the socio-economic scope of activities and links in the chain and supply industry of regional fish clusters dependent on North Sea fisheries?
- Subquestion 3: What is the dependence of North Sea fisheries on the chains and supply industry by regional fish cluster?
- Subquestion 4: What are the main developments and trends in the fish cluster chain?

2 Ports and auctions as centres for the fish chain

2.1 Type of (fishing) port and landings largely determine the resulting chain infrastructure per fish cluster of fishing regions

Several unique characteristics can be mentioned for each of the six fishing regions and the category of other places, when it comes to the chain and supply industry. It should be mentioned here that this study mainly focused on socio-economic characteristics of the chain and supply industry per fishing region. Another study within the impact analysis again looked precisely at socio-cultural characteristics of fishing regions (Kraan, 2023).

The research questions for the baseline measurement of fish clusters posed are as follows:

- Subquestion 1: What are the characteristics of the chain and supply industry for regional fish clusters dependent on North Sea fisheries?
- Sub-subquestion 1.1: What chains and suppliers are there around North Sea fish?
- Sub-subquestion 1.2: How are those activities of the chains and supplying industries regionally distributed?
- Sub-subquestion 1.3: Which fish species are landed and sold where, per fishing region?

2.2 Location and history characterise specialisations by fishing region

Fish clusters within fishing regions have often developed around ports of landing and auction of fresh North Sea fish. The ports and auctions are physical locations where supply (landings from the fishery) and demand (from buyers such as fish processors and fish retailers) come together. For pelagic fish, which is brought on board as frozen fish by freezer trawlers, the head offices and frozen warehouses of these fishing companies are historically located in the ports of IJmuiden and Scheveningen. Vlissingen and Amsterdam are exceptions to this as storage capacity in warehouses was found here for the frozen pelagic fish such as herring and mackerel. Ports and auctions are also hubs in the entire infrastructure of the fish processing chain and supply industry. This includes the entire logistics and transport but also suppliers such as unloading of the fish by specialised fish unloading service companies, (gas) oil bunkering for ships, port facilities such as shore power and ice supply to store the caught fish cooled on board, supply of ship equipment and maintenance by maritime engineering companies.

2.3 Urk and Katwijk exceptions with no landing ports of their own

The exceptions are the towns of Urk and Katwijk. Urk lies inland on the IJsselmeer and has no direct water access to the North Sea. Most Urk cutters therefore unload their fish in other ports such as Harlingen, Den Helder, IJmuiden, Delfzijl, Vlissingen and abroad Boulogne and Thyboron. Despite fresh fish being landed in other ports, many Urk cutters still offer their fresh fish through their own auction as members and co-owners of their cooperative Urk fish auction. As a result, a fish cluster focusing mainly on processing flatfish (particularly plaice) developed around the Urk fish auction over the past century. It should also be noted that prior to the closure of the Zuiderzee, Urk had been a fishing community for a long time, more or less forcibly created because the Zuiderzee flooded the island or cut off pieces of land, making agriculture and cattle breeding impossible. With the emerging Zuiderzee fishery, the main source of income developed, fishing for species such as herring and anchovies caught in the then salt water. Urk currently has the only IJsselmeer auction in the Netherlands, in addition to the Visafslag Urk. Here, freshwater fish is landed directly, caught by Dutch inland fishing vessels that operate mainly on the IJsselmeer. These include species such as eel, pikeperch, bream and woolly crab.

Katwijk does not have its own port nor a fish or shrimp auction despite its location on the North Sea coast. At the beginning of the 20th century, Katwijk became one of the most important fishing villages due to a growing fleet of, first, the so-called 'bomschuit' vessels, later replaced by the loggers and in the 1960s by a fleet of pelagic freezer trawlers and beam trawlers. Although today's vessels often still have the abbreviation KW for Katwijk on the bow as their home port, IJmuiden, Scheveningen or ports in Zuidwest-Nederland are the main places to unload the catch. The headquarters of Katwijk pelagic and demersal fishing and processing companies always remained in Katwijk. For this reason, Katwijk, like Urk without its own landing port, nevertheless became and remained an important fishing cluster.

2.4 Different chains of activities by category of landed North Sea fish

In general, we can talk about the processing chain of North Sea fish and the supply industry. The processing chain generally consists of the following activities and links described from left to right in Figure 2.1.

- Unloading North Sea fish at landing.
- Transport to fish auction. Sometimes a fish auction provides this service but mostly by specialised transport companies that own trucks with refrigerated trailers.
- Fish auction. Here, registration of fish via scales is carried out and determination of size and undersize fish as well as who are MSC certificate holders, sorting and/or sieving of fish and shrimps, preservation in case of shrimps, selling/auctioning of North Sea fish and handling financial transactions, quality inspection by auctioneer, auctioning or mediating buying and selling transactions in North Sea fish, supply and rental of fish

boxes and fish tubs, supply of ice, storage of fishing gear on site such as pulswings, shaving boards, conservation, transport, removal of bulky waste, supply of cold water per tub. In the case of frozen pelagic fish, weighing and catch registration (mainly for quota utilisation) takes place on board after

which, when the catch is unloaded in port, the frozen fish in cardboard packs are immediately transported and go to the frozen warehouses (Figure 2.4).

- Transport to buyer. Often fish processing company or fish retailer via own transport or by specialised transport companies.
- Processing and transformation of North Sea fish into fish products by fish processing/fish wholesale companies or by fish retailers. Many interactions also take place between fish processors through mutual orders and sales transactions as each processing or fish wholesale company adds value in the processing process.
- **Transport**. After all the processing and treatment is done on the fish product, the fish products are transported to the domestic customer or abroad as exports.
- Sales (and preparation). Sales to consumers in the case of Retail (such as supermarket, fish retail) or indirectly through a wholesale supplying the fish product to out-of-home consumption channels such as hotels, restaurants, canteens, institutions and catering where the fish products are often prepared as (part of) meals.
- **Consumption** of the fish product by consumers as end-users.

The roughly most important sales channels are wholesalers

(supermarkets), fish wholesalers, wholesale abroad (hotels, restaurants, canteens, institutions, catering), fish processing companies (often for further processing of the fish product) and fish retailers (fish mongers, itinerant trade such as fish carts and stalls). These sales channels apply to both domestic and foreign markets. With foreign countries, another marketing channel can be added, specifically other wholesalers (importers, agents food, frozen).

The processing chains differ for each category of North Sea fish landed. The processing chain of shrimp, for example, is set up differently from that of frozen herring or mackerel. The end product is also different, as are the sales market (which region in the Netherlands or in an export country) and the sales channel (hotels, restaurants or supermarkets, for example) through which the product reaches the consumer. For each North Sea fish species, a tailor-made description of the value chain and activities can be given.





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However, this would become far too comprehensive as sometimes more than 30 to 50 different species are sold at a single fish auction. Being able to distinguish the differences between chains and the category of fish products helps in understanding how fishing regions and clusters depend to a greater or lesser extent on North Sea fisheries.



Figure 2.1 Simplified representation of the North Sea processing fish chain

The various processing chains of North Sea fish can be divided into roughly the following categories based on the species of fish and the specifications of the final product:



Pelagic frozen fish: pelagic frozen trawlers mainly catch herring, mackerel, horse mackerel and blue whiting in large numbers in both the North Sea and other Global Seas. Unlike

demersal cutter fisheries, freezer trawlers remain at sea for weeks at a time. The catch is processed immediately and frozen as a whole on board in cardboard bulk packs. Once in port, the processed fish is unloaded and temporarily stored in frozen warehouses. The companies in this pelagic fishery are vertically integrated. This means that the umbrella parent company owns both the fishing companies and the processing companies. The processing companies buy the landed frozen fish directly from the affiliated (sister) fishing company without the intervention of an auction. From the frozen fish warehouse, the fish is sold and transported to buyers at home and abroad. Almost all fish is destined for the African and Asian sales market where the frozen cartons of herring, blue whiting, horse mackerel and, to a lesser extent, mackerel are an important source of protein. Against this, the supply of these imported frozen pelagic fish products can compete with the much smaller-scale supply from local fisheries. These fish products (frozen as whole fish) make an important contribution to food security in countries like Nigeria, Cameroon, Egypt, China, etc. where affordable protein is scarce. In these African countries, the frozen fish is mainly sold in local markets on the streets in cities to local people (Hoekstra, 2019b). Mackerel is the species with the highest market value because it is mainly processed (often smoked) for the European Retail market. These chains should not be confused with those of the herring as we know it in the Netherlands and surrounding countries as the 'Hollandse Nieuwe' or herring mates (Hoekstra, 2019c). This herring is imported from Norway, Sweden and Denmark in particular and is a completely different product from the frozen herring supplied by pelagic freezer trawlers.

Fresh trade: of the freshly landed demersal North Sea fish by North Sea cutters and coastal fishing boats at the Dutch auctions, part is processed for the domestic or foreign catering and fish retail trade (itinerant fish trade and fish mongers). These fish products are deliberately landed fresh because of the market demand for these fresh fish products and therefore have a short shelf life after catching and processing. Some fish species are often packaged as

whole fish, as in the case of species such as Norway lobster, squid, red gurnard, mullet, brill, turbot, sole, halibut. The fish species are chilled with ice and manually packed in containers such as tempex boxes, ranging from three to fifteen kilos. Usually Mondays and Fridays are the most important days of the week for fresh trade because of the largest supply of the week at Dutch auctions. Some fish products are first skinned, filleted or portioned before being packed fresh and chilled. Think of species such as plaice, lemon sole, cod. Compared to the chains of frozen fish products, the financial margins of fresh fish are higher, but the volumes sold are then also smaller. Fish species caught using the flyshoot fishing technique in the English Channel have become an increasingly important product for the fresh fish trade because of their high quality and increasing commercial importance for the Dutch fishery

and processing chain. In the Netherlands, the supply of fresh fish on supermarket shelves is very small compared to southern European countries. In these countries, it is very common to also buy fresh fish on ice in a supermarket. In the Netherlands, this is more common in specialist shops such as fishmongers and at itinerant fish mongers such as the fish cart on the street or the market.



Frozen market: Freezing (initially freshly landed) North Sea fish extends its shelf life compared to fresh fish products, but financial margins are often lower because in the fresh trade prices fluctuate daily. In addition, smaller volumes are less involved than with frozen fish products and buyers are willing to pay more for fresh quality. The frozen market is particularly responsive to

demand from the domestic and European fish market, although exports are not limited to just Europe. The chains behind these products require processing machines and lines such as sorting, freezing, glazing, breadcrumbing, portioning, filleting, small packaging, sawing and/or smokebox machines. There is less flexibility in processing processes than in the fresh produce trade. The volumes processed are often higher and it is less manual labour (manual filleting and fresh packing) but much more processing using machines (filleting and packing machines). Machine capital has a certain economic payback period so productivity has to be high. The staff required is also often high in fish processing to achieve production volumes. The final product is often aimed at home consumption and is easy and quick to prepare by consumers. Competition is often fierce as frozen North Sea fish products such as plaice compete globally with other whitefish species. Unlike fresh North Sea fish, the availability of frozen fish products is very high worldwide. As a result, the supply of frozen fish products is less distinctive than fresh fish products. At the same time, the demand for fish products is much higher than the supply of North Sea fish. Consequently, partly due to the global logistically efficient possibilities of import and export, the frozen market is only expected to grow with the growing world population. Precisely those imports or exports can be reasons for glazing and freezing fish products such as squid, cod, shrimp, sole, plaice to preserve quality.



Shrimp: The North Sea shrimp, also known as grey shrimp, is caught by shrimp cutters in the Wadden Sea and along the North Sea coast. The shrimp are rinsed, cooked and landed in plastic bags on board the cutters. Once at the auction, the shrimps are weighed, sieved, sorted,

preserved and often sold on contract through auctions. After the initial sale through auctions, the shrimp are either peeled mechanically in the Netherlands or manually abroad (mostly in Morocco). The shrimp are packaged in Dutch processing plants for European Retail (mostly supermarkets) or catering.



Figure 2.2 Simplified representation of the various activities and parties in the supply industry surrounding North Sea fisheries

In addition to the processing chains, the following supply activities and parties can be identified. These activities and parties may of course be specialised according to the type of fish species and type of product per chain, as listed above. However, the supply industry often supplies multiple chains regardless of what type of fish species and product are produced. For this reason, the supply industry was not approached per chain but in general (Figure 2.2).

• **Technical work on board** fishing vessels such as shipyards (construction and maintenance), engines, ship paneling and installation of furniture, boilers, electrical engineering (electrician), painting inboard and outboard (painter), installation of device and software such as navigation (technical fishing cooperatives or maritime installers), satellite, maritime communication, fishing nets, fishing gear, fishing lines and processing lines, safety equipment such as life raft.





- **Port services** (forklift service when unloading and transporting North Sea fish, maintenance of jetties, shore power, drinking water, waste collection, registration of vessels moored in port).
- **Gas and diesel fuel oil bunkering**. In port, oil bunkering companies supply fishing vessels with fuel for the next fishing trip.
- **Refrigerated and frozen (packing) houses**. This is often where imported or landed fish products that are yet to be processed are temporarily stored chilled or frozen as stock.
- **Netmakers**. Fishing companies outsource the making and repair of fishing nets to fishing cooperatives or employ their own staff (shore personnel) to repair or make nets. This is a very precise and specialised craft. Because manual net

mending is time-consuming and labour-intensive, it is also very costly. A demersal fishing net can easily cost $\leq 15,000$ to $\leq 30,000$, depending on the fishing method chosen. A pelagic fishing net often costs even double that or more.

• Various work and household items for on board. Fishing cooperatives often supply the necessary work and household items for on board fishing vessels. For example, work clothes (boots, work overalls or oil jackets, gloves), knives for cleaning fish such as gutting and cleaning products.



Besides the aforementioned supply services, there are also services that are not directly related to the production (fishing and fish processing) of North Sea fish but are essential to the raison d'être of the North Sea fishery and the chain behind it. Think of these other services as:

- **Producer Organisations (PO) and associations** to take measures in favour of the rational practice of fishing and to improve the conditions for the sale of fishery products of member fishing companies as members. An important task includes determining and monitoring quota utilisation and mediating quota lease or purchase transactions within the PO. Several POs for demersal cutter fishery and one for pelagic fishery are active in the Netherlands as of early 2023. There are also POs and association(s) for inland fishing, shellfish farming/fishing and small coastal fishing.
- Education to train fishermen and fish processors.
- **Financial services** to finance investments and provide overdraft facilities, guide business decisions, prepare annual accounts. Services are provided by banks, accountants, business advisers with knowledge of the Dutch fisheries and processing chain.
- Ship brokers mediate the purchase and sale of fishing vessels.
- Social insurance to cover financial and labour risks Because many demersal cutter fishing companies have the organisational form of partnership, fishermen are self-employed and need to be insured for unemployment, sickness and industrial accidents, death or pension.
- Certification and inspection for guaranteeing sustainably caught fish and the food safety of the fish on offer This category is very broad, from government inspection on board at sea to shipping inspection from shore safety. But also audits by the NVWA at fish auctions and at fish processing companies from a public health food safety perspective. Certification includes the granting of permits and diplomas such as fishing and sailing licences but also certain eco-labels such as that of Marine Stewardship Council (MSC).
- **Suppliers of processing equipment** such as fish processing and filleting machines. This does not include the machines and equipment on board fishing vessels, but specialist processing production lines and chain machinery.
- **Temporary employment and secondment agencies** that recruit and second staff specifically for the fishing and fish-processing industry. Particularly due to a shortage of available personnel for both the Dutch fishing fleet and the fish-processing industry, the importance of these temping agencies has grown strongly over the past 10 to 15 years.
- Fish waste and recycling companies supplying packaging materials such as Styrofoam and polystyrene packaging to package fresh fish products. For

post-processing waste such as fish heads, bones, skin and guts, specialist waste processors operate to collect the waste and process them into various new raw materials.

- **Government agencies** where dozens of policy and policy executive staff work on the administrative, legislative and legal enforceability and enforcement of North Sea fisheries, for example, licensing and annual quotas (individual fishing rights). These officials are not counted as employment. Officials are paid from tax revenues. Therefore, there is no relationship to the socio-economic situation of the fishing industry and its impact on the number of policy officers.
- **Coast Guard**. Not specifically for fisheries only but no less important in case of distress at sea, on board or overboard a fishing vessel.
- Knowledge and research institutes that perform scientific and statutory research tasks such as sampling and determining the biological fish stock in order to determine the annual catch advice per quoted and commercial fish species for the European member states. Also consider reporting other socio-economic performance and sustainability indicators or safety tests towards the European Union on behalf of the Netherlands. As for 'government bodies', knowledge and research institutes will not be counted for employment because the direct relationship and dependence with the socio-economic size of the Dutch fish sector is lacking.
- Local tourism and tradespeople such as fish mongers, restaurants, butchers and bakers For local tourism, tourist offices, guided tours, North Sea fish tastings, flag days depend on the local fishing fleet. Fish mongers and restaurants, as middlemen, have a direct relationship with the availability of freshly landed North Sea fish through an auction, locally or in nearby fishing regions. Local retailers such as butchers and bakers and even supermarkets have a diminishing but still economic interest in a fishing fleet that takes weekly orders for food and items on board.

The above list is not exhaustive but when questioned during the regional workshops in each of the six fishing regions, these are the main parties in the supply industry around North Sea fisheries.

2.5 Regional distribution of types of chains and suppliers often determined by which species of North Sea fish are landed locally

The creation of fish clusters can often be traced to geographical location and history, as clarified above. The species landed and offered through the auctions often determine the layout and hence specialisation of the processing chains and supply industry by fishing region. Thus, specific chains and supply industries can be identified by fishing region. For example, the Wadden coast is known for its specialisation in supplying and processing North Sea shrimps. Urk as a fishing region is originally characterised by the largest share nationwide of flatfish plaice as a North Sea fish. The IJmuiden and Katwijk-Scheveningen fishing regions are known for the supply of frozen pelagic fish and its storage and processing. Zuidwest-Nederland can be characterised as the region where not only fresh North Sea fish is landed but also where many supplying industries are located such as shipyards, maritime ship equipment, technical fitters. The Kop van Noord-Holland was known for its North Sea landings of flatfish and roundfish until the closure of the Den Helder auction (2023). In addition, this region has an important share in the supply of shrimp and langoustine via the Den Oever auction. Of course, the above characteristics cannot be exhaustive because each fishing region is evolving. As an illustration, most plaice is sold through the Urk auction, but to a decreasing extent because the landings and hence guota utilisation of plaice have been declining steadily since 2017. Due to the declining supply of North Sea fish, many fish processing companies in Urk have switched to fish species other than landed by North Sea fisheries such as farmed salmon imported from Norway and cod imported from Iceland and other European fish auctions. The currently processed volumes of salmon exceed those of plaice at Urker fishprocessing companies, according to a survey of companies based in Urk and the survey response. Another random example is Scheveningen, which is characterised not only by landings of frozen pelagic fish but also fresh North Sea fish such as sole and, increasingly, squid, red gurnard and fresh mackerel caught by cutters using the snurrevaad fishing technique (flyshoot) in the English Channel (southern North Sea between England and France).

The supply industry is less tied to local landed fish species for fixtures and machinery than the fish processing chain. Nevertheless, the supply industry responds to opportunities offered by the local fish chain based on entrepreneurship. For example, the IJmuiden and Katwijk-Scheveningen fishing regions have more pelagic netmakers due to the dominance of pelagic companies established here, than other fishing regions. Another example is the equipment required on board shrimp cutters and packing machines in the shrimp wholesalers in the Wadden coast fishing region. Suppliers of these technical installations are mainly located in this fishing region due to the presence of many companies in the shrimp processing chain.



Figure 2.3 Total turnover (in million euros) of North Sea fish per shrimp auction in the Netherlands from 2011-2022

* 2022 are provisional figures; ** For Zoutkamp, turnover data are missing for the years 2011-2013, 2015 and 2022. For the years 2011-2013 and 2015, turnover was estimated based on the average share of shrimp auction Zoutkamp on the national total in turnover of shrimp auctions. For 2022, an estimate was made based on extrapolation from 2021 to 2022 with the average turnover growth of the other shrimp auctions; *** Breskens has not been operational since 2022 with operations moved to the Vlissingen auction. Source: NOVA auctions, edited by Wageningen Economic Research.



Figure 2.4 Landings of North Sea shrimp at Dutch auctions from 2011-2022. Landing weight is expressed in tonnes

* provisional figures; ** Zoutkamp is missing due to no figures being made available.

Source: NOVA auctions, edited by Wageningen Economic Research.

In the Netherlands, ten recognised North Sea fish auctions⁹ will be operational by 2023. At the beginning of 2022, there were still 12. For that reason, figures 2.3 to 2.6 still show the economic figures of twelve auctions. In that year, the doors of the fish auction Den Helder and earlier of the shrimp auction Breskens were closed for good. For both exits, a sharp decline in supply volumes and associated economic losses was the main reason. Operations at the Breskens auction were absorbed by the Vlissingen auction, which already had a close cooperation. Cutters that used to unload and sell their North Sea fish via fish auction Den Helder have moved to Den Oever or IJmuiden. The Den Oever auction is under the same cooperative as the until recently still operational Den Helder auction. The 12 operational NVWA-approved North Sea fish auctions in 2022 can be divided into typical shrimp auctions and fish auctions. In 2022,

there were seven auctions where shrimp was landed if Stellendam is included (Figure 2.3). For the Stellendam auction, the landing turnover of shrimp is only a small part (27% out of the total landing turnover in 2021). For this reason, Stellendam has been added to the fish auctions (Figure 2.5). On the total turnover of the shrimp auctions, the sales value of Den Oever seems to be higher than that of Harlingen and Zoutkamp in some years (Figure 2.3). However, at the Den Oever and Lauwersoog auctions, other North Sea fish such as Norway lobster (particularly Den Oever) and other flatfish and roundfish are landed in addition to shrimp. For both outlets, the majority of the total turnover consisted of North Sea shrimp sales. Specifically, 66% and 70% respectively in 2021. If only turnover from sold North Sea shrimp is included, the Harlingen and Zoutkamp exits are the largest, followed by Den Oever and Lauwersoog, 2021 is chosen here as the most current reference year because the supply volumes sold through Dutch auctions in the year 2022 were disturbed by the mothballing (not sailing) of many North Sea cutters. In particular, the larger North Sea cutters fishing for flatfish and roundfish and, to a lesser extent, the shrimp cutters sometimes stayed in port for several weeks because of the sharp increase in fuel prices, mainly caused by the war in Ukraine (Deetman et al., 2022).

⁹ In addition to the NVWA-approved North Sea fish auctions, there is a separate mussel auction in Yerseke where samples of mussel harvests are taken to determine, in particular, the quality size of the mussels, and an IJsselmeer auction in (popularly called 'on' because of the former island) Urk for the sale of freshwater fish caught mainly on the IJsselmeer. The port of Eemshaven is only for transhipment of fresh fish, not an auction.





Source: NOVA auctions, edited by Wageningen Economic Research.





Source: NOVA auctions, edited by Wageningen Economic Research.

Landing volumes by weight (expressed in tonnes) show strong fluctuations of shrimp landings from year to year (Figure 2.4). This characterises the North Sea shrimp fishery with years of large catches and years of much smaller catches due to lower recruitment of the shrimp population. With some 3,700 tonnes in landing volume, the Harlingen auction was also the largest among the six shrimp auctions in the Netherlands in 2021 (Figure 2.4). In total, around 9,000 tonnes of North Sea shrimp were sold through the Dutch auctions in 2021. Peak years in terms of supply volume were 2014 (15,000 tonnes) and 2018 (17,000 tonnes). For all volumes mentioned, it is about dead weight, or shrimp cooked on board and excluding siftings. Dead weight is calculated by dividing live weight by conversion factor 1.18 (VIRIS/Business Information Network, n.d.). In such years of large catches and high landing volumes, landing prices often drop sharply due to the market economics of supply and demand. The average landing price was $\leq 2-3$ per kilogram in those years of high landing volumes of North Sea shrimp. At that time, there was a stock surplus in the cold and frozen warehouses of shrimp processing plants. Shrimp fishermen were forced to fish shorter and land less in order to avoid further price drops and a temporary stop of shrimp buying by the chain. In years of scarcer supplies or stock shortages in the warehouses of shrimp processors and wholesalers, the average price per kilogram of North Sea shrimp can be much higher, up to above \in 7 per kilogram. The year 2020 was exceptional due to the market distortion during the Covid-19 pandemic. The low pricing at that time was mainly driven by limited capacity in the peeling workshops in Morocco. Most of the North Sea shrimps from northern Europe are peeled manually in Morocco because of lower labour costs and by specialised peeling workshops where hygienic conditions are significantly better than home manual peeling in Dutch households in the last century. During the Covid-19 pandemic, peel workers had to keep at least one-and-a-half to two metres away to avoid spreading the virus. The peeling capacity was therefore only one-third of the usual processing capacity, temporarily limiting market demand by supply from processing.

Lauwersoog was the last auction in 2021 where North Sea shrimps were still sold publicly visible through the public auction clock (RTV Noord, 2021). Nowadays, shrimps are only processed at the auction through pre-closed purchase contracts where no publicly transparent price formation between buyers and suppliers (fishermen) takes place through the auction clock system. Among the Dutch auctions where mainly fish is landed, Urk and IJmuiden were the largest in terms of turnover in 2021 and 2022 (Figure 2.5). High prices of landed fresh North Sea fish caused an increase in turnover in 2022 compared to a year earlier for several fish auctions. Expressed in landing weight, the decrease is visible in the landing volume of North Sea fish at Dutch auctions from the peak year 2016 (Figure 2.6).

2.6 The characteristics of fish clusters by fishing region

In the six defined fishing regions, each fish cluster has its own characteristics (Figure 2.7). Consider the presence of one or more auctions for North Sea fish, in terms of the supply of North Sea fish species and the presence of resulting processing chains and supply industries. Fishing villages are also shown on this map with black dots based on the Register of Dutch Fishing Vessels. Fishing villages are thus chosen starting from those ports or places with fishing vessels in the past and present registered under a port code (e.g. the abbreviation VLI on the ship's bow stands for Vlissingen).

Notably, some fishing villages shown do not fall within any of the six colored fishing regions. These fishing villages have been categorised as 'other'. Noting that the fish-processing chain and supply industry is not limited to the registration of fishing vessels per village or (port) municipality. Bunschoten-Spakenburg, for example, is an important fish cluster for the itinerant fish trade in the Netherlands and even for places across the border in neighbouring countries. The classification of fishing villages into fishing regions is therefore mainly approached from the perspective of Dutch fisheries. Often the link between past and/or present landing places and fishing clusters can be made because demand and supply of North Sea fish come together, as described in earlier paragraphs above.

Table 2.1 summarises the regional distribution of chains and supplying industries together with the main types of fish species landed and sold by fishing region.



Figure 2.7 The six fishing regions in the Netherlands with fishing villages indicated in black dots based on fishing ports Source: Register of Dutch Fishing Vessels, edited by Wageningen Economic Research.

Fisheries region	Main fish species in landing volume (preservation/condition)	Characteristics of the fish cluster
1.Kop van Noord-Holland	Shrimps (fresh, cooked) Norway lobster (fresh, preserved) Flatfish (fresh)	Wieringen and Den Oever are highly specialised in the supply and chain of shrimps and langoustines. The shrimp cutters moored in the home port help attract day tourists, according to interviewees.
	e V	Den Helder and Texel are more geared to landing flatfish. There are hardly any fish processing companies located in this fishing region. Via transport, processing is outsourced mostly to other fish clusters particularly in IJmuiden and Urk. During this study, it became clear that the Den Helder fish auction had to close (by 2023) due to declining supplies and thus economic revenues, partly caused by Brexit, the pulse ban, high fuel prices and consequently that a relatively large number of (flatfish) cutters from this fishing region have applied for decommissioning or sale of the vessel. The Den Helder auction will be leased and put to use by the maritime offshore wind industry and initiatives such as hydrogen generation in the North Sea.
		Texel is known for its innovative nature in flatfish fishing. An innovative fishing technique such as the pulse trawl was more or less tested and further developed here at an early stage by fishing entrepreneurs and the involved supply industry.
2.IJmuiden	Pelagic fish such as herring (processed and frozen)	Both frozen pelagic fish and fresh North Sea fish are landed in IJmuiden.
	Various species such as skate, lobster and squid (fresh) Flatfish such as sole and turbot (fresh)	Unlike Urk, there is less fish processing such as filleting here but a lot of fresh packing of the entire North Sea fish, destined for export or domestic catering. IJmuiden has good port and logistics facilities, making it an important national fish cluster for both the pelagic and demersal fish chains. A lot of refrigerated and frozen capacity is also located here, particularly for pelagic fish. The supply of fresh North Sea fish from the English Channel is mainly through the Scheveningen and IJmuiden outlets. Think of freshly landed fish such as squid, red gurnard, mullet and mackerel. This fish caught using the snurrevaad fishing technique (also known as: flyshoot) is known for its high quality because relatively to beam trawling, the fish spend much less time in the fishing net before coming on board.

Table 2.1 Characteristics of chain and supply industry and fish species landed by fishing region

Fisheries region Main fish species in landing volume **Characteristics of the fish cluster** (preservation/condition) 3. Zuidwest-Nederland Flatfish such as sole and turbot (fresh) This Fisheries Region is characterised by the large geographical spread of fish clusters, traditionally across Flatfish and roundfish such as mullet, red several of Zeeland's islands. Vlissingen has become an important port for English-flagged cutters with Dutch gurnard and squid (fresh) owners since Brexit at the expense of Boulogne, for the supply of fresh North Sea fish from the Channel. Shrimps (fresh, cooked) Stellendam is an important nerve centre with its auction and shipyards and associated companies specialising in the design and construction of cutters, maintenance and repair. Maritime engineering knowledge is also highly developed due to the shellfish fishery present with Yerseke as an important processing hub. In doing so, Yerseke has increasingly become a major logistics hub where many transport movements to and from with fish and shellfish products by truck go every day.

Much interaction with Scheveningen due to the fact that the auctions are under the same company (United Fish Auctions, UFA) and due to the presence of the fishing fleet that originally has Scheveningen as its home port. To a lesser extent, there is interaction in transport of fish products to and from Urk.

Flatfish such as plaice and sole (fresh) This is the largest fishing region in the Netherlands in the number of fishing and fish processing companies of Diverse other North Sea fish such as mullet, red gurnard and squid (fresh)

North Sea fish. Particularly much plaice is sold through the Urk auction to local fish processing companies. Landings from other ports mainly in the Netherlands, France and Denmark.

The fish cluster is characterised by large business succession due to the strong fishing identity and many young people this fishing region has.

The booming international fish processing and maritime cluster of inland shipping and engineering companies owe their origins to the traditionally present North Sea fisheries. This fishing region has a high concentration of fishing-related businesses within its municipal boundaries. The advantage is that companies that stop are often bought up by other local companies, thus preserving the chain infrastructure and not disappearing.

Unique to Urk is that it is inland and has no direct connection to the North Sea or Wadden Sea through the afsluitdijk. As such, Urk relies heavily on road transport and logistics.

There is a lot of interaction with almost all fishing regions particularly for sourcing fish for (further) processing. With growing fish processing companies, Urk's importance as a logistics hub is increasing for the Netherlands and even Europe-wide for fish processing. Many companies import and export fish and fish products. The processing industry has invested a lot in freezing and cooling capacity, leading to an increase in the import of frozen fish products.

4.Urk



Fisheries region	Main fish species in landing volume	Characteristics of the fish cluster
	(preservation/condition)	
5.Katwijk/Scheveningen	Pelagic fish such as herring (processed and frozen) Flatfish such as sole (fresh) Round fish such as mullet, red gurnard and squid	Katwijk does not have its own port or auction. Katwijk has a particularly strong pelagic fish cluster because one of the large pelagic shipping companies has its headquarters here. For that reason, pelagic processors such as herring processors and pelagic suppliers such as netmakers are also concentrated here.
	(fresh)	Scheveningen has a renowned port around which a lot of processing and trading of fresh North Sea fish has developed with a particular focus on out-of-home consumption in the catering industry, partly due to the presence of many expats and tourists. The densely populated periphery of The Hague makes expansion of the chain and supplying companies challenging. Pelagic chain companies therefore turn their eyes more towards IJmuiden or abroad for expansion opportunities. Because the Scheveningen fish auction is close to the Randstad, it offers many opportunities for local sales of fresh North Sea fish. Compared to other fish auctions, Scheveningen therefore has many more smaller companies that buy fish via the auction, mainly destined for the local catering industry.
		The supply of fresh North Sea fish from the English Channel goes mainly through the Scheveningen and IJmuiden auctions. Think freshly landed fish such as squid, red gurnard, mullet and mackerel. These fish caught using the snurrevaad fishing technique (aka: flyshoot) are known for their high quality as the fish spend much less time in the fishing net before coming on board, relatively to beam trawling. The supply of fresh demersal fish from the English Channel allows the Scheveningen auction and local fish chain to respond to demand from exports and the local catering industry including many beach bars.
		The harbour and exit are defining for the streetscape and attracting tourists to Scheveningen. There are many interactions with Stellendam and Katwijk because the latter fishing cluster does not have its own port and auction. Businesses and municipalities indicated that pelagic fishing in particular also plays an important social role for the port in Scheveningen and local residents or nearby businesses. According to interviewees, during the Covid-19 time, you could notice that fewer pelagic trawlers were unloading in Scheveningen harbour. It led to unemployment among fish unloading personnel who could hardly find other work quickly. According to the companies, it led to an increase in crime around the port.
Wadden coast	Shrimps (fresh, cooked) To a much lesser extent, some North Sea fish species (fresh)	The Wadden coast is particularly characterised by shrimp fishery on the Wadden Sea and along the northern coast of the North Sea. As in the Kop van Noord-Holland, there are hardly any fish-processing companies here apart from specialised companies and suppliers in the shrimp chain.
		Interactions exist between the ports with shrimp landings. There is a direct interaction with Urk from the Harlingen shrimp outlet because it is owned by the Urk outlet. Harlingen is also the home port of many Urk cutters.

Fisheries region	Main fish species in landing volume (preservation/condition)	Characteristics of the fish cluster
7. Other	To a lesser extent, supply of North Sea fish as these places do not have their own auction.	This category is a collection of companies in the chain and supply industry that fall outside the six fishing regions.
		Important fish clusters within this category include Bunschoten-Spakenburg where there are many fish smokehouses (eel, salmon) and itinerant fish traders (fish trucks and shops) that source North Sea fish from other fishing regions such as Urk, Scheveningen, IJmuiden and Zuidwest-Nederland.
		In addition, several importers are located close to the logistics main ports of the Port of Rotterdam and Schiphol Airport. These are mainly non-North Sea fish imported and traded, particularly within Europe as a destination market.
		There are also several transporters and maritime suppliers inland that are close to junctions of European highways for efficient connectivity to the hinterland such as Germany and Belgium as major markets for fish products and their ports for maritime services.

3 Size of chain and supply industry

3.1 Socio-economic size of the chain and its suppliers was around €6.6bn in turnover and 13,550 employees (8,350 FTEs) in 2021, of which 40-50% (€2.9bn) was directly related to North Sea fisheries

The Dutch fish cluster consisted of 346 companies with around \in 6.6bn in turnover and 13,550 employees (8,350 FTEs) in 2021 (Table 3.1). Of these, 314 companies depended on North Sea fisheries. Together, these 314 businesses had a turnover of approximately \in 5.8bn and 12,500 people employed (over 8,150 FTEs) in 2021. About half of this (\in 2.9bn) was directly attributable to turnover in North Sea fisheries.

Subquestion 2: What is the socio-economic scope of activities and links in the chain and supply industry of regional fish clusters dependent on North Sea fisheries?

Table 3.1Socio-economic size of the Dutch fish cluster by chain link andsupply industry in 2021

Chain link and supply industry	Number of companies 2021	Turnover 2021 (in million euros)	Number of employees 2021	fte 2021
Fish auctions	12	270	450	250
Transport	19	140	1,000	800
Suppliers	109	1,030	2,500	2,100
Fish processing/wholesale	206	5,170	9,600	5,200
Total	346	6,610	13,550	8,350



Figure 3.1 Employment calculated for the fishing complex based on National Input-Output Tables (CBS, n.d.) from 2010-2020 in thousands of workers (Agrimatie, 2022)

In this study, employment figures were collected via a digital survey of companies and by consulting the Chamber of Commerce extracts for each company (Table 3.1). A less time-consuming and at the same time less precise way is to estimate employment via the calculation of the National Input-output Table (CBS, n.d.). These figures are calculated annually for the entire agrocomplex (Agrimatie, 2022). The agrocomplex consists of the primary agriculture, food and beverage sectors. The input-output table shows which sectors the North Sea fishery supplies to including exports and consumption and from which sectors the fishery sector gets its inputs including imports. Value added (VA) and employment are determined for the primary fishing
sector, fish processing chain and supply industry. In the latest available year (2020), total employment is estimated at 10,400 (Figure 3.1). This was about 0.14% of total Dutch economy employment in 2020. VA was calculated at \notin 0.9bn, which was about 0.15% of gross domestic product (GDP) (Figure 3.2). These two macroeconomic indicators (VA and employment) distinguish how much VA and employment is generated by foreign- and domestic aquatic raw material inputs from fisheries. About half of the value added was related to the processing of imported aquatic raw materials; this amounted to about \notin 0.45bn in 2020. For employment, this was calculated at 5,400 out of a total of 10,400 workers in 2020.



Figure 3.2 Added value calculated for the fishing complex based on National Input-Output Tables (CBS, n.d.) from 2010-2020 in billion euros (Agrimatie, 2022)

3.2 The socio-economic value that cannot be quantified within a baseline measurement

In the regional workshops but also from the survey response, it is clear that a baseline measurement falls short of capturing intangible value and capital, which cannot be quantified. On the face of it, the socio-economic size of the chain and supply industry behind the North Sea fishery may seem very small compared to other sectors in the Netherlands such as the chemical, automotive or food industry. However, certain and often very difficult to replace intangible value is hidden in the knowledge and skills of people working in the chain and in the supply industry of North Sea fisheries that make the added value possible. Think of specialist expertise in designing, building and maintaining cutters or pelagic freezer trawlers. The net maker who, as a skilled craftsman, knows exactly how to make or prepare the economically valuable fishing net, tailored to the fishing grounds and usable for the fishing strategy of the fishing company as client. Or, for example, the sector and practical knowledge of fish transport companies that know the working rhythm of professional fishermen at sea and can respond flexibly to it, thus ensuring maximum fish quality. Or, for example, the knowledge of fisheries that enables the design and manufacture of advanced and innovative equipment and fishing gear. Finally, there is the example of the fish filleter and fishmonger who knows exactly how to fillet North Sea flat or round fish so that the unique quality of the fresh product is optimally preserved, and in which season certain North Sea fish is at its best for the buyer in terms of size, taste and texture. Many more examples were mentioned in the regional workshops and in the survey response, but the thrust is that the knowledge and skills of specialists in the chain and supply industry are essential to realise the socio-economic value for the North Sea fish product and the services to be provided to the North Sea fishing fleet.

3.3 Socio-economic size chain and suppliers by fishing region

Ranked by employment, the fishing regions Urk, Wadden coast and Zuidwest-Nederland are the three largest regions. Note that certain fishing regions such as Wadden coast and Zuidwest-Nederland are geographically very extensive areas. In contrast, IJmuiden, Urk and Katwijk-Scheveningen are again highly concentrated in one or two fishing villages. In terms of turnover, the top three look different. Katwijk-Scheveningen is the second largest region after Urk and Wadden coast in terms of turnover of the processing chain and supply industry. The number of companies in the processing chain and supply industry is much lower in some fishing regions than in others while the turnover is proportionally much higher. This is the case for the IJmuiden, Wadden coast and Katwijk-Scheveningen regions. These regions are home to some vertically integrated processors that are internationally renowned market players. The 'other' region represents active companies in the chain and supply industry that do not fall within the fishing regions.

In terms of employment and turnover, this residual category of companies represents the second largest share in the national total of the chain and supply industry. These are mainly companies located in the fish cluster of Bunschoten-Spakenburg, around the port of Rotterdam or close to Schiphol Amsterdam for the import and export of fish products or more inland at major motorway junctions with Germany. **Table 3.2**Socio-economic size by fishing region of the North Sea fish supply
chain and supply industry (sorted from large to small by number of employees
in 2021)

Fisheries region	Number of companies 2021	Turnover 2021 (in million euros)	Number of employees 2021	fte 2021
1.Urk	96	2,200	4,150	2,450
2.Wadden coast	27	800	1,900	1,250
3.Zuidwest-Nederland	56	550	2,100	1,350
4.Katwijk/Scheveningen	32	700	850	550
5.IJmuiden	26	500	550	350
6.Kop van Noord-Holland	17	100	250	150
7.Others	92	1,760	3,750	2,250
Total	346	6,610	13,550	8,350

3.4 Selection of companies wholly or partly focused on North Sea fisheries

Turnover and employment are two key indicators for determining the socioeconomic size of the chain and supply industry per fishing region. A total of 346 companies belonged to the Dutch fish cluster in 2021. Of these, 314 companies had a 5-100% turnover dependence on North Sea fisheries. This selection of companies was made to exclude active businesses that do process fish or supply services to the Dutch maritime and sailing sector but no longer deal specifically with North Sea fish or the North Sea fishing industry from our research. The minimum share in North Sea fish or services for Dutch North Sea fishery had to be greater than 5% of the total annual business turnover in 2021 to be among those 314 companies. For most of the 174 fishprocessing/fish wholesale companies, it is not only North Sea fish that is processed and traded, but also many other fish species that do not originate from the North Sea, such as farmed salmon, tuna, tropical shrimps, cod (caught around Iceland or waters further north than the North Sea).

The reason why the vast majority of the fish-processing chain in the Netherlands does not process only North Sea fish is prompted by market

demand exceeding the supply of North Sea fish. The supply of North Sea fish at Dutch auctions has been declining sharply since 2016 (Figure 2.6) while the demand for fish products is rising worldwide (Visserij in cijfers, 2022a). Most of the fish products processed and exported by Dutch companies remain within the European Union. Of the export value, 77% was destined for other EU member states with Germany as the largest buyer of fish products from the Netherlands (Visserij in cijfers, 2022b).

3.5 Zero measurement for professions that are further away from the processing chain or suppliers but do have a direct relationship with North Sea fisheries

Besides the aforementioned activities and professions that belong directly to the processing chain or suppliers, there are also professions that are further away from the production of North Sea fish in the chain. In the sense that these occupational activities do not directly contribute to the added value and production of North Sea fish. Think of professions such as fishery teachers, employees within fishery producer organisations, associations or branch organisations. Determining an accurate size of these is complex. Approximate global figures of employment can be linked to it as a baseline measurement.

Table 3.3 The share of North Sea fish(s) in total sales in 2021 among digital survey respondents

	Minimum share	Maximum share	Average share	Median	Number of answers	Response in % by
						stratum
Suppliers	6%	100%	40%	43	24	22
Fish	5%	100%	46%	50	33	21
processing/						
Fish wholesale						
Transport	No data	No data	No data	No data	0	No data
Exits	No data	No data	No data	No data	0	No data

- Fisheries education: In the Netherlands, the annual intake of first-year vocational students (MBO) for vocational fishing training is between 40-50 students. These are the courses Stuurman-werktuigkundige zeevisvaart (Mate-Engineer Sea Fishing, SW6, level 2) and Stuurmanscheepswerktuigkundige vissersschepen (Mate-Engineering Fishing Vessels, SW5, level 3), which are specifically aimed at North Sea and coastal fishing. In addition, some courses train the student into a maritime officer (levels 3 and 4) where students can choose to specialize in merchant shipping, fishing or hydraulic engineering, or the course Skipper-engineer limited working area (SMBW, level 2), which initially trains students for the merchant shipping. However, the outflow option to fishing can still be chosen by the student. In the Netherlands, there are five vocational (MBO) educational institutions that offer the above-mentioned courses with the possibility of obtaining the diploma and required certificates to become a professional fisherman for the Wadden and North Sea. In total, there are some 15-20 fishery teachers in vocational education (MBO) who teach fishery education. However, most do not teach fishery education full-time but part-time a few hours a week. In total, fisheries education is estimated to employ about 10 FTEs.
- **Producer and industry organisations:** Several POs and associations are active in the Netherlands for cutter fishing, small sea (coastal) fishing and large sea (aka pelagic) fishing. In terms of employment, this is estimated to amount to around 40 FTEs.
- Fish retail such as fish shops and itinerant fish traders (fish carts, wagons): The delineation of this study determined that no other links are included for data collection in the chain beyond fish processing and transport. The further away from primary production (North Sea fishery itself) in the chain, the less specific the activities become and thus challenging to distinguish direct effects related to North Sea fishery. However, unlike supermarkets and restaurants, fish retail does have a direct relationship with the supply of North Sea fish. For this reason, this study will still attempt to include the socio-economic magnitude to the extent possible in the baseline measurement. At the end of 2021 and the beginning of 2022, the Netherlands had 770 fish shops registered with the Chamber of Commerce (CBS, 2023). It is uncertain whether this includes all itinerant fish shops such as fish carts and wagons. The 770 registered fish shops employed about 3,500 people. Based on the ratio of part-time employees to full-time employees in the fish-processing industry, this is about two-thirds of the total number of employed

persons converted to FTEs. This works out to a calculated 2,300 FTEs for the fish retail industry.

Of course, there are other professions that can be related to North Sea fisheries and have not yet been included in the figures in Table 3.1. For example, occupations and positions in the service industry such as accountants/accountants, account managers at banks with fisheries in their portfolio, insurance specialists, ship brokers and employment agencies. However, from the regional workshops in the six fishing regions, these invited professions indicated that although they could be related to the Dutch North Sea fisheries, their direct dependence and importance were almost negligible. At financial service providers but also at employment agencies, portfolios are chosen much wider than fishing companies. In addition, the North Sea sector is such a small sector for these kinds of service providers that they cannot operate solely with clients from this sector.

The following two groups are examples of independent parties. These parties are not dependent on the socio-economic size of fisheries because officials are paid from public funds. Independent fisheries researchers may not be paid from public funds because these knowledge institutions are privatised, but the studies are often funded by taxpayers' money. We do not attribute this employment to the multiplier effect of North Sea fisheries for these reasons.

- **Government employees Fisheries:** This mainly concerns employees focused on the fisheries file working at RVO, ministries LNV, EZ, I&W, Rijkswaterstaat, provincial or municipal such as aldermen.
- **Fisheries researchers:** These are researchers involved in knowledge institutions such as Wageningen University & Research, TU Delft, Marin, Hogeschool Zeeland, NHL Stenden, Van Hall Larenstein.

3.6 Employment in North Sea fisheries spills over into the chain and shore-based supply industry

Estimates are often made as to what the multiplier effect (knock-on effect) is, of the number of active North Sea fishermen on the number of onshore jobs in the processing chain and supply industry. In the past, estimates of a factor of one in four to six jobs were regularly given by administrators and

representatives of fishing industry associations and producer organisations as the ratio of the number of active fishermen to the number of people employed in the onshore processing chain and supply industry behind North Sea fisheries. The ratio and knock-on effects cannot be made one-to-one because, as mentioned, more and more non-North Sea fish is being processed in addition to North Sea fish. In addition, suppliers have long been serving not only North Sea fisheries but often other maritime sub-sectors or other industry branches entirely outside maritime and fisheries. The employment and turnover of the 314 companies in Table 3.1 is therefore not entirely attributable to North Sea fisheries.

Survey respondents were asked what percentage of company turnover was directly related to North Sea fish. The answers to this reflect the great diversity of the share of North Sea fisheries (Table 3.3). No answers to this question had been received for fish auctions and transport and therefore data are missing. Nevertheless, it is known from the interviews and regional workshops that the turnover of almost all Dutch fish auctions consists almost entirely, i.e. almost 100%, of revenue from the sale of North Sea fish. Some auctions also have revenues from inland waters such as rivers and other fresh waters, such as the IJmuiden auction, which has freshwater fish supplied by anglers. Note that turnover should not be confused with net profit. A fishing company sells caught North Sea fish through an auction. The auction is intermediary in the sale of fish by the fisherman and the purchase of fish by the buyer. The actual net result is created by netting the income from services provided such as, for example, crate rental, fish sorting, commission per unit of fish auctioned minus the costs, such as personnel and fixed charges (water and electricity use, etc.). Among transport companies, the diversity of activities is also high when it comes to the question of what the proportion of turnover is related to North Sea fish. Nevertheless, the 19 selected companies are specialised in the transport of fish and particularly North Sea fish.

An initial exploration using the best available figures gives the following estimate for the multiplier effect of employment, passed on from the North Sea fishery to the onshore chain and supply industry.

• Total number of active crew in the Dutch-flagged cutter fisheries, small sea fisheries and pelagic fisheries (aka large sea fisheries) was around to 1,800 crew in 2021 (Visserij in cijfers, 2022c). Given that almost all active professional fishermen in the cutter, small sea and large sea fisheries work full-time, we count the 1,800 crew as 1,750 FTEs (estimated).

- Besides those on board the active Dutch-flagged North Sea fishery (excluding mussel and oyster vessels), there are also foreign-flagged fishing vessels unloading their caught North Sea fish in Dutch ports on a weekly or monthly basis, owned by Dutch family businesses. These include some 70-80 cutters and some 15 pelagic freezer trawlers. Assuming 75 cutters with between two and six crew members on each vessel, we count four crew members here. In the shrimp fishery, it is common to have two or three crew members including skipper. In cutter fisheries, depending on the length and engine power of the vessel, the number of crew varies between four and six crew members including skipper. Here, assuming vessels do not sail with alternating crews where two shifts alternate every other week as the cutter sails continuously. In addition to the skipper and crew, there is often a shore skipper within family-owned cutter fleet companies who alternates between the skipper at sea and in managing business ashore for the company. Other occupations closely linked to a fishing business such as netmakers are among the employment opportunities in the chain and supply industry. Again assuming that almost all active fishermen work full-time, this is around to 350 FTEs (four to five workers times 75 cutters). For pelagic trawlers, ranging from 30 to 70 crew per vessel are active and registered in the Register of Dutch Fishing Vessels per freezer trawler. Assuming the average of 50 FTEs per trawler, employment is estimated at 750 FTEs.
- This brings total employment in North Sea fisheries to 2,850 FTEs (1,750 + 350 + 750).
- In addition to North Sea employment from fishing, for the processing chain and supply industry (Table 3.1) including indirect jobs, it is estimated to be 10,500 FTEs (Table 3.4).

Table 3.4Sum of employment in chain and supply industry includingindirect jobs

Link in the chain or indirect jobs	Employment
Chain and supply industry (Table 3.1)	8,150 FTEs
POs and industry associations	40 FTEs
Fisheries education	10 FTEs
Fish mongers	2,300 FTEs
Total	10,500 FTEs

Scenario 1: 50% of total turnover and employment is attributable to North Sea fisheries.

- Based on the results of the digital survey of companies, it appears that the average share of North Sea fish in the total turnover of the processing chain and suppliers (Table 3.3) was 40-50% in 2021. In other words, about half of onshore employment (chain and suppliers) could be attributed to North Sea fisheries. Of the 10,500 FTEs (Table 3.4), half are 5,250 FTEs.
- Based on this first exploratory scenario, the ratio of active fishermen in the North Sea accounts for a multiplier effect of 1.8 for onshore employment in the processing chain and supply industry. In other words, for every active professional fisherman in the North Sea, this could generate a around two full-time jobs onshore in the processing chain and supply industry including indirect service jobs such as fisheries education and POs. This can be calculated by dividing 5,250 FTEs by 2,850 FTEs.

Three additional scenarios: from 25% to 100% reliance on North Sea fisheries

 Besides the scenario of 50% dependence on North Sea fisheries in turnover and employment, three other scenarios were calculated (Table 3.5). The outcome is a multiplier effect ranging from a factor of 0.9 to 3.7. In other words, for every active fisherman on the North Sea or Wadden coast, this yields around of 1 to 4 jobs ashore. The scenario of 100% dependence for the entire fishing clusters is not realistic. The most plausible is the scenario of 50% dependence on North Sea fisheries, assuming the 40-50% dependence on North Sea fisheries based on the average among participating companies in the digital survey (Table 3.3).

Table 3.5 Four scenarios calculated for the multiplier effect

Dependence on North Sea fisheries	Calculated FTE ashore	Multiplier
25%	2,625 FTEs	0.9
50%	5,250 FTEs	1.8
75%	7,875 FTEs	2.8
100%	10,500 FTEs	3.7

- In the survey, respondents indicated that this multiplier effect was probably higher in the past. According to them, the baseline measurement should have been done two decades ago. Back then, the number of policy decisions and their effects were not as large as they are today. In their estimation, the importance and socio-economic scale of North Sea fisheries for fish cluster was many times greater than today. Over the past two decades, the North Sea fishery has been shrinking in the number of cutters and landing volume.
- Without nuances, these calculations can be open to careless and multiple interpretations. Therefore, the above are carefully described very precisely for the four scenarios with which underlying arguments, assumptions and estimates have been included and made in the calculations.

It should also be noted that in the past, the Dutch cutter fleet and thus automatically the number of crew was much larger. Over the past two to three decades, there have been several decommissioning schemes that have caused the cutter fleet to shrink significantly (Figure 3.3). In 1990, the active cutter fleet under the Dutch flag consisted of 553 vessels with 2,490 crew members. In 2021, this was 283 vessels (Visserij in cijfers, 2022d). Landings from North Sea fisheries have also declined over the past two decades (Figure 6.1). This baseline study is the first time known to calculate the socio-economic size of the chain and supply industry in relation to North Sea fisheries. For this reason, no series is known of the number of companies active in the chain and supply industry.





Source: Visserij in Cijfers. Wageningen Economic Research (2022d).

4 Impacts and diversion options vary by region and link in the chain

4.1 Effects of policy decisions on the chain and supply industry and whether or not the companies have diversion options

In Chapter 3, a baseline measurement of the socio-economic size of the North Sea fishery chain and supply industry by fishing region was provided. This chapter analyses the quantitative and qualitative data collected through the survey and regional workshops among the companies on the effects on the chain and suppliers of policy decisions for North Sea fisheries. The companies were also asked about the existence or absence of diversion options in case of negative effects on North Sea fisheries.

Subquestion 3: What is the dependence of North Sea fisheries on the chains and supply industry by regional fish cluster?

	Pulse ban	Remediation(s) of the cutter fleet a)	Closure of fishing areas e.g. for wind farms and nature protection areas (VIBEG) in the North Sea (incl. Wadden Sea)	Brexit	Quoting and other catch-restricting regulations (such as days at sea, licences)	Nitrogen standards and legislation	Rapidly changing and many laws and regulations (such as NVWA controls and rules)	Unilateral policy decisions (such as Norway closing their coastal waters to beam trawling)
1. Urk	11	4	2				1	1
2. Wadden coast	2	1	2			1		
3. Zuidwest-Nederland	4	3	2	2	1	1		
4. Katwijk-Scheveningen	3	4	1		1			
5. IJmuiden	5	2	1	3				
6. Kop van Noord-Holland		1	1					
7. Other	2	2	1	1			1	
Total	27	17	10	6	2	2	2	1

Table 4.1 Policy decisions with the largest impacts in the last 5-10 years

a) In the past 5-10 years, there have been no decommissioning in the Dutch cutter fishery except the one for shrimpers (2021). When answering this question, participants had in mind the upcoming decommissioning for cutters (2022-2023).

Respondents of the digital survey were asked which policy decisions had the most impact on their business operations. Respondents could name several policy decisions, with each policy decision tracking the number of times it was mentioned as having the most impact on business operations (Table 4.1). The European ban on pulse fishing technology was mentioned most often followed by the planned cutter decommissioning to compensate for Brexit and the closure of fishing areas due to nature protection and offshore wind farms. Particularly in IJmuiden and Zuidwest-Nederland, the impact of Brexit was mentioned. In the fishery regions Wadden coast and Zuidwest-Nederland with a lot of shrimp fishing active in coastal waters, it is not surprising that it was precisely here that nitrogen standards and legislation was mentioned as a policy decision with las biggest impact.

Many respondents mentioned that it is the combination and accumulation of multiple policy decisions that make the negative effects on the Dutch North Sea fishery through the chain and suppliers so great. Besides policy decisions, several developments were also mentioned by respondents that had and are affecting the chain and suppliers. These are summarised in Chapter 5 in Table 5.2.



■ Loss-making ■ Breakeven ■ Profitable

Figure 4.1 Financial situation of your company right now (3th quarter 2022)



Figure 4.2 Business survival threatened in case of more than 50% shrinkage of Dutch fishery (in number of vessels or landings of North Sea fish) (3th quarter 2022)

Looking at the financial situation of the companies among survey respondents, it can be seen that the majority of chain and supplying companies were still operating profitably within each fishing region in the third guarter of 2022 (Figure 4.1). In the Katwijk-Scheveningen fishing region, no respondents were operating at a loss or breakeven (no profit and no loss) financial figures. In Kop van Noord-Holland, relative to other fishing regions, many businesses were operating at breakeven or at a loss, adding up to 50% of the businesses. In these fishing regions, it was mainly fish transport companies and technical suppliers among the respondents, which are closely linked to cutter fishing. This insight from the survey was confirmed as accurate by the local companies present in the regional workshop held in the Kop van Noord-Holland region. With these figures, note that the composition of respondents strongly determines the results and the picture that emerges per fishing region. In all six fishing regions there was a spread of small and larger companies in terms of number of employees and turnover, but not everywhere respondents were represented for every link in the chain. Figures 4.1 to 4.5 should therefore be read as mainly indicative.

To determine the critical lower limit per fishing region among companies, the survey asked about the effects of several scenarios of shrinkage in cutter fleet size (number of cutters) and North Sea fish landings (in weight volume). Under the scenario of a halving (-50%) of the number of cutters or in landing volume of North Sea fish compared to the year of the baseline measurement (2021), a large proportion of companies in the IJmuiden (67%), Urk (39%), Zuidwest-Nederland (33%) and Kop van Noord-Holland (33%) fishery regions, in particular, indicated that their survival would be directly threatened.

The survey then went on to ask which scenarios other than just halving (-50%) the number of cutters or landings of North Sea fish would directly threaten the companies' existence for each fishing region (Figure 4.3). Companies could choose one answer as the critical lower limit at which the company's existence is directly threatened. This reveals a similar picture to that described earlier (Figures 4.1 and 4.2). A small proportion of businesses are directly threatened in their existence at a contraction of 0-20%. This varies by fishing region from no business (Wadden coast) to 20% of businesses (IJmuiden). Again, proportionally, most of the businesses in the Katwijk-Scheveningen (86%) and Wadden coast (50%) regions reported experiencing no impact at all under various scenarios of contraction for business survival. The South West region also had a relatively high proportion of respondents (45%) who expect no impact in the event of shrinkage. IJmuiden, Urk and Kop van Noord-Holland showed chain threats among respondents at the 21-40% scenario. Respectively, these were a share of 40%, 34% and 29% out of the total number of respondents per fishing region.

4.2 Dependence of North Sea fisheries by link in the chain in 2022 (time of questioning via survey) and in 2017 (five years ago)

In addition to the analysis by fishing region, respondents also differentiated by link in the chain in terms of dependence on North Sea fisheries. They were asked for the dependence in 2022 and five years earlier (2017) to identify the extent of already deployed outlets. In 2022 and 2017, auctions are the link in the chain with the greatest dependence on North Sea fish. Indeed, the socio-economic activities for auctions are almost or entirely dependent on supplies of fresh North

Sea fish (Figure 4.4 and 4.5). If the number of cutters and thus the supply of fresh North Sea fish shrinks, Dutch auctions will be hit hard in terms of economic returns and employment. Again, note that the supply of fresh North Sea fish and the size of the cutter fleet have already declined sharply over the past two to three decades (Figures 3.1 and 5.1). For the other links in the chain and supply industry, the earlier commitment to diversification is evident. The share of the largest category dependence on North Sea fisheries (>75% of turnover) had decreased for those links in 2022 compared to five years earlier, while the category with the smallest dependence (0-25% of turnover) had increased. In the regional workshops but also in the survey, companies were asked whether this dependence on North Sea fisheries was different 30 years ago (around 1990). Most links, except for fish auctions answered in the affirmative. Specifically, dependence on North Sea fishery was many times greater. Even for suppliers, dependence at that time was often

60-90% for turnover. This confirms the picture that many companies in the chain and supply industry have been looking to broaden their operations beyond North Sea fishery in the interest of the company's survival for much longer.



Figure 4.3 At what level of contraction of the North Sea fishery (in number of vessels or landing volume of North Sea fish) is the survival of your business directly threatened?

It was clear from the interviews and regional workshops that relocating was often not their own preference but was perceived as a necessity. The technical services to cutters, transport, and processing of North Sea fish were exactly what led to the establishment of these companies in the fish clusters. According to the interviews and respondents, North Sea fishing provided the opportunities for distinctiveness and specialisation. The highly specialised processors, transport companies and suppliers that still depended almost entirely on cutter fishing in the past five years often saw a sharp drop in economic performance and had to move out of the sector to avoid operating at a loss for long periods. For example, in several fishing regions, the largest buyers of North Sea fish at regional auctions reduced their share from as much as 90% of North Sea fish to 30% or even less of total turnover within two to three years. To compensate for the loss of the large share of fresh North Sea fish, they switched to imported fish such as farmed salmon, cod caught from more northern waters, fresh fish bought from other European auctions or frozen flatfish and whitefish from third countries outside Europe.



Little or no importance (0-25% of turnover)
Small (26-50% of turnover)
Large (51-75% of turnover)
Very large (>75% of turnover)

Figure 4.4 How important was North Sea fish to your company's sales in 2022 (at this time of the study)?





Figure 4.5 How important was North Sea fish to your company's sales in 2017 (five years ago)?

4.3 Diversion possibilities different by chain link and supplier

Diversion opportunities vary by chain and supply chain link. Table 4.2 shows for each link whether and, if possible, which diversion options were mentioned in the regional workshops and in the survey.

Besides the exploration of diversion options, shrinkage will often logically lead to consolidation from efficiency in an industry. In practice, this means that the overall socio-economic size of an industry and link in the chain shrinks and so does the number of players.

Table 4.2The availability of diversion options or not

Link in the chain and supply	Fallback options
industry or indirect	
professions	
Exits	Barely. Exchanges necessarily choose the limited diversion options. These include collaborations with other European auctions to continue the supply and trade of North Sea fish. Other possibilities mentioned are the broadening of logistics services such as deep-freezing capacity for the storage of imported frozen fish products by fish processors and fish wholesalers, the process of defrosting, sorting and packaging fresh North Sea fish. Exchanges also mentioned the possibility of leasing parts of the auction premises to other users such as maritime companies (e.g. hydraulic engineering or wind at sea energy operators) to still generate income for the auction in the event of the loss of income from North Sea fish landings.
Transport of North Sea fish	Transport other chilled fresh produce if possible with the refrigerated trailers, such as flowers, vegetables and fruit.
Suppliers	Strongly varying by type of link in the chain. Port companies may divert to buyers of services and port facilities other than fishing companies. Think of other maritime branches such as hydraulic engineering (such as offshore wind farm operators), sand replenishment, naval defence and inland navigation. At the same time, the appearance and 'street scene' of the port changes once fishing vessels are not present. Several ports in fishing regions are contemplating a future vision looking at customers other than North Sea fisheries. Fisheries cooperatives may be able to partly divert to other maritime sub-sectors but fishermen are members and owners of the cooperative. They will often vote against as members on proposals by the executive board to largely swap fishing for focus on other maritime sectors. Shipbuilders with a dock for cutters may not readily adapt it for other maritime sub-sectors such as large shipping or pleasure (yacht) sailing. Netmakers may divert to pelagic fishing or foreign cutters for net making and maintenance. However, the language barrier and distance are limiting here. Technical suppliers such as ship carpenters and painters can move to other maritime subsectors but often specialise in cutter fishing, which makes them less competitive. Freezer and cold stores can store other chilled products such as meat and vegetable products. Fish unloading service companies have hardly any diversion options. Fish waste and recycling companies can divert to imported fish such as farmed salmon
Fish processing/fish wholesale	Diversion to imported fish species. However, it must be financially feasible to invest in processing machinery and its availability. For fresh trade, import is not always possible due to limited shelf life and potential quality loss.
Fisheries education	Diversion to other maritime education such as inland navigation and merchant shipping. However, there is a risk that without fisheries education, there will be no North Sea fisheries in the future. For the current annual intake of 40-50 fishery students in the Netherlands, even after a sharp contraction in numbers of cutters, there is still enough demand from the already large shortage of qualified personnel. The cutter and pelagic fleets already have to employ workers from other European or third countries to be able to set sail operationally every week.
Fisheries producer and industry organisations	Little to no diversion options for employees other than retraining and finding work in other occupational sectors.
Fish retail (fish shops and itinerant fishmongers)	For the fresh trade in North Sea fish, importing is not always possible as in the fresh trade of fish processing. Offering farmed fish products or thawed fish products is an option to compensate for the lost volume of North Sea fish.

5 Trends and developments: biggest concern is loss of skilled staff and, consequently, practical knowledge for the future

5.1 Biggest concern of companies is rapid loss of skilled personnel and, consequently, scarce and specialised knowledge

This chapter describes the main trends and developments that were mentioned in the survey, regional workshops and interviews. The research question here is:

Subquestion 4: What are the main developments and trends in the fish cluster chain?

Besides the socio-economic effects expressed in figures, such as decrease in turnover, companies expect many impacts on the chain and supply industry that cannot always be quantified. A particular example is human capital, such as the loss of skilled personnel with years of accumulated practical knowledge from the technical supply services to North Sea fisheries or the specialist processing of North Sea fish. Fishing and similarly the activities in the processing chain and supply industry are more than a professional profession and source of income alone. According to the companies, the negative effects deeply affect those working in North Sea fisheries and the chain behind it, their cultural commons, the right to exist and identity of fishing communities. The knock-on effect of a shrinking North Sea fishery poses an existential threat to those employed on board fishing vessels, as well as to the chain and supply industry. Those employed in the North Sea fisheries sector have often entered this profession out of passion and close affinity with a fishing region or community (Kraan, 2023). The informal sector such as volunteering within fishing communities is also closely linked to companies active in the North Sea fisheries chain and supply industry. Sponsorship through financial donations or

providing fresh North Sea fish free of charge are examples that characterise volunteering in fishing regions. With a shrinking supply of North Sea fish, such sponsorship and contributions to volunteering are expected to decline.

In general, workers active in North Sea fisheries are highly skilled in professional practice. The theoretical part of vocational training can be challenging for many vocational professionals, interviews with the education sector show. Therefore, it is not a given that an outgoing professional in the North Sea fisheries sector can easily retrain. The impact on low social incomes when work in North Sea fisheries disappears will be potentially large. This requires close guidance to increase the retraining and/or outflow opportunities of these workers.

Education interviews also revealed that while young people with an affinity for North Sea fisheries are often willing to pursue vocational training as fishermen or fish processors, parents in particular advise against this choice because of negative media coverage of the uncertainty and negative economic results of North Sea fisheries. The risk of too low an intake for these vocational courses is that the labour potential becomes too low and vulnerable to sustain production in the North Sea fish chain any longer. Interviewees from fisheries education indicated that the current annual intake of 40-50 fisheries students still offers more than sufficient job guarantee even if the cutter fleet shrinks significantly due to decommissioning. According to education, the shortages of qualified and skilled professionals in the North Sea fishery and processing chain are so great that the demand for qualified professionals will only increase, reinforced in part by ageing and the high outflow of current professionals. Staff shortages throughout the North Sea fisheries chain are a threat to the survival of many family businesses in the near future (Vismagazine, 2022a).

5.2 Declining supplies and higher North Sea fish prices force chain and suppliers to divert by diversifying

One of the main trends in the North Sea fishery supply chain and industry is the decline in landings of fresh North Sea fish in Dutch ports through auctions since 2016. The landings of North Sea fish by cutters under the Dutch flag actively declining sharply since that year (Figure 5.1). From 2016, the landings of fresh North Sea fish by cutters (85,000 tonnes live weight) have fallen by 32% by 2021 (to 58,000 tonnes live weight). At Dutch auctions, landings of fresh North Sea fish by Dutch and foreign-flagged cutters are recorded. In 2016, around 107,000 tonnes of North Sea fish (dead weight) were still landed at Dutch auctions. In 2021 this was 62,000 tonnes (-42%) and in 2022 it was 50,000 tonnes around (-53%). At the auctions, landings are calculated as dead weight whereas the catch registration (Fishing in Figures) is expressed as live weight.

Due to the scarcer supply of fresh North Sea fish, buying and selling prices rose sharply, particularly in 2022 (CBS, 2022) (Figure 5.2). That year will go down in the books as that of an energy crisis due to the outbreak of war in Ukraine with historically high fuel prices. In some weeks, gasoil prices rose above $\in 1.00$ per litre (Deetman et al., 2022), which was the highest level in the last decade. In comparison, the gasoil price was $\in 0.66$ per litre in 2012 and $\in 0.34$ per litre in 2016. The growing global demand for fish products has caused Dutch fish processing companies to import more, reinforced by the declining supply of fresh North Sea fish. Only a small part (probably 25-30%) of Dutch companies' demand for fish products can be met by North Sea fish alone. Most of the fish products processed and transported by the Dutch chain are destined for export. Most of this (77% of the total export value of fish products) remains within the European Union.

Of the total volume of North Sea fish production, it is complex to calculate the share that was sold within the Netherlands. The main reason is that various processed fish products are made from all the North Sea fish landed fresh plus imports. This multitude of fish products would then have to be converted to the original weight per fish species. Using equivalents (whole fish equivalents) for

fish alive as a whole (not treated or processed such as filleted) can give an indication of the original weight. Note that it gives a rough indication because it is impossible to apply the conversion factors (or equivalents) to every product per fish species. North Sea fish is not recorded separately from other fish species in fish processing plants. Assumed domestic sales have been calculated for the main two target species of the Dutch cutter fishery (Table 5.1).

The total landings of the Dutch-flagged fishing fleet (both demersal and pelagic fish) were 304,000 tonnes in 2020. The Dutch cutter fishery landed 58,000 tonnes in that year (19% out of the total 304,000 tonnes).

For plaice, assumed sales within the Netherlands were estimated at around 13% of the total production volume in 2020. For North Sea sole, this was estimated at 22%. North Sea sole in particular is a much sought-after fish product in the Dutch catering industry. The equivalents are available for 2020. Those for 2021 and 2022 have yet to be definitively calculated on trade statistics. The assumed domestic sales are rough estimates by subtracting exports from the total of domestic landings and imports. However, based on best consumption data in the Netherlands, it appears that there was much larger fish consumption in 2020 and 2021, around to 350,000-370,000 tonnes live weight (GfK, 2022). That is a multiple of the only 84,350 tonnes calculated in Table 5.1.

The year 2020 was characterised by the Covid-19 pandemic which caused cutters to shut down more in ports as landing prices temporarily fell sharply due to the declining demand from closed hospitality industry. The 2019 figures were compared with those for 2020 but showed a similar share of domestic sales in total production volume.

Table 5.1 The share of North Sea fish products plaice and North Sea soledestined for domestic sales and exports in 2020. Calculated in tonnes(1,000 kilograms) by whole fish live weight (Whole Fish Equivalent)

2020	All fish (incl.	Plaice	North Sea sole
	North Sea fish)		
Import	1,671,850	19,300	3,500
Supply	304,000	19,000	6,700
total available	1,975,850	38,300	10,200
Export	1,891,500	33,400	8,000
Assumed domestic sales	84,350	4,900	2,200
Assumed domestic sales	4%	13%	22%
percentage of total available			

Sources: Eurostat/COMEXT and VIRIS/Farm Information Network.

Another frequently mentioned concern from companies as a knock-on effect is the loss of distinctiveness for Dutch fish processing and fish wholesale companies. According to companies, if the supply of fresh North Sea fish largely disappears, international competitiveness will decrease. Indeed, fresh North Sea fish such as plaice and sole is internationally a niche product that is not available everywhere in contrast to farmed fish products such as salmon and sea bream. Many fish processing companies indicated that they are diversifying by necessity to imported and non-North Sea fish species such as farmed salmon, cod from northern waters, tuna, tropical shrimp, farmed sea bass and sea bream. These non-North Sea fish species are available worldwide in much larger volumes often year-round. This allows Dutch fish processing and fish wholesale companies to capitalise on the international reputation and growing demand for these types of non-North Sea fish products. However, because these non-North Sea fish species are offered and traded globally in bulk, they do not have the same distinctive character as the scarcer fresh North Sea fish. Dutch fish processing companies are often originally specialised in processing and trading freshly landed North Sea fish.

The competitiveness of the Dutch fish-processing industry will decline because they no longer have specialisation of their own local and scarce North Sea fish to the extent they used to. Switching out to fish products from elsewhere than the North Sea is an option that most fish processors have been forced to explore already in the past two to three decades.



Figure 5.1 Landings of North Sea fish (live weight, in tonnes) by Dutch-flag cutters from 2001-2021 Source: Visserij in cijfers (2022e).

The choice to grow non-North Sea fish species comes at the expense of North Sea fish is evident not only from production and marketing volumes, but also from the whole changing production infrastructure. As an illustration, the regional workshops revealed that specialist plaice-processing fish companies were forced to switch to processing farmed salmon because they were operating at an economic loss with plaice alone and could no longer employ all their staff on a daily basis. These companies have also invested in production machinery specifically designed for salmon processing. As the number of companies still operating machines particularly for filleting plaice is decreasing, there are hardly any or no technical suppliers left who manufacture or want to maintain these machines. This may mean that only obsolete plaice filleting machines with logically shorter and shorter technical lifespans remain. Should the supply of fresh North Sea fish be able to increase in the future, finding sufficient processing capacity for it in the Netherlands and abroad could still be a challenge, according to the companies consulted. The lack of capacity in the chain and supply industry may reduce the demand for North Sea fish such as plaice in this future scenario.



Figure 5.2 Monthly landing prices of fresh North Sea fish species at Dutch ports from 2017-2022, in €1,000 per tonne Source: CBS (2022).

5.3 Businesses unanimously experience lack of support and image of North Sea fisheries under pressure

Companies experience a lack of timely financial support and moral backing from the government. Among nature conservation organisations, companies experience opposition to North Sea fisheries. The companies that participated in this study frequently emphasised that several nature conservation organisations express opposition towards fisheries by calling on policymakers to restrict North Sea and Wadden Sea fisheries from the perspective of nature conservation. According to the companies, the impact of North Sea fishing on ecology is magnified in these calls while the potentially greater impact of other human activities on the North Sea is understated. According to the companies,

the calls to limit fishing do not do justice to the collaborative efforts of fishing companies, research and conservation organisations. The initiated sustainability and innovation efforts in the past two decades are thus largely ignored in the perception of the companies active in the chain and supply industry of North Sea fisheries. From 1 January 2023, a nine-month tolerance policy will apply among shrimp fishermen fishing in Natura 2000 areas. The Dutch shrimp fishery is looking for solutions to meet the nitrogen regulations for these Natura 2000 areas to get new permits granted from the government (NH Nieuws, 2022; Omrop Fryslan, 2022; Tweede Kamer, 2022). The companies see the catching and processing of North Sea fish as an important social contribution to healthy and sustainable food. In the opinion of the companies active in the fish clusters, nature and fisheries go well together, while nature conservation organisations argue the opposite. According to the companies, it is not unwillingness to become more sustainable, but they argue for sufficient space, time and financial support from policy-makers in this necessary transition to sustainability.

In addition, companies experience that timely financial support from the Dutch government was absent in 2022 such as financial compensation for the high fuel prices during the war in Ukraine early that year. While several EU member states offered their fishermen a financial compensation scheme due to historically high fuel prices, this was not forthcoming for Dutch fishermen in 2022 (Visserijnieuws, 2022a). Unanimously, companies expressed concern and lack of understanding that, for them, North Sea fisheries are being increasingly curtailed. The companies hardly understand that, in their opinion, policy is focusing too one-sidedly and solely on the shrinkage of the fishing fleet due to the announced decommissioning (2022-2023) for Dutch cutters. According to the companies, there is a lot of communication from the Dutch government about the various funds intended to stimulate innovation and sustainability among the Dutch fishery and chain. However, the companies say they do not understand why it is taking so long for these financial subsidy schemes to become accessible for Dutch companies to claim. Several schemes have been announced for 2023 that can economically compensate Dutch fishermen for the energy crisis caused by high fuel prices and loss of income such as idling (not sailing out) due to Brexit. In 2022, the Innovation Performance Contracts scheme was made available, also known as the IPC Fisheries scheme (Rijksoverheid, 2022b).

Companies indicated that they perceive that the image of North Sea fisheries is under pressure. They explained that the many media reports on the socioeconomic crises in the Dutch fishery sector reinforce this pressured image. Partly because of this, the companies in the chain and supply industry say it is increasingly challenging to find or train sufficiently skilled personnel. The companies explained that other professional sectors that pay better and are less physically labour-intensive are rapidly becoming more attractive despite the fact that many workers in the North Sea fishery chain once started the profession out of passion. Besides the challenge of having sufficient skilled personnel, both on the production floor and in the office, the strength and performance of these companies is under additional pressure due to outflow of personnel. Main reasons for outflow are ageing (proportionally many staff approaching retirement age) and staff retraining to find work in sectors other than the North Sea fishery because of the uncertainty and lack of future prospects for the sector. According to the companies active in chain and supplying services, personnel are mainly found within the fishing regions themselves. The explanation given is that the work in the fish-processing chain and supplying companies is specific and specialised. In addition, newcomers from these fishing regions already have the necessary affinity from their background because they grew up in a fishing community or because family members or friends work in the sector of North Sea fishery and related chain and supply industry. The diversification of companies in the fish clusters can mitigate this problem to some extent, but even in the case of an originally specialised North Sea fish processing company branching out to other fish species, this still requires affinity from fish. The work ethic and work mentality does not change completely. This makes recruiting new staff without any affinity for fishing extra challenging in an already tight labour market in the Netherlands.

Not all North Sea fish processing chains can easily divert to alternative fish species. The fresh trade of North Sea fish can divert to a limited extent by buying up North Sea fish landed in other European ports through auctions. However, the transport distance between that port and the Netherlands should not become too great as this could undermine the freshness quality of the fish. This is one reason why the IJmuiden fishing region is hit hard socio-economically in the event of a shrinking cutter fleet and reduced supply of fresh North Sea fish. Other fish clusters such as Urk are geographically and logistically more favourable than IJmuiden for truck transport of, for example,

fresh farmed salmon from Norway to the Netherlands for processing. For the import of frozen fish products, this difference in terms of geographical and logistical location would be smaller for IJmuiden, but many processing companies here have specialised in fresh fish rather than frozen fish products. Besides IJmuiden, there are other fish clusters that are also strongly focused on the fresh trade of North Sea fish products. Some examples of such clusters Bunschoten-Spakenburg, Urk and Scheveningen that trade in fresh North Sea fish for the (itinerant) fish retail trade, export of fresh fish products to the food service such as catering and/or local restaurants and beach pavilion respectively. These clusters can often divert to importing both fresh and frozen fish products in addition to processing fresh North Sea fish.

Several cutters continued to fish at a loss for some time due to high fuel prices in order to retain crew in 2022. The scarce available crew are almost all self-employed in the Dutch fishery, eliminating income when not working.

Dutch fish processing companies have started to import more for two main reasons. First, due to the declining supply of fresh North Sea fish. Secondly, because global demand for fish products is rising due to the growing world population and demand for protein-rich food. With North Sea fish alone, only a small part (probably 25-30%) of the market demand for fish products can be met by Dutch companies. The Netherlands is often referred to as a trade hub for its European hinterland such as Germany, Belgium and France. The Netherlands imports a lot and exports a lot. Most of the fish products processed and transported by the Dutch chain are therefore destined for export. Most of it (75-80% on the total export value of fish products) stays within the European Union.

5.4 Investment and turnover in North Sea fisheries down

Companies in the supply industry saw a decline in turnover from services provided to Dutch fisheries over the past five years. This is in contrast to the years 2014 to 2017 when, partly due to the economic success of pulse fishing technology and good catches, fishing companies invested in new vessel construction or modernisation. This provided technical companies such as fitters, ship designers and shipyards, ship carpenters and painters with a lot of work in North Sea fisheries. Due to diminishing returns and uncertainty about the future for Dutch fisheries, investments are stalling. Following the ban on pulse trawling, Brexit and declining catches, many new-build orders for cutters have been cancelled. This has resulted in several suppliers having to scale down their workforce or reassign them to other assignments outside the North Sea fishery. Many suppliers expect a contraction in their turnover from North Sea fishery orders rather than growth in the coming years. In their own view, they will be forced to move increasingly to sectors other than North Sea fisheries. The risk is that this will also mean that specialist knowledge (such as installations on board cutters) will not be kept up to date and will become increasingly scarce. Companies that participated in this study expect the decline in the fishing fleet and North Sea fish landings to inhibit investment and innovation rather than encourage it. Given the uncertainty as to whether there will be further future decommissioning, this may cause companies in the chain and supply industry to consider focusing more on fish chains other than North Sea fisheries.

5.5 Increasing control regulations affecting the chain

Increasingly, control regulations are being introduced from Brussels to ensure transparency and compliance with legislation. Certain control regulations have a major impact on the feasibility in the North Sea fish chain. The requirement to weigh freshly landed North Sea fish in European ports not only on board but also on land after transport is a break in the chilled chain. Fresh fish is often transported in chilled tubs or crates with ice. The moment the fish and ice have to be separated in order to weigh and register the net weight of the fish on land, there is an interruption in the chilled chain. This interruption can reduce the quality of the fresh fish. It also means an extra operation that requires more time and therefore increases costs. Dutch cutters are increasingly fishing seasonally in foreign waters such as off Denmark and France because of better catches than in Dutch and surrounding (coastal) waters. Normally, Dutch cutters would largely sell their caught North Sea fish through Dutch auctions. Now that fish have to be weighed and registered not only on board but also on land, many more Dutch fishermen have started selling their catch directly in foreign ports. This has caused a drop in turnover at several Dutch fish auctions. The Urk fish auction in particular has experienced direct negative

effects due to this control regulation, with turnover declining by 20-30% per year since the European regulation was introduced.

5.6 Opportunities as development of other fishing techniques

It is clear from the interviews that there are also opportunities for the chain, such as for shipbuilders and certain auctions. For example, the emergence of the snurrevaad (flyshoot) fishing technique has, for shipbuilders and certain auctions, created more demand for new-build vessels and supplies of highquality fresh fish such as squid (Fisheries News, 2023). This has been able to partly dampen the negative effects of the pulse fishing ban, according to the companies interviewed. Innovations can partly cushion the negative effects of some implemented policy decisions. Consider the further development of processing machines that give a better cutting efficiency in machine filleting of fish species. The proverbial knife thus cuts both ways. It gives less wastage of high-quality fish when filleting and, in addition, automation can partly offset shortages of production staff. However, automation is not a perfect solution to the shortage of specialist staff. With the increasing scarcity in supply of fresh North Sea fish, more and more fish processors are exploring the opportunities of quadruple valorisation, or optimal reuse of residual streams as raw materials for by-products. Heads, bones and other parts of the fish that do not serve as fillets can be circularly processed into food supplements (healthy sports shakes, fish oil, omega-3 capsules), pharmaceutical products (skin and hair care among others), animal feed and fodder, clothing products (leather products made from fish skins such as shoes) and bioenergy. In particular, byproducts for the food supplement and pharmaceutical industries are attractive because of the earnings model and higher value of social desirability on Moerman's ladder (Figure 5.3). Another development that several fish processing companies are responding to is the currently small market of vegetarian products but for which there is a growing demand. With that innovative development, traditionally fish processing companies are becoming food processing companies in the broadest sense rather than specialising only in the processing of fish products. Of course, with all the mentioned diversion options and innovations such as building and buying new processing machines for other types of fish or even vegetarian products, the investment has to be

financially viable. Not every family business has sufficient financial buffers for this kind of major investment.



Figure 5.3 Moerman's ladder (Timmermans, 2018)

5.7 Market and political developments increase uncertainty for the processing chain and limit multiple diversion options

Several market and political developments may limit the resilience and diversion possibilities of the chain. First, the energy crisis with high energy prices due to the war in Ukraine particularly affects the production processes of fish processors in the chain. Think particularly of energy-intensive processes such as cooling or freezing fish products (Deetman et al., 2022). A survey of members by the umbrella organisation of fish processors and fish wholesalers (Visfederatie) showed that the majority of companies experience problems with sharply

increased energy prices combined with staff shortages and rising wages (Visserijnieuws, 2022b). The costs are being passed on as far as possible by fish processing companies that in addition to already higher fish prices is causing rising consumer prices for fish products. Interviews show that fish processors and fish retailers in particular (fish shops and itinerant fish traders) active in the trade of fresh North Sea fish products experience inconvenience from excessive fish prices. Price elasticity and thus demand for naturally already high-priced fresh North Sea fish products are expected to decline at the expense of alternatives such as cheaper farmed fish products or poultry products. The energy crisis and subsequent economic recession are reducing disposable income for many households in Europe. This also works against sales in North Sea fish products. Also, many fish shops are still struggling with increased property rents. Many property owners raised rents to compensate for temporarily suspended income at the time of lockdowns in the Covid-19 crisis. Another policy decision affecting fish retailing, according to reports and interviews, is the introduction by 2023 of a 10 per cent increase in the legal minimum wage. Not only will revenues fall for fish retailers but also costs will rise from increased rental, raw material (flour and oil, packaging), energy and staff costs (Vismagazine, 2022b). In a news report, fish shop owners interviewed and chairman of the Association of Dutch Fish Specialists expressed the expectation that some of the Dutch fish shops will go bankrupt due to the sharp increase in costs relative to revenues (RTL Nieuws, 2022).

One political policy development is the announcement by Norway to tax salmon farming production by 40% in addition to the tariffs already in place from the Norwegian government (AICPE CEP, 2022; De Tijd, 2022). The European fish processing industry fears that this will worsen both its financial margins and competitiveness. The increased cost of salmon as an important alternative to reduced supply of North Sea fish will not be able to be fully passed on by Dutch fish processors. Often, fish processors and fish wholesalers enter into six-monthly or annual supply contracts with European supermarkets. The moment costs rise in between, buyers (here: Retailers) will not want to break open the fixed price with a contract clause. Buyers are often unwilling to implement a price increase towards consumers on the instructions of processors. The import of already processed salmon products from other continents such as Chile by the European market is an evident solution. This will partly be at the expense of employment in the Dutch salmon processing chain. The introduction of a 40% (additional) tax on Norwegian salmon is an intention for the time being. When finally introduced, the diversion option of

Norwegian salmon processing as an alternative to North Sea fish will be limited.

Another political and market development is the call to ban imports, particularly of white fish products such as Alaska Pollack (pollock), cod and plaice from Russia because of the war and invasion of Ukraine launched by Russia. In a petition and statement by thirteen environmental organisations, the European Commission is urged to ban these imports of fish products from Russia and/or include them in the European sanctions package against Russia (Seas at Risk, 2022). Fish products such as Alaska Pollock are in demand for the product kibbeling (battered whitefish bites) and the cod population is in better biological condition in Russian and northern waters than in the North Sea. With a possible ban on imports of whitefish products from Russia, Dutch fish processors will see another diversion option for declining North Sea fish supplies disappear.

Table 5.2 Developments with the biggest effects in the last 5-10 years

	Less and less supply of North Sea fish	High fuel prices (particularly since the war in Ukraine)	Sharp rise in fish prices due to scarcity in supply of North Sea fish as raw material for the chain	Covid- 19 crisis	Decisions from certifiers or market participants (such as the MSC label suspended for Norwegian cod resulting in European Retailers no longer buying this product)	Higher and changing demands from society (sustainability and other customer requirements)
1. Urk	11	4	1	1	1	
2. Wadden coast	1					
3. Zuidwest-Nederland	2	2	1			
4. Katwijk-Scheveningen						
5. IJmuiden		3		1		
6. Kop van Noord-Holland	1					1
7. Other		1	2			
Total number of times mentioned	15	10	4	2	1	1

Discussion

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6 Discussion

6.1 Unique figures of this study

This study is unique because for the first time (as far as known from literature and public data sources) the size of the chain and supply industry of North Sea fish has been analysed. Studies of some links in the chain, for example those of auctions similar to the fish processing industry and fish wholesale in the Netherlands, have been carried out in the past (Hoekstra, 2019). However, for the other links such as suppliers and fish transport companies, hardly any socio-economic figures are known on a national level let alone per fishing region. Estimates are regularly made as to how much land-based employment is directly related to and to the credit of the economic activities of Dutch fisheries in the North Sea. Various interviews conducted in the past often estimated a multiplier effect of four to six. In other words, each active fisherman in the North Sea provides employment for four to six workers on land. In this report, several scenarios have been calculated which assume a multiplier effect of one to four (Table 3.5). A multiplier effect of around two is considered the most realistic assuming an average turnover share of 50% dependent on North Sea fisheries (Table 3.3). For the first time, this study has provided a baseline measurement of the socioeconomic size of the chain and supply industry by fishing region and nationwide using scientific methodology. In addition, this study provided an update on socio-economic figures. Specifically, of earlier figures published in the past. For example, the last published socio-economic figures on the fish processing industry and fish wholesale in the Netherlands date from 2017.

6.2 Limitations of the study

Like any research, this study contains limitations that often arise from choices made in advance in consultation between researchers and clients but also possibly during the study because it turned out that insufficient data are available, for example. It is important to mention the limitations of this study in order to nuance the representativeness and accuracy of certain outcomes and to be transparent about the conditions under which the report should be read.

The following limitations of this report should be noted:

- When the baseline measurement started, several external developments were at play that created a turbulent and dynamic time in the fisheries sector. Consider the high fuel prices due to the invasion of Ukraine.
- The selection of active companies in the chain and supply industry of North Sea fish was made on the basis of multiple sources (see S1.3 Methodology in the Summary chapter). There is a chance that a single company per link was not included in this process. However, the risk of this is considered small because multiple indices and sources were compared and several experts with sector expertise such as key figures interviewed and economic fishery and fish chain researchers were consulted.
- The choice to classify a company within a link is debatable in some cases. Concrete examples are three fish processing companies that also have a fish transport activity, even in the company name. For each company, we then looked specifically at where the main part of turnover was achieved. In these three situations, the company was assigned to the fish processing/fish wholesaling link on that basis. Another example is that of frozen and cold stores that store fish products as temporary stock for fish processing companies. In this study, the choice was made to classify those few companies in the Netherlands in the supplier link. The SBI code for these companies is 52102 (Storage in cold stores). These companies could be classified as fish processing/fish wholesalers instead of suppliers. At the same time, raw materials yet to be processed are often stocked for fish processors by these cold stores and this is the main reason for classifying them as suppliers.
- The NVWA counts a higher number of fish processing and fish wholesale companies (more than 400) in the Netherlands than this study (206). This is because the NVWA looks at this from a food safety and food production perspective to determine the number of companies while this study mainly

focused on core socio-economic activities to determine whether companies should be counted as fish processing and fish wholesale companies. Also, this study uses a lower limit of ≤ 1 m turnover per year that does not apply to the NVWA's selection.

- This study collected figures on landings of fish in Dutch ports by foreignflagged vessels. This is counted as imports in trade statistics. Estimates were also made for the employment of foreign-flagged cutters and pelagic trawlers with Dutch crews or owners. However, for the chain and supply industry, no foreign companies that are owned by Dutch parent companies were included in the counts. The actual impact of policy decisions may therefore be greater than just the measured socio-economic effects in the fishing regions and fishing clusters of Dutch companies. Many Dutch companies operate internationally and, in addition to Dutch companies, also operate through subsidiaries or shares abroad. The impact of a policy decision in the Netherlands or Europe can have direct effects on employment at the foreign branches.
- For the southwest of the Netherlands, shellfish fishing/farming is very important with Yerseke as a North European processing hub. Shellfish processing and wholesale businesses are included in the socio-economic size of the Dutch fish cluster but not in the dependence on North Sea fisheries (Chapter 4) and developments (Chapter 5). This may understate the estimated dependence on North Sea fishery (in this shellfish farming in the deltas and Wadden Sea) for the Zuidwest-Nederland region.
- Self-employed persons without staff or small self-employed persons are not fully covered in this study. This is because a minimum limit of €1m turnover per year was kept for fish processing companies, for example. At the same time, while the impact for a small business might be negligible at the macro level, at the micro (business) level the impact of policy decisions can be very large. The socio-economic dependence of North Sea fisheries has been qualitatively articulated from interviews and described in this study, however.

6.3 Recommended research for the future

• Internationalisation is hardly included in this study, if at all. For example, what is the contribution and share of the Dutch North Sea fishery for the chain and supply industry in the rest of Europe? This study has mainly

focused on the Netherlands. The impact of policy decisions on Dutch chain companies was therefore not considered from an international perspective. If supply volumes and knowledge of North Sea fish shrink, these will not automatically be picked up and compensated by other parts of Europe or the world. As a result, the food supply of specifically North Sea fish and the chain infrastructure behind it may come under pressure in the future. This requires further analysis of the extent to which the Netherlands' role through North Sea fish chains impacts food supply and broad welfare within Europe and towards third countries. The European Union is a net importer and the largest market for global seafood trade (EUMOFA, 2023; Turenhout et al., 2022). Will the position of the largest market in seafood trade be compromised if several EU member states experience their own domestic production of landed fish declining? And how will this affect third countries that rely on EU imports of fish products for their food security? Questions that deserve attention in follow-up research.

- Within the links in the chain, there are large differences between companies in the type of activities and the added value that translates into turnover. For example, a fish processor often has a lower turnover than a fish wholesaler. The reason for this is that the turnover of fish wholesalers incorporates the most value in the fish product. A fish processor's added value consists of labour costs and the use of capital such as processing machines and associated costs such as water and energy consumption. The turnover and number of employees between a specialist fish processor and fish wholesaler are hardly comparable because the structure of the added value and costs arise differently. The same applies to the diversity in suppliers. For example, the cost structure and added value of a cold store or frozen food store are very different from those of a technical installation company, a painter, or a ship carpentry company.
- This study only considered the socio-economic impacts of policy decisions and developments regarding North Sea fisheries on the chain and supply industry. It did not include the environment (ecology). Future research could analyse and monitor not only socio-economic but also ecological effects. The sustainability goals (Sustainable Development Goals) could be used for this purpose. What effects do policy decisions such as Brexit, the ban on pulse fishing technology, closed areas for offshore fishing and remediation have on the marine ecosystem? The Dutch fishing fleet will change in terms of size and effort due to policy decisions. Including ecology as a driver not only looks at the value chain but also at the environmental impact (ecology) of

the overarching food system (Berkum et al., 2018) (Figure 6.1). A planned displacement study will look at the impact of area closures on ecology and fisheries.



Figure 6.1 Food system approach (Van Berkum et al., 2018)

 Within the chain links, there are significant differences between companies in the type of work and the added value, which translates to revenue. For example, a fish processor often has lower revenue than a fish wholesaler. This is because most of the value is accounted for in the fish product's price at the wholesaler. The added value of a fish processor consists of labour costs and the use of capital such as processing machines and related costs such as water and energy consumption. The turnover and number of employees between a specialist fish processor and fish wholesaler are hardly comparable because the structure of added value and costs arise in different ways. The same applies to diversity in suppliers. For example, the cost structure and added value of a cold storage or freezer facility are very different from those of a technical installation company, a painter, or a ship carpenter. A follow-up study that can more deeply explain the economic workings within links in the chain and supply industry could provide a more accurate picture for policymakers where added value mainly arises.

• This study primarily focused on the dependence on North Sea fishing for the fish clusters and fishing regions. Only diversion possibilities (loosely translated: adaption) were considered. Therefore, possibilities for innovation or other strategies to mitigate and reverse the negative socio-economic trends were not examined.

Sources and literature

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Appendices

Appendix 1 Press article on impact analysis

Copied on the next two pages is the press article that appeared in the special No 5 as a supplement to the trade magazine Visserijnieuws on 4 February 2022, which detailed the impact analysis.

Zakelijke dienstverlening & Financien SPECIAL

Nieuw onderzoek naar sociaaleconomische gevolgen beleid

Effecten op visser ij, keten en gemeenschappen o nder de loep

DEN HAAG - Donkere wolken trekken samen boven de visserij. Om beter zicht te krijgen op de sociaaleconomisch gevolgen van de huidige ontwikkelingen voor de visserij, de visketen en de visserijgemeenschappen start Wageningen Economic Research dit jaar een groot onderzoek in opdracht van het ministerie van LNV.



wereld rond de visserij in sneltreinvaart veranderd. De aanlandpiicht, het pulsverbod en de bouw van windparken op zee zijn een paar van de ontwikkelingen die grote invloed hebben op de ruimte voor de visserij op zee en van een ieder die graag in de visserij wil blijven werken. Doordat niet meer met de puls gevist mag worden en door steeds minder ruimte op zee moeten de vissers op de Noordzee hun visserijgedrag aanpassen om hun boterham te kunnen blijven verdienen, waarbij de vraag steeds terug komt of dit door de veelheid aan veranderingen überhaupt nog vel kan.

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Figuur 1: Ontwikkeling van de economische resultaten in de kottersector. Bron Visserijincijfers.nl

De teruglopende verdiensten en de oplopende olieprijs van de laatste maanden maken het bovendien nu al voor steeds meer (kotter) vissers moeilijk het hoofd boven water te houden, zie fig. 1.

Deze enorme veranderingen voor de vissers hebben niet alleen gevolgen voor de visserij, maar ze werken indirect ook door op de keten. Minder Noordzeevis leidt tot minder aanvoer op de afslag, minder versers zijn, is er ook minder werk voor toeleverende bedrijven. De afhankelijkheid van import voor de visverwerkende industrie voor de grondstoffen (nog te bewerken vis) is al hoog en zal steeds

verder toenemen bij dalende aanvoer.

Naast economische consequenties zijn er ook sociale gevolgen, die verder gaan dat de directe gevolgen voor de vissers zelf. Uit eerdere studies is bekend dat het kleiner worden van de visserij in visserijgemeenten leidt tot sociale veranderingen (Salz en anderen 2008). Visserij is een beroep dat vaak al generaties lang uitgeoefend wordt door families die samenwerken in de visserijbedrijven, en het speelt een belangrijke rol in de culturele identiteit van visserijgemeenschappen. Daarnaast heeft het gevolgen voor werkgelegenheid, (vak)kennis en innovatie, maar ook op het perspectief voor toekomstige studenten, (zij)instromers en bedrijfsopvolgers om in de visserij hun vak uit te kunnen oefenen.

Ook in de Tweede Kamer zijn deze verdergaande effecten van het visserijbeleid onderkend. Vorig jaar zijn er twee moties aangenomen (Lodders en Von Martels) die vragen om een impactanalyse van het Noordzeeakkoord, de Waddenagenda, de Kottervisie en de Brexit, inclusief gebiedsafsluitingen/beperkingen door windmolenparken op zee en natuurgebieden, voor de visserijsector, de visketen (inclusief visverwerkende industrie) en de regio's waar de Noordzeevisserij een belangrijke sector is. Het ministerie van LNV heeft naar aanleiding van dit verzoek vanuit de Tweede Kamer aan Wageningen Economic Research gevraagd de komende twee jaren dit onderzoek uit te voeren in nauwe samenwerking met vissers verwerkers/ handelaren, toeleveranciers en overheden.

Het ministerie van LNV geeft aan veel waarde te hechten aan de uitvoering van dit onderzoek. Het is de eerste keer dat de relaties in de hele keten zo systematisch worden onderzocht. Nu er zoveel op de visserij afkomt is het belangrijk om meer inzicht te krijgen hoe de onderdelen van het viscluster van elkaar afhankelijk zijn en wat de gevolgen van een kleiner wordende aanvoersector voor het hele cluster kunnen zijn. Inzicht in de gevolgen van ontwikkelingen en beleid helpt het ministerie bij beleidsbeslissingen die samenhangen met de grote veranderingen die komende jaren plaatsvinden. Ook voor ondernemers en bestuurders kan dit

onderzoek nuttige informatie opleveren om in te kunnen spelen op de ontwikkelingen. Het voorstel is besproken met vertegenwoordigers van de sector, hun aanbevelingen worden meegenomen in het onderzoek.

FOCUS VAN HET ONDERZOEK

Het onderzoek richt zich op de kottersector (inclusief de garnalensector), de pelagische trawiers, de kleinschalige kustvisserij en de toeleveranciers en verwerkers/handelaren die van deze aanvoerders afhankelijk zijn. De kweek van schelpdieren (mosselen en oesters) wordt buiten beschouwing gelaten omdat bij deze sector andere vraagstukken aan de orde zijn. Ook wordt in het kader van het mosselconvenant al een onderzoek uitgevoerd naar de economie van de mosselsector.

SAMEN MET DE SECTOR

Er is gevraagd om dit onderzoek samen met de vissers uit te voeren, zodat we weten wat er daadwerkelijk gebeurt in de gezinnen, het dorp en de bedrijven. Dit vraagt dat we in alle openheid met vissers, toeleveranciers en afnemers kunnen praten. We plannen dan ook veel tijd in om die ervaringen boven tafel te krijgen en goed vast te leggen. Via focusgroepen op de havens, interviews en schriftelijke enquêtes zullen vissers, familiebedrijven, verwerkers, toeleveranciers en lokale beleidsmakers gevraagd worden om input te leveren. We hopen dat we iedereen die mee wil denken daarvoor de ruimte kunnen geven. In Visserijnieuws zullen we

regelmatig verslag doen van de voortgang en vragen om inbreng voor de volgende stap van ons onderzoek.

GOEDE BASIS

We gaan de komende maanden eerst in kaart brengen hoe het veranderde beleid de visserijpraktijk beïnvloedt en wat de directe en indirecte sociaal-economische consequenties kunnen zijn en hoe we dit kunnen meten/vaststellen (fig. 2). Deze overzichten met relaties tussen het beleid, de visserijpraktijk en de verschillende processen in de keten worden de basis voor de verdere onderdelen van het project. We zullen dat doen door te luisteren naar de ervaringen van mensen werkzaam in en betrokken bij de visserij en de visketen. Daarnaast gaan we ook op zoek naar cijfers (zogenaamde indicatoren) die informatie geven over de stand van zaken in de visserij, visketen en gemeenschappen, en die in het vervolg van het project kunnen worden bijgehouden en gebruikt in de analyses.

Omdat elke visserijregio uniek is wordt per regio informatie verzameld en verwerkt. Er worden zes regio's onderscheiden: Waddenkust (Friesland, Groningen), Kop van Noord Holland (Den Helder, Texel, Den Oever, Wieringen), IJmuiden, Katwijk/Scheveningen, Zuidwest Nederland en Urk.

KETENS IN BEELD

In de volgende fase worden de visclusters in kaart gebracht. Voor elk van de regio's zal worden bepaald hoe belangrijk[§]



Figuur 2: Effecten van visserijbeleid op de visserij en (indirect) op de verwerkende en toeleverende sectoren en de visserijregio's

de verschillende schakels in de visketen (bijvoorbeeld afslagen, verwerkende industrie, handel, toelevering) zijn qua omzet en werkgelegenheid, hoe ze functioneren en hoe afhankelijk ze zijn van elkaar. Daarbij wordt onderscheid gemaakt naar de verschillende vissoorten: garnalen, platvis, demersale rondvis, langoustines, pelagische vis en overige vis (inclusief inktvis en krabben en kreeften). Deze informatie kan worden gebruikt om veranderingen in de visserijactiviteiten en aanvoer van vis te vertalen naar effecten in de keten.

SOCIALE IMPACT

Binnen de visserijregio's vertegenwoordigt de visserij naast economische waarde ook een sociale en culturele waarde. Veranderingen in de visserij hebben gevolgen voor de visserijgemeenten en de visserijgemeenschappen. Visserij is belangrijk voor de identiteit van dorpen en families. In dit onderzoek brengen we de economische, sociale en culturele gevolgen van de beleidsveranderingen in kaart, hoe die doorwerken in de visserij en daarmee in de keten op regionaal niveau. Waar mogelijk doen we voorstellen voor flankerend beleid.

Hierbij gaat het dus niet om het geld of banen, maar om het verliezen van de geschiedenis van visserijfamilies, de vaartuigen in de haven en daarmee de uitstraling van de haven. Wat verliezen we als vis steeds minder onderdeel wordt van de dagelijkse praktijk binnen een gemeenschap, wat doet dat met de identiteit van mensen?

Daartoe willen we eerst in beeld brengen wat de sociaal culturele waarde van de visserij is, en hoe dit beïnvloed kan worden door verandering. Verschillende (internationale) onderzoeken over de sociale waarde van visserij voor gemeenschappen kunnen hiervoor als basis dienen.

Dit onderzoek wordt echt een uitdaging omdat we in vrij korte tijd een beeld moeten krijgen van de sociaalculturele waarde en betekenis van visserij in een tijd waarin de visserij enorm onder druk staat en aan verandering onderhevig is. We hebben een flinke inhaalslag in te maken, maar met de hulp van de mensen uit visserijgemeenschappen komen we vast heel ver.

Wij zijn blij dat er nu vanuit het beleid zo expliciet aandacht is voor de sociale kant van het verhaal.

... EN DAN DE IMPACT VAN BELEID

We hopen dat we, door kennis die we krijgen van vissers, toeleveranciers, lokale bestuurders en afnemers te koppelen aan andere gegevens en wetenschappelijke inzichten, een zo goed mogelijk onderbouwd beeld krijgen van de economische en sociale effecten van beleidsverandering. Als eerste analyseren we de effecten van de uitkoopregeling in de garnalensector en de sanering in de kottersector die in voorbereiding is. Als de Europese Commissie deze sanering heeft goedgekeurd en straks bekend is hoeveel vissers daar daadwerkelijk gebruik van maken, kan onderzocht worden wat de gevolgen zijn voor het hele viscluster.

Vanaf de herfst werken we aan een model waarin de effecten van beleidsmaatregelen en externe ontwikkelingen op de visserij kunnen worden ingeschat. Dit model willen we met inbreng van de vissers ontwikkelen. Wat we willen voorspellen (de cumulatieve effect van zoveel verschillende zaken) is nog nooit gebeurd. Er gebeurt zoveel met de visserij op dit moment dat wij meer dan ooit onze statistische modellen met kennis van de sector moeten samenbrengen. Om de sociaaleconomische effecten van gebiedssluitingen te kunnen bepalen, moeten we weten waar vissers bij sluitingen naartoe gaan en wat de effecten zijn van de verplaatsing van hun activiteiten. Binnen het MONS programma¹ is een project voorgesteld om hier onderzoek naar te doen. Met deze kennis kunnen we ook veel beter inschatten wat de effecten van gesloten gebieden zijn. Met dit onderzoek en de modelontwikkeling zetten we, samen met de sector, een grote stap vooruit om de werkelijke sociaaleconomische effecten van beleid in kaart te brengen en dat is onmisbaar voor goede beleidskeuzes.

Dit onderzoek wordt gedaan door Marloes Kraan (sociale aspecten), Geert Hoekstra (ketenaspecten), Katell Hamon (vissersgedrag en modellering), Hans van Oostenbrugge (wetenschappelijke borging) en Bea Deetman (projectleider). Zij zullen, ondersteund door collega's van Wageningen Economic Research en Wageningen Economic Research anspreekpunt zijn voor de vissers en andere betrokkenen.

LITERATUUR:

- Maatschappelijke gevolgen van de achteruitgang in de visserij Salz, P., E. Koefnagel, M. Bavinck, L. Hoex, J. Bokhorst, A. Blok. en J. Quaedvlieg Rapport 2006 020 ISBN/EAN 97890 8615 246 9.
- Het MONS programma richt zich op Monitoring. Onderzoek, Natuurversterking en Soortenbescherming en is opgesteld in het kader van het Noordzeeakkoord.

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Appendix 2 Survey delivered digitally to businesses

The following pages show the digital survey as circulated among Dutch companies active in the North Sea fish processing chain and supply industry.



Enquête: impact van beleidsmaatregelen op de (vis)keten in Nederlandse visserijregio's _&

* Vereist

Wat is de impact op de keten door effecten van regelgeving vanuit Brussel en Den Haag op de Nederlandse visserij?



De Nederlandse visserijsector verandert als gevolg van beleidsbeslissingen die genomen worden in Den Haag en Brussel. Wat zijn de effecten van deze beslissingen op en in de keten?

De afgelopen jaren is de wereld rond de visserij in sneltreinvaart veranderd: aanlandplicht, pulsverbod, bouw en uitbreiding van windparken op zee en Brexit zijn slechts een paar van de ontwikkelingen als gevolg van beleidsmaatregelen die grote impact hebben op de visserij. En niet alleen op de visserij zelf maar ook op de keten en visserijgemeenschappen. Ook in de Tweede Kamer zijn deze verdergaande effecten van het visserijbeleid onderkend.

Twee moties zijn aangenomen (Lodders en Von Martels, zie de links hieronder) waarin een sociaaleconomische impactanalyse werd gevraagd van de minister van LNV om de optelsom van effecten op de visserij, keten en gemeenschappen te bepalen. Deze enquête is een onderdeel van de impactanalyse. De analyse wordt uitgevoerd door Wageningen Economic Research in samenwerking met Wageningen Marine Research.

Aangenomen Tweede Kamer moties:

- Von Martels: <u>https://www.tweedekamer.nl/kamerstukken/detail?id=2020Z24275&did=2020D50982</u>
 - Lodders c.s.: <u>https://www.tweedekamer.nl/kamerstukken/detail?id=2020Z25122&did=2020D52724</u>

Privacy en gegarandeerde anonimiteit: hoe wordt er met mijn gegevens omgegaan?

Vertrouwelijke omgang met uw gegevens en wetenschappelijke integriteit We gaan vertrouwelijk met uw gegevens om. Deze zullen nooit herleidbaar tot uw individuele bedrijf zijn omdat alle gegevens op groepstotalen worden berekend en verwerkt in het rapport.

Via deze website kunt u meer lezen over hoe WUR met data omgaat: <u>https://www.wur.nl/nl/Over-</u><u>Wageningen/Integriteit-en-privacy.htm</u>. Daaronder vallen de 'beleidsdocument verwerking persoonsgegevens Wageningen University & Research' (<u>https://www.wur.nl/nl/show/Beleidsdocument-verwerking-</u> <u>persoonsgegevens.htm</u>) en 'Nederlandse Gedragscode Wetenschappelijke Integriteit' (<u>https://www.wur.nl/nl/show/Nederlandse-gedragscode-wetenschappelijke-integriteit-2018.htm</u>).

Privacy

Vragen

De vragen 1 t/m 20 zijn voor iedere schakel in de keten gelijk. Vanaf vraag 20 geeft u aan tot welke schakel uw bedrijf of organisatie behoort waarop gericht nog enkele korte vragen volgen.

-	-	

In welke visserijregio is de hoofdvestiging van uw bedrijf of organisatie gevestigd?

- Kop van Noord-Holland
- O Waddenkust
- O Zuidwest Nederland (Stellendam en zuidelijke eilanden incl. Zeeland)
- Scheveningen-Katwijk (incl. Den Haag, Rotterdam, Zoetermeer)
- () IJmuiden
- O Urk
- .
- 0

2

3

O Andere

4

Wat is uw functie binnen het bedrijf?

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1	

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~ /					

)	Kwaliteitsmanagement
/	wantensmanagement

Logistiek of personele planning

\bigcirc	Marketing
\smile	

- O Secretariaat/administratie
- O Technische dienst

O Andere

5

Hoe groot is het belang van de Noordzeevisserij voor uw bedrijf op dit moment (anno 2022)?

Hoe groot was het belang van de Noordzeevisserij voor uw bedrijf vijf jaar geleden (anno 2017)?

Wat is do nostcodo van	de hoofdvectiging	van uw bedrijf of organicatio?	
wat is de posicoue van	ue nooruvestiging	vali uw beuriji of organisatie:	

Zeer	groot	(>75%	van	de	omzet)	
	Zeer	Zeer groot	Zeer groot (>75%	Zeer groot (>75% van	Zeer groot (>75% van de	Zeer groot (>75% van de omzet)

Groot (51-75% van de omzet)

Klein (26-50% van de omzet)

Geen of nauwelijks (0-25% van de omzet)

Wat is uw bedrijfsnaam (indien u deze wilt delen)?*

*Anonimiteit en vertrouwelijke omgang met uw gegevens is gegarandeerd

\mathcal{I}	Zeer	groot	(>75%	van	de	omzet)

- Groot (51-75% van de omzet)
- Klein (26-50% van de omzet)
- Geen of nauwelijks (0-25% van de omzet)

7

Is dit belang, namelijk de afhankelijkheid voor uw bedrijf van de Noordzeevisserij, sterk veranderd in de **afgelopen 20-30 jaar**? Zo ja, in welke mate of in welke vorm?

11

Hoe staat uw bedrijf er op dit moment financieel voor?

\frown	
1	Winctgovend
	vvinstgevenu

- Breakeven (geen winst, geen verlies)
- Verliesgevend

Zeg ik liever niet

8

Welke **ontwikkeling** in de **visserij** heeft de grootste impact gehad op uw bedrijfsvoering de **afgelopen 5 tot 10 jaar**?

9

De Noordzee visserij verandert als gevolg van de regelgeving vanuit Den Haag en Brussel.

Welke verandering is volgens u de **belangrijkste bedreiging** voor uw bedrijf?

	1	2	

Heeft u voldoende financiële buffers voor komende 12 maanden?

~		
- `		-
		a
	_	•

O Nee

O Weet ik niet

O Zeg ik liever niet

13

Wat was uw omzet* in 2019? (afronden in miljoenen euro)

*Omzet is hier de bedrijfsomzet van het bedrijf waar deze enquête aan is gericht. Bij verticaal geïntegreerde bedrijven gaat het in deze vraag dus <u>niet</u> om de omzet van alle dochterbedrijven in de hele keten te samen. Die krijgen deze enquête apart opgestuurd.

10

De Noordzee visserij verandert als gevolg van de regelgeving vanuit Den Haag en Brussel.

Welke verandering is volgens u de belangrijkste kans voor uw bedrijf?

14

Wat was uw omzet in 2020? (afronden in miljoenen euro)

*Omzet is hier de bedrijfsomzet van het bedrijf waar deze enquête aan is gericht. Bij verticaal geïntegreerde bedrijven gaat het in deze vraag dus <u>niet</u> om de omzet van alle dochterbedrijven in de hele keten te samen. Die krijgen deze enquête apart opgestuurd.

15

Wat was uw omzet in 2021? (afronden in miljoenen euro)

*Omzet is hier de bedrijfsomzet van het bedrijf waar deze enquête aan is gericht. Bij verticaal geïntegreerde bedrijven gaat het in deze vraag dus <u>niet</u> om de omzet van alle dochterbedrijven in de hele keten te samen. Die krijgen deze enquête apart opgestuurd.

16

Wat was het **nettoresultaat (nettowinst)** als **percentage** van de **omzet*** in **2021**? (Indien gewenst om te antwoorden en gelieve afronden op hele percentages of een nauwkeurige schatting)

*Omzet is hier de bedrijfsomzet van het bedrijf waar deze enquête aan is gericht. Bij verticaal geïntegreerde bedrijven gaat het in deze vraag dus <u>niet</u> om de omzet van alle dochterbedrijven in de hele keten te samen. Die krijgen deze enquête apart opgestuurd.

17

Wat was uw omzet (schatting mag) voor de eerste 6 maanden (t/m juni) van 2022? (afronden in miljoenen euro)

*Omzet is hier de bedrijfsomzet van het bedrijf waar deze enquête aan is gericht. Bij verticaal geïntegreerde bedrijven gaat het in deze vraag dus <u>niet</u> om de omzet van alle dochterbedrijven in de hele keten te samen. Die krijgen deze enquête apart opgestuurd.

19

In welke mate is 2022 anders qua impact op uw bedrijf, door beleid en regelgeving vanuit Brussel en Den Haag op de Nederlandse visserij, dan voorgaande jaren?

Nota bene: als er geen afwijkingen zijn van de effecten of impact door regelgeving/beleid in 2022 vergeleken met eerdere jaren, kunt u antwoorden met 'niet anders' of 'geen'.

20

Tot nu toe werden veel vragen gesteld over de economische waarde en omvang (zoals omzet) van uw bedrijf in de (vis)keten.

Zijn er volgens u nog bepaalde unieke kenmerken of waarden (niet in cijfers of eurotekens uit te drukken) verbonden aan Noordzeevis en de in de keten(s) daarachter, die mogelijk bedreigd worden door alle uitdagingen op de Noordzee door regelgeving vanuit Brussel en Den Haag?

21

Hoeveel arbeidskrachten* in **personen** stonden per 31-12-2021 op de loonlijst van uw bedrijf? (nauwkeurige schatting mag als u niet de exacte aantal personen paraat hebt)

*Dit is inclusief kantoorpersoneel en directie. Uitzendkrachten of gedetacheerde personeelsleden <u>niet</u> meerekenen.

18

Wat verwacht u voor de omzet voor de tweede helft van 2022?

- De omzet van tweede helft 2022 wordt hoger dan in eerste helft (t/m juni) van 2022
- De omzet van tweede helft 2022 wordt **gelijk aan** de omzet in de eerste helft (t/m juni) van 2022
- De omzet van tweede helft 2022 wordt lager dan in eerste helft (t/m juni) van 2022
- Ik kan hier nog geen realistische inschatting op maken

22

Hoeveel arbeidskrachten* in **FTE** stonden per 31-12-2021 op de loonlijst van uw bedrijf? (schatting of afronden op hele aantallen FTE)

*Dit is inclusief kantoorpersoneel en directie. Uitzendkrachten of gedetacheerde personeelsleden niet meerekenen.
Indien van toepassing:

Hoeveel personen werkten als uitzendkracht of gedetacheerd per 31-12-2021 in uw bedrijf? (nauwkeurige schatting mag als u niet de exacte aantal personen paraat hebt)

Graag in aantal personen en in FTE te antwoorden.

24

Hoe is het personeelsbestand opgebouwd qua leeftijd per 31-12-2021? (schatting)

De antwoordkeuzes moeten optellen tot 100%

	<5%	6%-20%	21%-40%	41%-60%	61%-80%	>80%
Jonger dan 30 jaar	0	0	\bigcirc	0	0	0
31-50 jaar	0	0	0	0	0	0
51-65	0	0	0	0	0	\bigcirc
>65 jaar	0	0	0	0	0	0

25

Tot welke categorie behoort uw bedrijf? *

O Visserij

Visafslag

O Toeleverancier

Visverwerking/visgroothandel

O Transport

O Andere

Visafslag

26

Hoeveel aanvoerders had u in **2021**? (zowel buitenlands gevlagde als Nederlandse gevlagde schepen)

27

Hoeveel aanvoerders heeft u **op dit moment (anno 2022)**? (zowel buitenlands gevlagde als Nederlandse gevlagde schepen)

Stel de kottervloot* gaat **fors krimpen** (>50% van de schepen verdwijnt) in 2022 en begin 2023, wat betekent dit voor uw bedrijf? Komt daarmee de toekomst van uw bedrijf direct in gevaar of heeft u uitwijkmogelijkheden?

*Onder kottervloot worden de kotters bedoeld die op garnalen, platvis en rondvis vissen. Denk aan de demersale vistechnieken: boomkor, sumwing, twinrig, quadrig, flyshoot.

29

Bij welke mate van krimp in de huidige **kottervloot** (in aantal schepen), wordt uw bedrijfsvoering direct in haar voortbestaan bedreigd?

O Bij 0-20% krimp

- O Bij 21-40% krimp
- Bij 41-60% krimp
- () Bij 61-80% krimp
- O Bij meer dan 80% krimp
- Krimp (bijvoorbeeld door sanering) van de kottervloot heeft geen invloed op het voortbestaan van ons bedrijf

30

Zijn er nog vragen die we niet gesteld hebben of opmerkingen die u nog graag meegeeft bij dit onderzoek?

11

Wilt u het resultaat van dit onderzoek per e-mail ontvangen (medio november/december 2022), vul dan uw e-mailadres hieronder in.

Toelevering

32

Hoeveel **procent** van jullie bedrijfsomzet is **direct gerelateerd** aan **Noordzee visserij**? (naar schatting en afronden op hele percentages)

33

Stel de kottervloot* gaat **fors krimpen** (>50% van de schepen verdwijnt) in 2022 en begin 2023, wat betekent dit voor uw bedrijf? Komt daarmee de toekomst van uw bedrijf direct in gevaar of heeft u uitwijkmogelijkheden?

*Onder kottervloot worden de kotters bedoeld die op garnalen, platvis en rondvis vissen. Denk aan de demersale vistechnieken: boomkor, sumwing, twinrig, quadrig, flyshoot.

Bij welke mate van krimp in de huidige **Noordzee kottervloot** (in aantal schepen), wordt uw bedrijfsvoering direct in haar voortbestaan bedreigd?

- Bij 0-20% krimp
- O Bij 21-40% krimp
- O Bij 41-60% krimp
- O Bij 61-80% krimp
- O Bij meer dan 80% krimp
- Krimp (bijvoorbeeld door sanering) van de kottervloot heeft geen invloed op het voortbestaan van ons bedrijf

Zijn er nog vragen die we niet gesteld hebben of opmerkingen die u nog graag meegeeft bij dit

Transport

37

Hoeveel **procent** van jullie bedrijfsomzet is **direct gerelateerd** aan **Noordzee visserij**? (naar schatting en afronden op hele percentages)

38

Stel de kottervloot* gaat **fors krimpen** (>50% van de schepen verdwijnt) in 2022 en begin 2023, wat betekent dit voor uw bedrijf? Komt daarmee de toekomst van uw bedrijf direct in gevaar of heeft u uitwijkmogelijkheden?

*Onder kottervloot worden de kotters bedoeld die op garnalen, platvis en rondvis vissen. Denk aan de demersale vistechnieken: boomkor, sumwing, twinrig, quadrig, flyshoot.

36

35

onderzoek?

Wilt u het resultaat van dit onderzoek per e-mail ontvangen (medio november/december 2022), vul dan uw e-mailadres hieronder in.

Bij welke mate van krimp in de huidige **Noordzee kottervloot** (in aantal schepen), wordt uw bedrijfsvoering direct in haar voortbestaan bedreigd?

- O Bij 0-20% krimp
- 🔵 🛛 Bij 21-40% krimp
- 🔵 Bij 41-60% krimp
- O Bij 61-80% krimp
- O Bij meer dan 80% krimp
- Krimp (bijvoorbeeld door sanering) van de kottervloot heeft geen invloed op het voortbestaan van ons bedrijf

40

41

dan uw e-mailadres hieronder in.

Zijn er nog vragen die we niet gesteld hebben of opmerkingen die u nog graag meegeeft bij dit onderzoek?

Wilt u het resultaat van dit onderzoek per e-mail ontvangen (medio november/december 2022), vul

Verwerking

42

Stel de kottervloot* gaat **fors krimpen** (>50% van de schepen verdwijnt) in 2022 en begin 2023, wat betekent dit voor uw bedrijf? Komt daarmee de toekomst van uw bedrijf direct in gevaar of heeft u uitwijkmogelijkheden?

*Onder kottervloot worden de kotters bedoeld die op garnalen, platvis en rondvis vissen. Denk aan de demersale vistechnieken: boomkor, sumwing, twinrig, quadrig, flyshoot.

43

Bij welke mate van krimp in de **Noordzeevis aanvoer** (in tonnen gewicht), wordt uw bedrijfsvoering direct in haar voortbestaan bedreigd?

- Bij 0-20% krimp van de aanvoer in Noordzeevis
- Bij 21-40% krimp van de aanvoer in Noordzeevis
- Bij 41-60% krimp van de aanvoer in Noordzeevis
- Bij 61-80% krimp van de aanvoer in Noordzeevis
- Bij meer dan 80% krimp van de aanvoer in Noordzeevis

O Krimp (bijvoorbeeld door sanering) van de kottervloot en daarmee krimp in aanvoer van Noordzeevis heeft geen invloed op het voortbestaan van ons bedrijf

44

Wat is de belangrijkste (in gewicht) **Noordzeevissoort** dat u als bedrijf heeft verkocht in 2021?

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Hoeveel **procent** van de **verkoopomzet*** van deze belangrijkste verkochte <u>Noordzee</u>vissoort (zie antwoord vorige vraag) verkocht u naar het **buitenland (export)**?

46

Hoeveel **procent** van de **verkoopomzet*** van deze belangrijkste verkochte <u>Noordzee</u>vissoort (zie antwoord twee vragen terug en vorige vraag) verkocht u naar **Nederlandse afnemers**, dus binnen Nederland*?

*Moet samen met percentage in de vorige vraag (% export) optellen tot 100%

47

Wat was het **totaal* verkochte (productie)volume** (in gewicht, tonnen) in **2019**? (hier afronden in honderden of duizenden tonnen)

48

Wat was het **totaal* verkochte (productie)volume** (in gewicht, tonnen) in **2020**? (hier afronden in honderden of duizenden tonnen)

* Dit totaal verkochte (productie)volume omvat alle seafood producten. Dus zowel Noordzeevis als geimporteerde-, zoeterwater en/of binnenlandse gekweekte soorten.

49

Wat was het **totaal* verkochte (productie)volume** (in gewicht, tonnen) in **2021**? (hier afronden in honderden of duizenden tonnen)

* Dit totaal verkochte (productie)volume omvat alle seafood producten. Dus zowel Noordzeevis als geimporteerde-, zoeterwater en/of binnenlandse gekweekte soorten.

50

Hoeveel **procent** van het **totaal* verkochte (productie)volume** (in gewicht, tonnen) bestond uit **Noordzeevis** in **2021**? (Schatting, en in procenten gelieve aangeven)

* Dit totaal verkochte (productie)volume omvat alle seafood producten. Dus zowel Noordzeevis als geimporteerde-, zoeterwater en/of binnenlandse gekweekte soorten.

51

Hoeveel **procent** van het productievolume (in gewicht) werdt **direct ingekocht** bij de **Nederlandse visafslagen** in **2021**? (schatting en gelieve afronden op hele percentages)

2

Bij welke Nederlandse visafslag kocht u het meeste Noordzeevis (in gewicht) in 2021?

Hoeveel **procent** was dit ruw geschat van het **totale ingekochte volume** door uw bedrijf bij alle **Nederlandse visafslagen** in **2021**? (zie vorige vraag)

Zijn er nog vragen die we niet gesteld hebben of opmerkingen die u nog graag meegeeft bij dit onderzoek?

Wilt u het resultaat van dit onderzoek per e-mail ontvangen (medio november/december 2022), vul dan uw e-mailadres hieronder in.

Hartelijk dank voor uw deelname en voor de inzet van uw kostbare tijd.

Hoe ziet het vervolg van dit onderzoek eruit?

Wanneer wordt het onderzoeksrapport openbaar en wat gebeurt ermee? In november/december 2022 wordt het onderzoeksrapport opgeleverd waarbij de Tweede Kamer mogelijk geïnformeerd wordt over de publicatie van dit rapport. De openbare WUR publicatie wordt in ieder geval gedeeld met de opdrachtgever ministerie van LNV en zal volgens de aangenomen motie gedeeld moeten worden met de Tweede Kamer medio 2022/2023.

Met vriendelijke groet,

Geert Hoekstra, Yolande de Valk,

Wageningen Economic Research



Deze inhoud is niet door Microsoft gemaakt noch goedgekeurd. De gegevens die u verzendt, zal worden gestuurd naar de eigenaar van het formulier.

Microsoft Forms

Appendix 3 Presentation of regional workshops for the chain and supply industry by fishing region

The following pages show the PowerPoint presentation as given during the regional workshops for the chain and supply industry by fishing region.

The regional workshops for the chain and supply industry took place at the following times:

- 1. 3 June 2022 Kop van Noord-Holland (location of workshop: Den Helder exit)
- 10 June 2022 Zuidwest-Nederland (location of workshop: exit Stellendam)
- 3. 24 June 2022 Wadden coast (location of workshop: Lauwersoog exit)
- 4. 12 July 2022 Katwijk-Scheveningen (location of workshop: Seafood wholesaler W.G. Den Heijer, Scheveningen)
- 5. 26 July 2022 IJmuiden (location of workshop: Wageningen Marine Research, IJmuiden)
- 6. 30 August 2022 Urk (location of workshop: Urk exit)

Impact beleid op visserij, visketen en de visserijregio's

H. van Oostenbrugge, K. Hamon, M. Kraan, G. Hoekstra, B. Deetman, X. Verschuur, J. de Valk, A. Klok, L. Puister-Jansen

Regionale workshop visketen (14:00 - 16:00)





Programma

1e uur:

- Toelichting onderzoek
- Korte voorstelronde
- Deze visserijregio in cijfers
- De keten en regio (viscluster) beter in beeld

2e uur:

- World cafe: In kleine groepjes twee rondjes
- In grote groep bespreken + afsluiting bijeenkomst



2

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Aanleiding voor dit onderzoek

- Tweede kamer moties Lodders en Von Martels
- Gevolgen beleid visserij op de keten en visserijgemeenschappen



WAGENINGEN UNIVERSITY & RESEARCH



8









Appendix 4 Explanation of methodology

This appendix explains the abridged methodology in the Summary section of this report. The following choices were made in the data collection and selection of active companies. First, a list of companies active in the fish chain and supply industry in the Netherlands was drawn up. Several sources were used for this as mentioned above. A digital survey was customised for the links transport, supply industry, fish processing/wholesale, fish auctions (Appendix 2). Through the Microsoft Forms programme, the digital survey was designed and reviewed by researchers with expertise in survey methodology prior to dispatch. Contact details such as email address and business phone number were collected for each company by visiting their website. Companies that participated in this survey were personalised. In fact, in all figures, individual company data have been reprocessed into group totals and averages so that data from an individual company cannot be traced. The collected data were collected with the consent of the companies according to Wageningen University & Research's (WUR) strict policy around integrity¹⁰ and privacy. This involved prior agreement with respondents on how personal data would be processed according to the applicable policy on processing personal data¹¹ within WUR and the Dutch Code of Conduct on Scientific Integrity.¹²

The businesses approached received one or more emails (as a reminder) explaining the survey and the online web link to complete the digital survey. A separate questionnaire was prepared for those businesses initially in doubt as to whether they were fish retailers or fish processing/fish wholesalers, with two questions added in addition to the other questionnaire (Appendix 2). Specifically: *Is your business purely a fish retailer (itinerant or physical fish shop) or (mainly) a fish processing/fish wholesale business?* and *Was your turnover in fish products (including seafood) for 2021 larger or smaller than* $\notin 1m$? The selection limit and demarcation to be considered a fish processing/fish wholesale company in this report is at a minimum annual turnover of $\notin 1m$ and where the core activities are fish processing and fish

wholesale (SBI codes 1020 and 46382) other than a fish shop (SBI code 4723). The selection criteria for active fish processing/fish wholesale companies in the Netherlands is based on the methodology of previous research studies on the fish processing industry and fish wholesale in the Netherlands by Wageningen Economic Research (Hoekstra, 2019a; Beukers, 2015; Beukers, 2011; Smit, 2006).

An inventory of companies in the fish-processing industry was based on data from the Dutch Food and Consumer Product Safety Authority (NVWA) and, for benchmarking purposes, the list of the former Fish Product Board. At the same time, a check was made at the Chamber of Commerce (KvK) whether each selected company was still active under the listed name in 2021/2022. The minimum threshold of €1m is used to distinguish economically active processing and fish wholesale companies from passive companies and/or small companies where the relative added value on the total for the North Sea fishery chain is very low. Or from companies where fish products (including seafood) represent only a small share in a wide range of food products. For the inventory of companies specialising in transport of fish products and suppliers with clientele in North Sea fisheries, the index business register of the Fisheries Yearbook was consulted. Furthermore, the authors' sector knowledge was applied to distinguish which companies do and do not have an interest in North Sea fisheries. Based on the completed digital survey and expert judgement (read: sector knowledge), an assessment was made for each company as to whether there is a minimum turnover share through selling North Sea fish products or providing services and products to the North Sea fishery fleet and chain. This minimum turnover share was set at 5%. Companies with less than 5% turnover from North Sea fish or fisheries were not included in this study.

The company data collected were aggregated into group totals where individual company data could not be traced. Companies had the option to participate

¹⁰ <u>https://www.wur.nl/nl/Over-Wageningen/Integriteit-en-privacy.htm</u>

¹¹ <u>https://www.wur.nl/nl/show/Beleidsdocument-verwerking-persoonsgegevens.htm</u>

¹² https://www.wur.nl/nl/show/Nederlandse-gedragscode-wetenschappelijke-integriteit-2018.htm

anonymously. Answering the question what the company name was, was therefore optional. Those companies that had not responded to the digital survey were contacted by telephone for participation. Information on imports and exports of fish products in this sub-sector was obtained from international trade statistics (Eurostat). Of the companies from which no individual information was obtained, turnover and employment were based on information from the Chamber of Commerce for the year 2020 and 2021. Several companies were found not to be required to file financial statements with a profit and loss account with the Chamber of Commerce. Where these data were missing for specifically the year 2020 and 2021, they were calculated by a weighted average in the same size class based on the number of employees. Of all companies, the number of employees could be found out through the completed digital survey and Chamber of Commerce.

For fish, shellfish and crustacean consumption data, the annual GfK report commissioned each year by the Dutch Fish Agency was used for the Netherlands. Here, consumption is expressed in net weight. So excluding waste and only the actual weight consumed of fish, shellfish and crustaceans. For a complete picture and to compare countries, FAO data were consulted. Here, consumption expressed in gross weight to whole fish is calculated (Whole Fish Equivalent). The total consumption weight per country is calculated by the difference in production (fisheries and aquaculture) plus imports minus exports. This total consumption weight is divided by the number of inhabitants in the country. This average gross weight per inhabitant does not take into account any wastage by consumers of the fish product.

In addition to the digital questionnaire, six regional workshops were organised (Appendix 3). One workshop for each of the six fishing regions where a minimum of 15 and a maximum of 25 people were invited. From the list of active companies, as diverse a mix of companies as possible were selected for each fishing region, so that there was variation from the various links in the chain and in terms of size. The regional workshops were often convened at an auction or at a business premises in a nearby port within the fishing region. The aim of these six workshops was to get the best possible picture of each fishing region by hearing first-hand from local businesses about the unique characteristics of the fish chain and supply industry for their own fishing

¹³ For the definition of key people, see the 'Glossary of terms' section.

region. In addition, the workshop workshops also provided an opportunity to ask the companies present where the tipping point between economically profitable or loss-making performance lies. In other words, what is the critical lower limit when the impact of policy decisions can directly jeopardise the survival of their own business. In this context, the survival of the company is directly at risk as soon as sustained financial loss-making years are expected, making bankruptcy, takeover or relaunch inevitable. Consider, for example, the impact of the policy decision of large-scale decommissioning. The landing volume of North Sea fish and the number of cutters may be so high for a specific fishing region. Against this, a scenario is conceivable where, despite fewer active cutters after decommissioning, almost or all fish are caught within the allowed guota. However, with the expected high interest in the decommissioning of the cutter fishery (2022-2023), it is likely that significant fishing capacity will disappear. The workshops also provided an opportunity to test the conceptual model of the study where attending companies could respond to the theoretical mechanisms of behaviour by the chain and supplying companies on policy decisions. The conceptual model is a simplified representation of the reality of how policy decisions affect fish clusters and fishing communities with the interactions between activities. The workshops gave attendees the opportunity to talk more about the impact of policy decisions for North Sea fisheries on their business operations as an active company in the fish chain or supply industry for that fishing region.

Finally, key people¹³ were interviewed. These were often individuals with a national role (such as at a trade association, producer organisation) or with a thorough view of the local fish chain and supply industry through, for example, board positions. The main purpose of these interviews was to benchmark the insights from the digital survey. The results of the interviews were helpful in identifying the most important current developments and trends, by fishing region and nationally for the chain and supply industry.

For the representativeness of the research through the digital survey, a minimum lower limit of 25% on the total number of companies per link in the chain was set. This 25% is in line with previous research studies on the fish-processing industry and fish wholesaling in order to make estimates for the entire population with sufficient quality (Hoekstra, 2019a). For the companies

that did not complete the digital survey, turnover and employment data were collected via the Chamber of Commerce. Based on size class (in turnover and number of employees) as registered with the Chamber of Commerce, the weighted average in turnover per company was calculated in the size class to estimate the total socio-economic size of the chain and supply industry. For the first two size classes, the CoC assumes a limit of €0.7m. Or, €0-0.7m and €0.7-12m. This limit of €0.7m was raised to €2m because there appeared to be many companies with annual sales of €1-2m but often employing 1-10 employees (Table S1 in Summary section).

Table B4.2 Size classes for socio-economic size adjusted to the context of fish processing and fish wholesale enterprises

1	€1-2m 0 to 5 employees
2	€2.1-12m 6 to 50 employees
3	€12.1-40m 51 to 250 employees
4	More than €40m 251 or more employees

Source: Chamber of Commerce, edited by Wageningen Economic Research.

Table B4.1 Size classes for socio-economic size of firms

1	€0-2m 0 to 10 employees
2	€2.1-12m 11 to 50 employees
3	€12.1-40m 51 to 250 employees
4	More than €40m 251 or more employees

Source: Chamber of Commerce, edited by Wageningen Economic Research.

A different first two size classes have been chosen for the fish processing and fish wholesale link. The reason for this is the minimum lower limit of $\in 1$ m turnover and, subsequently, the adjustment of the number of employees, because fish wholesaling activities realise a larger turnover faster because most of the economic value is hidden in the traded fish product itself. With less than five employees, a fish wholesaler can easily achieve a turnover of $\in 1-2$ m per year. For specialist fish processors, suppliers or transporters, such a turnover requires much more labour and employees. This is because they are paid according to the labour and man-hours provided as added value and not in the product itself as is the case with fish wholesalers.

Wageningen Economic Research Postbus 29703 2502 LS Den Haag T 070 335 83 30 E communications.ssg@wur.nl wur.nl/economic-research

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