



Dutch public perceptions of the state of the North Sea

Quantitative research on the Dutch public's perceptions and (non-)monetary valuations of the Good Environmental Status of the North Sea



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Summary

This study presents the results of a survey of the Dutch public on their knowledge of, engagement with and financial willingness to contribute to the good environmental status (GES) of the North Sea. The results were obtained by approximately 400 respondents who completed an online survey on the environmental status of the North Sea. The survey focuses on three descriptors that are important with respect to achieving GES in the North Sea: Biodiversity, Underwater Noise and Litter. The purpose of this study is to contribute to the socio-economic analysis currently being conducted for the update of the Dutch Initial Assessment as part of the European Marine Strategy Framework Directive.

Consulting Dutch citizens on their perceptions of the North Sea can support environmental policy making. Citizens benefit from a clean, healthy, and productive sea and in doing so, it is important to explore the opinions, values and interests of this large group. In this way, citizens feel they are heard and become more aware of the choices that policymakers must make. In doing so, the greatest support can ultimately be created among citizens for future policymaking.

The survey results show that Dutch people often go to the Dutch coast. For example, more than half of the respondents have visited the area in the past 12 months and half intends to visit the area in the next 12 months. Great importance is attached to various cultural ecosystem services, such as enjoying the landscape, the North Sea area as a habitat for various plants and animals, and the positive influence that flora and fauna has on the landscape. Also, almost two-thirds of Dutch respondents indicate that they are (very) satisfied with the quality of nature, and more than half feel that their stress level decreases when they visit the North Sea area.

Nevertheless, respondents also experience negative influences in the North Sea area. Marine litter, turbid seawater and the view of wind farms are mentioned as negative aspects in the North Sea area.

Most respondents indicated that they know a little to a fair amount about the current environmental status of the North Sea. For example, most are familiar with marine litter as an environmental problem. The risk that wind farms pose to birds, and the disturbance of North Sea nature by fishing, are issues that are also known to the majority. Nevertheless, respondents are not aware of all environmental problems: for example, only a limited number of respondents have heard about underwater noise. There appears to be a relationship between the degree of familiarity with environmental problems and support for measures to combat the problems in question. E.g., respondents feel that measures should focus most on litter, whereas underwater noise is seen as much less important.

When looking at the financial willingness to contribute to achieving good environmental status in the North Sea, respondents were willing to contribute between 30 and 40 euros per household per year. In similar research conducted in Finland and Germany, this amount is higher. This may have to do with the difference between the environmental problems focused on in these foreign studies (eutrophication) and this Dutch study (including underwater noise). Eutrophication has a more tangible and direct effect on recreational activities, while the effects of underwater noise remain relatively abstract. The main reasons respondents mentioned for wanting to contribute financially to the GES of the North Sea is that they want to ensure a healthy sea for future generations and that the existence of a healthy ecosystem is important to them. However, there is also a large group that does not want to contribute to the cost of achieving GES. Important reasons for this are that they believe that those who pollute the North Sea the most should pay for the costs (the polluter pays principle), and that funding should come from the government and not from individual contributions.

Achieving GES of the North Sea is deemed to be important for the Dutch population. The vast majority indicate that it is important to achieve GES of the North Sea and believe that GES of the North Sea should be one of the most important policy focuses. Furthermore, among the three transitions of the North Sea Program (nature, energy and food), respondents attach the most importance to the nature transition. Thus, nature protection is considered more important than food or energy production.

To gain more insight into the preferences and considerations of Dutch citizens regarding the environmental status of the North Sea, an extension of the survey and follow-up study would be needed. First, a travel cost analysis could be conducted, covering data on respondents' place of residence and their willingness to spend time and money to go to the North Sea area. Second, by repeating the survey after the current energy crisis and inflation, an analysis could be conducted on the possible changes in respondents' opinions. Third, encouraging similar studies in neighboring



countries around the North Sea (England, Scotland, Norway, Sweden, Denmark, Belgium and France) could provide insight into citizens' opinions across the marine region and thus support more coherent policy-making at the international level.

Finally, it remains important that citizens are consulted about North Sea policy so that a solid mapping of public support for policy can be carried out to develop the most sustainable decision-making for the North Sea.

Samenvatting

In dit onderzoek worden de resultaten gepresenteerd van een enquête onder het Nederlandse publiek over hun kennis van, betrokkenheid met en financiële bereidheid om bij te dragen aan de goede milieutoestand (GES) van de Noordzee. De resultaten zijn verkregen door ongeveer 400 respondenten een online enquête over de milieutoestand van de Noordzee te laten invullen. De enquête richt zich op drie descriptoren die van belang zijn met betrekking tot het behalen van GES in de Noordzee: Biodiversiteit, Onderwatergeluid en Zwerfvuil. Het doel van deze studie is om bij te dragen aan de sociaaleconomische analyse die momenteel wordt uitgevoerd ten behoeve van de actualisatie van de Initiële Beoordeling als onderdeel van de verplichtingen vanuit de Europese Kaderrichtlijn Mariene Strategie.

Het raadplegen van Nederlandse burgers over hun percepties van de Noordzee kan het beleid op milieugebied ondersteunen, door het draagvlak voor maatregelen en duurzame milieubeleidsvorming in kaart te brengen. Burgers hebben baat bij een schone, gezonde en productieve zee en daarbij is het belangrijk de meningen, waarden en belangen van deze grote groep te onderzoeken. Zo voelen burgers zich meer gehoord en worden ze zich bewuster van de keuzes die beleidsmakers moeten maken. Hierbij kan uiteindelijk het grootste draagvlak worden gecreëerd onder burgers voor toekomstige beleidsvorming.

Uit de enquête die is uitgevoerd blijkt dat Nederlanders vaak naar de Nederlandse kust gaan. Zo heeft meer dan de helft van de respondenten het gebied de afgelopen twaalf maanden bezocht én is de helft van plan het gebied in de komende twaalf maanden te bezoeken. Er wordt veel belang gehecht aan verschillende culturele ecosysteemdiensten, zoals genieten van het landschap, het Noordzeegebied als leefomgeving voor verschillende planten en dieren, en de positieve invloed die flora en fauna op het landschap heeft. Ook geeft bijna twee derde van de Nederlandse respondenten aan dat ze (zeer) tevreden zijn met de natuurkwaliteit en meer dan de helft heeft het gevoel dat hun stressniveau verlaagt wanneer ze het Noordzeegebied bezoeken.

Desalniettemin worden door respondenten ook negatieve invloeden ervaren in het Noordzeegebied. Zwerfvuil op zee, troebel zeewater en het uitzicht op windmolenparken worden genoemd als negatieve aspecten in het Noordzeegebied.

Een meerderheid van de respondenten geeft aan een beetje tot vrij veel van de huidige milieutoestand van de Noordzee te weten. Zo zijn de meesten bekend met zwerfvuil op zee als milieuprobleem. Ook het risico dat windmolenparken met zich meebrengen voor vogels, en de verstoring van de Noordzeenatuur door visserij, is bij de meerderheid bekend. Toch zijn de respondenten niet op de hoogte van alle milieuproblemen: zo heeft slechts een beperkt aantal respondenten gehoord over de problemen met onderwatergeluid. Er blijkt een verband te bestaan tussen de mate van bekendheid met milieuproblemen en het draagvlak voor maatregelen om de betreffende problemen tegen te gaan. Respondenten vinden dat met de maatregelen het meest moet worden gefocust op zwerfvuil. Onderwatergeluid wordt als veel minder belangrijk gezien.

Wanneer gekeken wordt naar de bereidheid om financieel bij te dragen aan het bereiken van de goede milieutoestand in de Noordzee, blijken respondenten bereid te zijn om tussen de 30 en 40 euro per huishouden per jaar bij te dragen. In soortgelijk onderzoek dat is gedaan in Finland en Duitsland, ligt dit bedrag hoger. Dit kan te maken hebben met het verschil tussen de milieuproblemen waar in deze buitenlandse studies op is gefocust (eutrofiëring) en deze Nederlandse studie (o.a. onderwatergeluid). Eutrofiëring heeft een tastbaarder en directer effect op recreatieactiviteiten, terwijl de effecten van onderwatergeluid relatief abstract blijven. De belangrijkste redenen die respondenten noemden om financieel te willen bijdragen aan de GES van de Noordzee, is dat ze een gezonde zee willen waarborgen voor toekomstige generaties en dat het bestaan van een gezond ecosysteem belangrijk is. Er is echter ook een grote groep die niet wil bijdragen in de kosten voor het realiseren van een goede milieutoestand. Belangrijke redenen hiervoor zijn dat zij vinden dat degenen die de Noordzee het meest vervuilen, voor de kosten moeten opdraaien (het *polluter pays* principe), en dat de financiering van de overheid moet komen en niet van individuele bijdragen.

Het behalen van de GES van de Noordzee laat de Nederlandse populatie niet koud. Het overgrote merendeel geeft aan dat het belangrijk is dat de GES van de Noordzee wordt behaald en vindt dat de GES van de Noordzee één van de belangrijkste beleidspunten moet zijn. Verder hechten de respondenten van de drie transities van het Noordzeeprogramma (natuur, energie en voedsel) het



meeste belang aan de natuurtransitie. Natuurbescherming wordt dus belangrijker gevonden dan de productie van voedsel of energie.

Om meer inzicht te krijgen in de voorkeuren en overwegingen van Nederlandse burgers omtrent de milieutoestand van de Noordzee, zou een uitbreiding van de enquête en vervolgstudie nodig zijn. Ten eerste zou er een reiskostenanalyse kunnen worden uitgevoerd, met betrekking tot de gegevens van de woonplaats van de respondenten en de bereidheid van de respondenten om tijd en geld te besteden om naar het Noordzeegebied te gaan. Ten tweede zou door de enquête te herhalen na de huidige energiecrisis en inflatie een analyse kunnen worden uitgevoerd naar de mogelijke veranderingen in de mening van de respondenten. Ten derde zou het stimuleren van soortgelijke studies in buurlanden rondom de Noordzee (Engeland, Schotland, Noorwegen, Zweden, Denemarken, België en Frankrijk) inzicht kunnen geven in de mening van de burgers in het gehele mariene gebied en kan op die manier een meer coherente beleidsvorming op internationaal niveau worden ondersteund.

Tenslotte blijft het belangrijk dat de burgers met betrekking tot het Noordzeebeleid worden geconsulteerd, zodat er op een solide manier in kaart wordt gebracht wat het draagvlak is voor beleid en zo de meest duurzame besluitvorming voor de Noordzee kan worden ontwikkeld.

List of abbreviations

CVM	Contingent Valuation Method
(D)CE	(Discrete) Choice Experiment
DMV	Deliberative Monetary Valuation
EU	European Union
ES	Ecosystem Service(s)
GES	Good Environmental Status
MCA	Multi-Criteria Analysis
Ministry I&W	Ministry of Infrastructure and Water Management
MS	Member State(s)
MS1, MS2, MS3	Marine Strategy part 1; Marine Strategy part 2; Marine Strategy part 3.
MSFD	Marine Strategy Framework Directive
LPI	Living Planet Index
PVE	Participatory Value Evaluation
TEV	Total Economic Value
WTP	Willingness-to-Pay

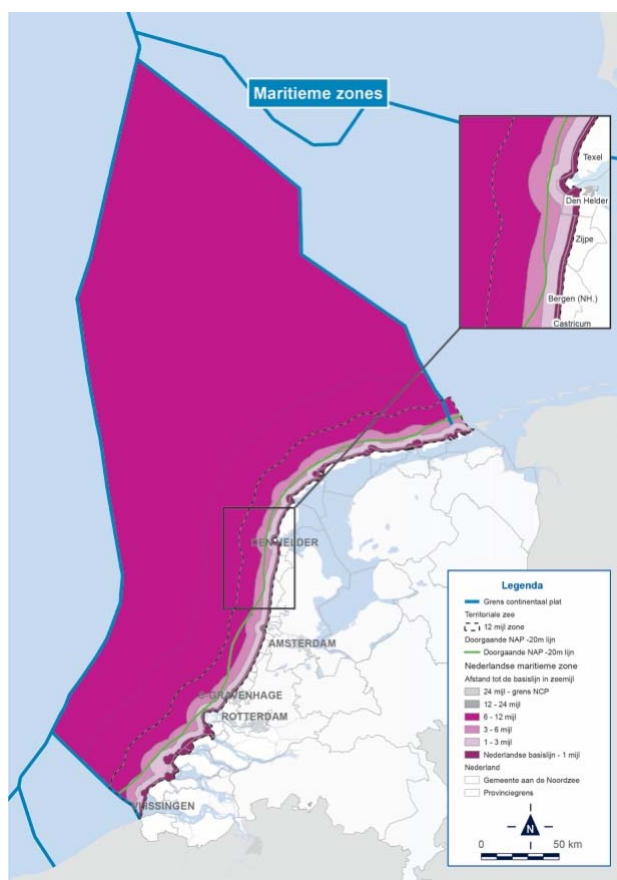


Figure 1. Marine waters of the Dutch North Sea, adjusted map from Noordzeeloket (2022)

The North Sea: please note that throughout this paper, by 'the North Sea', the Dutch marine waters in the North Sea are referred to unless stated otherwise.

1. Introduction

1.1 EU Marine waters, exploited areas with new developments

Over the past few decades, anthropogenic activities in the European marine waters have rapidly been intensifying, making these waters some of the most exploited marine areas in the world (Soma et al., 2019). Different stakeholders' interests add pressure to the environment and conflict with conservation goals (Borja et al., 2013). Consequently, the European Union (EU) presented the Marine Strategy Framework Directive (MSFD) in 2008, in which detailed guidelines and criteria contribute to the Good Environmental Status (GES) of EU marine waters (European Parliament & European Council, 2008). Member States (MS) are requested to develop national strategies that ensure their marine waters reach GES.

1.2 A jam-packed North Sea

The MSFD is highly necessary when it comes to the North Sea, as almost nowhere in the world is a sea more crowded and exploited (Boon & Kromkamp, 2022). This is unsurprising since the North Sea is connected to the busiest shipping routes in the world (Matthias et al., 2016). With global trade projected to increase and the North Sea having a high ship density, marine congestion is increasing (Matthias et al., 2016). What is more, shipping is not the only activity at sea. In March 2022, the Dutch government vouched to double its offshore wind capacity by 2030 and designated new offshore wind farm areas in the North Sea (Rijksoverheid & Ministerie van Infrastructuur en Waterstaat, 2022). Also, fishing, sand extraction, oil and gas extraction, and recreation are taking up space (Rijksoverheid & Ministerie van Infrastructuur en Waterstaat, 2022). At the same time, the North Sea ecosystem faces the long-term consequences of climate change, whereby measurements prove that the North Sea is warming faster than surrounding marine areas (Tinker & Howes, 2020). So, both the intensification of anthropogenic activities at sea and the looming impacts of climate change are threatening the environmental quality of the North Sea marine environment.

1.3 Dutch Marine Strategy

As a response to threats to the environmental quality of the North Sea area and as part of the implementation of the MSFD, the Dutch government has introduced its own national Marine Strategy, which consists of three parts (Eggenkamp & Rotteveel, 2014). First, the initial assessment (MS1) describes the current environmental status, the GES, and the environmental targets and was published in 2018. This initial assessment is due to be updated in 2024. Second, a monitoring program (MS2) explains the monitoring carried out by the Netherlands to assess and monitor its environmental state. This program was published in 2020 and is planned to be updated in 2026. Third, a program of measures (MS3) introduces and elaborates on the policy measures needed to achieve GES. This was recently published in March 2022 and will be revised in 2028.

Another requirement of the MSFD is that Member States (MS) conduct socioeconomic analyses, to support the development of their initial assessments (EU Water and Marine Directors, 2018). The results of these assessments should aid in decision-making and support the development of programs of measures (EU Water and Marine Directors, 2018). In addition, examinations of the perceptions and values of the public can be seen as contributory to the social analysis of the use of the marine environment, thus supporting the socioeconomic analyses that must be performed as part of the MSFD requirements. For the North Sea, research on the public's perceptions and values has not been carried out since the start of the first Dutch Marine Strategy cycle from 2012-2018 (Bemer & Steenhuisen, 2011). Thus, currently there is no clear picture of the perception and valuation of the Dutch citizen on the North Sea. The aim of this research is to contribute to the socioeconomic analysis of the Dutch initial assessment (MS1) update due in 2024, by assessing how the general public views and values the North Sea.

1.4 The worth of public opinion

Consulting the Dutch general public about their perceptions of the North Sea can support environmental policymaking. Environmental policymaking often involves super wicked problems (Levin et al., 2012), and this tempts policymakers to rely on science and expertise alone (Kuklinski & Peyton, 2009). Yet, citizens' opinions should also be considered, as this improves the effectiveness, efficiency and transparency of policymaking (Rodrigo & Amo, 2006). Effectiveness, because public consultation can provide valuable input that improves the quality of policymaking. Efficiency, because public consultation can improve the support and acceptability of policy choices, and with that the compliance of measures. And transparency, because public consultation identifies potential unintended effects and problems of measures and simultaneously raises awareness about the complexities the government faces whilst making decisions. All in all, this results in more support for measures and durable environmental policymaking (Mouter et al., 2019).

Public consultation has also been stressed by the European Commission in regard to the MSFD, since they state that citizens have an interest and benefit from clean, healthy and productive seas (European Commission, 2021). In The Netherlands however, only direct stakeholders (such as fisheries, energy companies and NGOs) are currently consulted through the North Sea Consultation (Noordzeeoverleg). The stakeholder's opinions, values, and interests are being elicited through this consultative body to inform future policymaking. Taking this into consideration, it is desirable that Dutch citizens are consulted about their knowledge, views, and ideas of the North Sea as well.

1.5. An environmental valuation debate: introducing monetary and non-monetary valuation

The following question then is *how* the general public can be consulted. In the past, MS have undertaken public consultations through questionnaires, stakeholder forums and/or interactive websites (EU Water and Marine Directors, 2018). In this research, the stated-preference survey contingent valuation method (CVM) will be used. Through this method, the respondents are asked whether they are willing to financially contribute to restore the North Sea ecosystem services (ES) through a hypothetically created market condition (Hanemann, 1994), giving a monetary valuation of the marine environment. Furthermore, the survey method provides the opportunity to investigate the general public's valuations on the issue at hand more broadly, giving an indication of the non-monetary valuation of the marine environment.

It is relevant to determine both monetary and non-monetary values in this research, as there has been a valuation debate on how ES can be interpreted (Pagiola et al., 2004). On the one hand, monetary valuation of marine ES has been prevalent in marine environment management, due to intensified economic activities in the waters (Börger et al., 2020). On the other hand, there are academics concerned about reducing the valuation of ES to just a number (EPA & SAB, 2009), whereby policy makers start demanding other valuations of ES beyond the monetary (Ruckelshaus et al., 2015). Different value definitions can be based on different conceptions of human-nature relationships, i.e., ideological foundations that underpin societal structures (Arias-Arévalo et al., 2019). In literature, environmental valuation has been approached from various disciplines: conceptually, ethically, methodologically, and empirically.

From a conceptual perspective, different definitions of value have been described, such as monetary values, intrinsic values, and shared values (see appendix 1). These definitions account for the multiple ways in which people engage with nature (i.e., gaining from nature, living for nature, living in nature) (Arias-Arévalo et al., 2019). Non-monetary valuation as an umbrella term can relate to more transcendental, collective valuation of an ecosystem. Naturally, they are more difficult to pinpoint, because they account for these ethereal principles (Kenter et al., 2014).

From an ethical perspective, monetary valuation has been subject to the commodification critique: market trade principles are extended to ecosystems. Pascual et al. (2014) state that this can lead to the marginalization of vulnerable stakeholders or the unequal distribution of benefits. However, there can also be positive equity outcomes, such as local empowerment, new income generation and poverty reduction.

From a methodological perspective, various research methods are used to assess different types of values: revealed preference methods (e.g., travel cost) and stated preference methods (e.g., CVM) elicit monetary valuation. Whereas deliberative methods (in-depth discussion groups) and

interpretative methods (participatory mapping), elicit non-monetary valuation (Arias-Arévalo et al., 2019).

From an empirical perspective, stated preference valuation has been prevalent in research in the marine environment (e.g. Börger et al., 2020; Jobstvogt et al., 2014; Ahtiainen et al., 2014; Nieminen et al., 2019; Oehlmann, 2021). Yet there has also been research dedicated to alternative approaches to environmental valuation (Kenter et al., 2014). These CVM and alternative valuation studies will be further elaborated in the literature review.

1.6 Research questions and outlay

Considering the described policy context and aim of the research, the following main research question has been formulated: **To what extent is the Dutch general public engaged with, knowledgeable of, concerned with, and financially willing to contribute to the Good Environmental Status of the North Sea marine environment?**

The general public's perception and value regarding the North Sea can be divided into multiple aspects. To begin with the public's engagement, the research will examine to what extent the public interacts with the North Sea. Examples include recreational use, leisure activities, the satisfaction of the quality of nature and the frequency of visits to the North Sea area. In addition, this study will determine to what extent the public is knowledgeable of the current environmental challenges in the North Sea. An example of this is whether the public has heard about the consequences of ecological problems related to underwater noise in the North Sea. To elaborate on this, the extent to which the public is concerned with these current environmental challenges can then be examined. Finally, the economic value the public ascribes to an ecosystem can also be estimated by the amount somebody is willing to pay to ensure that GES is achieved in the North Sea region (Börger et al., 2014).

Bearing in mind the different views on environmental valuation, the second objective of this research is to explore the differences between monetary and non-monetary valuation of ecosystems in the context of the North Sea for the Dutch general public. For this, the following methodological question has been formulated: **To what extent are monetary and non-monetary valuations on reaching the Good Environmental Status of the North Sea marine environment for the Dutch general public correlated?**

The monetary and non-monetary values will be derived from the survey data. Monetary valuation in this study is defined as the amount somebody is willing to pay to secure that GES is achieved in the North Sea region. As described earlier, however, non-monetary valuation can be interpreted in many ways. It is most feasible that this research considers non-monetary values as experiential variables. What these experiential variables are will be further elaborated on in the methodology section. Finally, through eliciting specific correlations or lack thereof between these monetary and non-monetary values, the differences between environmental valuation can be further explored.

1.7 Reading guide

This report will start with a chapter where the theoretical frame of the research will be discussed: the policy context, theory and empirical examples will be described. Subsequently, the following chapter will elaborate on how the research is conducted and why certain methodological steps were made. This also described, for example, how the survey was designed and the content of the questions. The next chapter is a detailed description of the results. The last chapter then further examines and discussed these results. For example, the monetary and non-monetary values derived from the survey will be compared, suggestions for possible further research will be mentioned, and once again a concise conclusion of the entire study is given.

2. Literature review

2.1 Theoretical background

2.1.1 European policy context

In 2008, the European Union introduced the Marine Strategy Framework Directive (MSFD), which aims to protect and restore Europe's seas and oceans and promote sustainable development (European Parliament & European Council, 2008). The MSFD requires every MS to establish a national marine strategy. These strategies strive to protect, preserve, and restore the marine environment while guaranteeing sustainable use of the North Sea, Baltic Sea, Mediterranean Sea, and Black Sea. The goal per marine region is to achieve or maintain a GES, which is determined by eleven qualitative descriptive elements (see appendix 2). These elements ensure that deterioration is stopped, and restoration and sustainable use of the waters are enabled (EU Water and Marine Directors, 2018).

2.1.2 National policy context

To enable the GES of the North Sea, new measures are presented in the Programma Noordzee 2022-2027 (Rijksoverheid & Ministerie van Infrastructuur en Waterstaat, 2022). In this document, three of the eleven GES descriptors are given attention to extensively, because they do not meet GES requirements yet, have a certain knowledge gap and/or are pressing issues in the North Sea region: biodiversity, marine litter, and underwater noise (Rijksoverheid & Ministerie van Infrastructuur en Waterstaat, 2022). Hence, these descriptors will also be a focal point in this study.

Biodiversity is a key pillar in the European Biodiversity Strategy of the European Green Deal (European Union, 2011). In the North Sea species such as guillemots, sea bass, turbot, and cod are in vulnerable positions. Figure 2 highlights the overall decline of biodiversity of the North Sea: in the period of 1990-2015 the Living Planet Index (LPI) of the North Sea decreased by 30 percent.

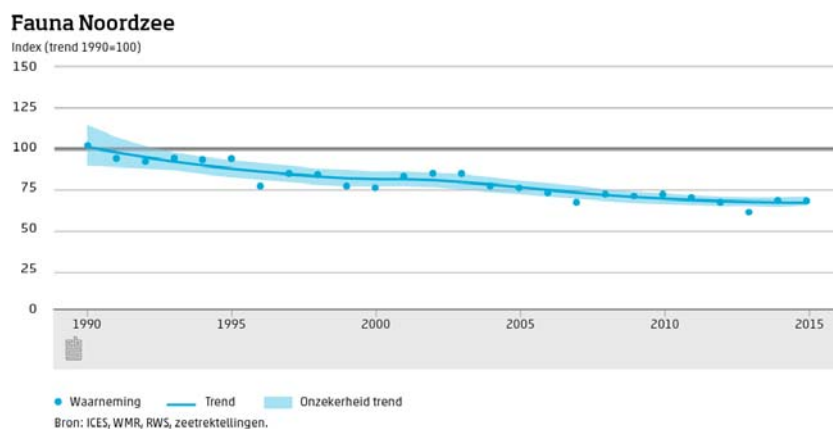
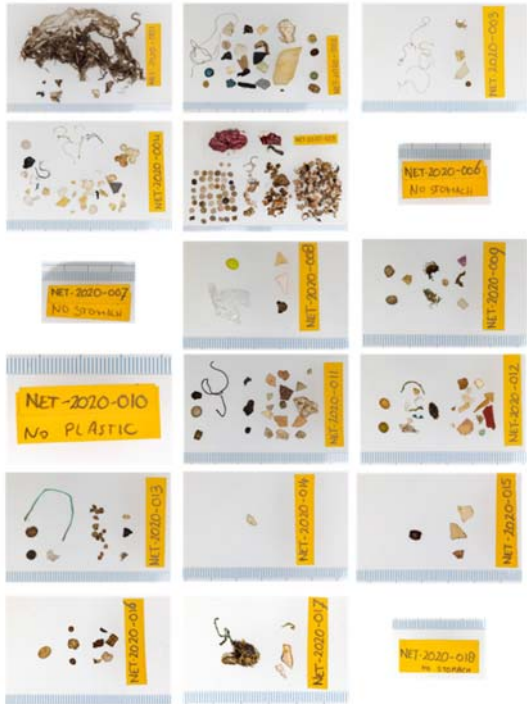


Figure 2: LPI of the North Sea from 1990-2015, a decrease of 30%. Source: CBS, ICES, WMR, RWS (2021)

Marine litter has been defined as one of the major global environmental problems by the EU (Werner et al., 2016). Although the amount of litter on the North Sea coast is decreasing, the amount of litter on the seabed is still substantial and e.g., creates problematic entanglement hotspots for grey seals, minke whales and gannets. Plastic litter is also found in stomachs of fulmars, which threaten their livelihood (Werner et al., 2016) (figure 3).

Overview of plastics in stomachs of 18 fulmars found in the Netherlands during 2020



NET-2020-002 had been in rehabilitation for 8 days

Figure 3: the monitoring program of plastics particles in stomachs of beached northern fulmars. Source: Franeker et al. (2020)

Underwater noise is an issue that the European Commission tries to tackle by agreeing on threshold values that every MS has to enforce (European Commission, 2021). In the North Sea this is a critical theme, as for instance the construction of offshore wind farms creates underwater (impulse) noise that is harmful for marine mammal populations (MinI&W & MinLNV, 2018) and shipping causes excessive (ambient) noise (figure 4).

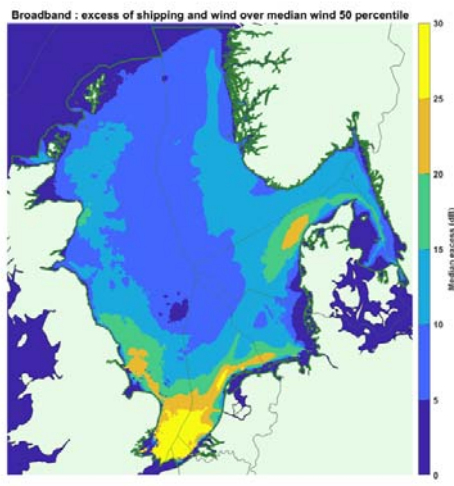


Figure 4: Difference between the total sound level and the natural sound level in the North Sea (Broadband_ExcessMedian). Source: JOMOPANS (2019)

2.1.3. Contingent Valuation Method

A contingent valuation method is a stated preference method where the WTP of individuals is elicited by using hypothetical scenarios for e.g. environmental changes in marine environments. Hence, the main research question (**To what extent is the Dutch general public engaged with, knowledgeable of, concerned with, and financially willing to contribute to the Good Environmental Status of the North Sea marine environment?**) will be investigated using a CVM. A CVM provides the context to ask about the WTP, but also more generally about the Dutch general public's engagement with, knowledge of, and concerns about the environmental state of the North Sea.

Stated preference techniques are the only methodologies that cover both use values and non-use values of an ecosystem (Bateman & Turner, 1994). These values can be divided by the Total Economic Value (TEV) framework (figure 5). Whereas the use-values of the TEV cover direct links between ES and human welfare, non-use values pertain to more intangible values such as the benefits derived from the knowledge that an ecosystem exists and can be enjoyed by others (altruist value). Another example of a non-use value is the value placed on passing on a healthy ecosystem to future generations (bequest value) (Sukhdev, 2010). Non-use values are particularly important concerning the marine environment, because literature has shown that these values form a significant portion of the TEV of a marine environment to society (Ahtiainen et al., 2014; Aanesen et al., 2010; Norton & Hynes, 2014).

Note that not all non-monetary values are featured in the TEV. Although the values described in the TEV framework can be about intangible matters, e.g., altruistic values and bequest values, they are still strictly concerning individualistic and self-regarding benefits. Some values move beyond the TEV framework and can be seen as more transcendental, cultural, societal, communal and other-regarding (Kenter et al., 2014). How these values can be elicited through different methods than a CVM is discussed below.

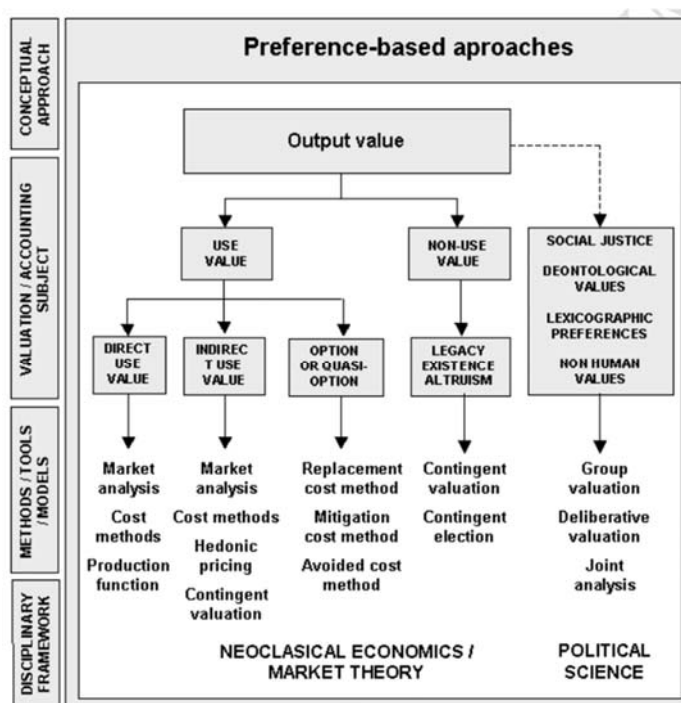


Figure 5: TEV, approaches to the estimation of nature's values. Source: Pascual et al. (2012)

2.1.4. Alternative valuation methods

Next to the above-mentioned CVM, there are also methods that elicit other values, for example: deliberative methods (e.g., in-depth discussion groups, citizen's juries), analytical-deliberative methods (e.g., participatory modeling, deliberative multi-criteria analysis), and interpretative methods (e.g., participatory mapping, storytelling, media analysis) (Kenter et al., 2014). Although these methods will not be used in this research, it is still relevant to mention them, and understand scholars' ambitions to further develop these methods and with that broaden the environmental valuation sphere (Arias-Arévalo et al., 2019).

Kenter et al., (2014) describes the case study Inner Forth which was about conducting a deliberative monetary valuation (DMV) with community councils. Here, results showed that even while WTP values decreased, altruistic values increased. Resulting in a clear example of how monetary valuation and non-monetary valuation do not always correlate. In The Netherlands, Participatory Value Evaluation (PVE) has been developed. Through this method, the public is given a restriction, possible policies and an outline of effects of these policies to choose from (Mouter et al., 2019). These results will then be analyzed to determine the cost and benefits of different policies. Case studies using this method have been about e.g., climate consultation and the long-term ambition of Dutch rivers. Also, in the Dutch marine environment context these alternative valuation methods are used, e.g., through the North Sea Consultation. This consultative committee has fifteen seats for relevant ministries and organizations in the energy, food, nature, or shipping sector, and elicits the stakeholder's values through in-depth discussions every two months.

These examples show new and additional methods for investigating non-monetary values, approaching valuation as something multi-dimensional that cannot be captured in a single metric. In the marine environment sphere, academics believe greater efforts are required to develop interdisciplinary, cross-sectoral methodologies that capture specific values relevant to the marine context (Hooper et al., 2019). Still, it is not surprising that these studies are in their infancy and are not dominating the marine area valuation sphere yet. A preference is still given to quantifying value in monetary terms, due to the graspable nature of a single metric (Börger et al., 2020).

2.2 Previous empirical findings

2.2.1. Empirical examples of CVM and DCE

A multitude of European primary studies has recently been conducted to investigate the general public's perception on marine environments and to monetize the benefits of an improved status of marine environments.

The most comprehensive research has been undertaken by Ahtiainen et al. (2014), who determined the economic valuation of ES provided by the Baltic Sea. The WTP of the public for reducing eutrophication in the Baltic Sea is described in a report given to decision makers by the BalticSTERN Secretariat, 2013. The research was internationally coordinated: all nine coastal states around the Baltic Sea participated and a cross-cultural analysis between the countries was made. By identifying perspectives and ideas of the public concerning the Baltic Sea, the results of their study played a crucial role in helping policymakers to implement MSFD (Hooper et al., 2019). The data of that extensive study was subsequently used by Czajkowski et al. (2015) to determine the recreational benefits of the Baltic Sea, using a travel cost method.

Other recent and relevant examples of primary marine waters studies using the CVM, are the following: Nordzell (2020) measured the monetary value of achieving the GES in Sweden's Sea waters. Through descriptive and statistical analyses, factors such as income, proximity to the sea, and knowledge of the environmental problems in the sea were connected to variations in WTP. Nieminen et al. (2019) estimated the economic benefits of achieving the GES in the Finnish marine waters of the Baltic Sea. In their study, the eleven environmental descriptors described by MSFD were grouped into six environmental problems, to make the survey more comprehensible to the respondents. Oehlmann (2021) undertook a study in Germany, which was designed to resemble the Finnish survey for both the Baltic and the North Sea. This has been done so that a meaningful comparison between countries is possible.

Besides Oehlmann (2021)'s German marine water studies, primary studies dedicated to the public's value of the North Sea are rather limited. However, the following studies are worth mentioning.



Norton & Hynes (2014) used the CE methodology in Ireland to estimate the value of non-market benefits of the achievement of GES by the Irish general public. Similar to the Finnish and German study, several of the eleven MSFD descriptors were combined into five attributes used in the choice card. Furthermore, a CE research by Börger et al. (2014) was performed for the Dogger Bank, in the British Southern North Sea. By mentioning policy options related to fisheries, wind farms and marine protection, it was assessed to what extent the British public perceives and values conservation benefits arising from the marine protected area. In a more recent paper, Börger et al. (2020) present a CE survey valuing a set of ES linked to the British section of the North Sea. This study also elaborated on the need for development of economic valuation and its application in environmental policymaking.

Lastly, a qualitative consultation amongst the Dutch population regarding the North Sea was undertaken by Bemer & Steenhuisen (2011) for the Ministry of Infrastructure & Water Management (I&W). Here, the general perception and valuation of the environmental state of the North Sea and its (recreational) benefits were assessed through a survey. The environmental problems included were oil pollution, extinction of species, marine litter, algal bloom, and damage to the seabed. This study and environmental problem focus are relatively outdated, however, since the first Dutch MS cycle started in 2012, other issues in the North Sea have become more prominent.

All in all, these studies have investigated the general public's perception on European marine environments. These several studies have used management targets and descriptors of the GES, described by the MSFD. However, more recent studies and regional focus of the Dutch North Sea is lacking, thus this research aims to fill this gap. Although different from the spatial context, the research of Ahtiainen et al. (2014), Nieminen et al. (2019), and Oehlmann (2021) are very similar in their goal and policy framework. Therefore, these studies are used as guiding examples for comparison throughout the rest of this study.

3. Methodology

3.1 Contingent Valuation Method (operationalizing monetary valuation)

There are several reasons why the CVM is the most appropriate method for this research. First, it is the most widely used method for estimating non-use values, which are predominant in the valuation of the marine environment (Hooper et al., 2019). Second, it is a method often used when research results intend to inform policymaking (Börger et al., 2020). Because the goal of this research is to contribute to the revision of the MS1, a CVM fits this policy context goal. Third, conducting a survey method is most realistic within the timeframe of this research, whereas non-monetary focused methods (i.e., workshops, storytelling, etc.) would be more time-consuming and its execution in the limited timeframe could lead to illegitimate results. Fourth, it provides the opportunity to both determine monetary valuation, as well as non-monetary valuation through wide-ranging questions in the survey. And fifth, the literature review mapped out similar primary studies that were conducted with the same goal and policy framework (Ahtiainen et al., 2014; Nieminen et al., 2019; Oehlmann, 2021), whereby these all undertook a CVM. To align with these studies, a CVM is seen as the most appropriate method for this study.

Another important aspect in regards to these similar European studies, is that the survey of the research of Oehlmann (2021) meticulously followed the same structure of the Finnish and Swedish surveys of Nieminen et al., (2019) and Nordzell (2020), to enable a direct comparison between the countries. This can ultimately form a basis for informed European-wide policy making. Because of this, the survey design of these similar studies has been considered in the first version of this research and further adapted to match the Dutch circumstances. For example, Nieminen et al. (2019) focused on eutrophication (one of the most important environmental issues in the Baltic Sea), whereas this study focusses on issues more prominent in the North Sea, such as underwater noise and marine litter.

3.2. Defining experiential variables (operationalizing non-monetary valuation)

As the second objective of this research is to explore the extent of correlation between monetary and non-monetary valuation on reaching the GES of the North Sea marine environment for the Dutch general public, monetary and non-monetary valuation needs to be further defined. The monetary value will be the WTP variable. Keeping in mind that non-monetary valuation derived from alternative valuation methods is not feasible in the timeframe of this research, non-monetary values will be experiential variables as derived from the survey. Previous literature shows that people's WTP in other North-European countries often correlate with variables related to concern for the marine environment (Oehlmann, 2021) and good prior knowledge of certain environmental issues (Ahtiainen et al., 2014). Furthermore, Oehlmann (2021) showed that frequency of visits to the North and Baltic Sea significantly correlated with the WTP. Considering this, the non-monetary values in this research will be identified as the following experiential variables: perceived knowledge on the GES of the North Sea (Knowledge), whether the respondent cares if the North Sea is protected and the GES is achieved (Concern), and frequency of visits in the last 12 months (Visit) (see Appendix 4, survey question 1, 9 and 10). It is assumed that correlations found in these studies will also be found in the North Sea context for the Dutch population. This leads to the following hypothesis:

Hypothesis:

A higher degree of "Concern", "Prior knowledge to certain environmental issues", and "Frequency of visits to the North Sea area", elicits a higher WTP

Furthermore, in academic literature several demographic factors have been found to influence respondents WTP for the GES of marine waters, mainly level of education and age. For instance, Oehlmann (2021)'s study showed that respondents with a higher education level had a higher WTP. Also, in Nieminen et al. (2019)'s study WTP increased with a lower age of the respondent. Given that these sociodemographic factors have had a significant influence in similar studies, in this study the OLS model will also be used to determine which sociodemographic factors influence the Dutch respondents WTP of achieving GES in the North Sea. Leading to the second hypothesis:

Hypothesis:

A higher level of education, and lower level of age, elicits a higher WTP

3.3. Survey design

Based on the literature review, the first version of the survey was designed. The questionnaire is formulated in Dutch, to decrease non-response bias (Etter & Perneger, 1997). After that, reformulation and corrections of the survey took part in close cooperation with civil servants from several divisions of the Ministry of I&W and Rijkswaterstaat, including economists and natural scientists, and comprised several feedback loops. In total, correspondence and feedback loops with a total of 10 colleagues has taken place, ranging from a team coordinator of marine policy at the Ministry of I&W, to a senior consultant at Rijkswaterstaat involved in underwater noise. Adding questions and refocusing the content of the survey, were part of this process. Then, the questionnaire was pretested by 14 participants through convenience sampling. These participants were recruited through the professional network of the external supervisors from the economist's division of Rijkswaterstaat and Ministry of I&W and the personal network of the researcher. The participants were asked to review the survey in terms of clarity, length, and conciseness of information. Based on the results of this pretest, the survey functioned well, but some last reformulations were made. A data and evidence-based agency, Kantar, was later consulted to give the final advice on the implementation of the survey in an online environment. Finally, the survey was programmed by Kantar to function online and was sent to the respondents.

There are several key elements of what a CV survey should include: a detailed description of the ES being valued and the hypothetical change regarding the ES, questions about WTP for the ES being changed, and questions about respondents' characteristics (Bateman & Turner, 1994). The survey consists of four parts:

The first part is about the respondents' recreational use of the North Sea area. Questions about the frequency of visits to the North Sea area in the last twelve months, how many times and what kind of leisure activities have been done in these months, and if the respondents plan to visit the North Sea area in the next twelve months, are included in this first part. Next to that, the respondents are asked about how satisfied they are with the quality and/or experience of nature of the North Sea, if certain factors influence their experience of the North Sea positively and/or negatively, and how important they think certain cultural ES are.

The second part of the survey focuses on the current status of the North Sea. Here, the current environmental status of the North Sea is being described as an ecological system under pressure due to intensive anthropogenic use. Then, the respondents are asked about how much they know about the current environmental status of the North Sea, how important they think it is that the GES of the North Sea is reached, if they think the GES of the North Sea should be one of the most important policy focuses, and if they think they can influence the implementation of GES of the North Sea through their own actions. Furthermore, to investigate how knowledgeable respondents are about the challenges on the North Sea, several issues are introduced in the survey (with a focus on biodiversity, litter, and underwater noise). Then, the respondents are asked if they heard about these issues prior to the survey.

The third part of the survey is about GES of the North Sea. First, the respondent is asked if they knew about the policy measures to achieve GES of the North Sea prior to this survey, and which issues (i.e., biodiversity, litter, underwater noise, and climate change) should be focused on. Subsequently, the WTP context is described, and the respondents are asked if they would be willing to pay to contribute to reaching GES of the North Sea. As a continuation, the respondents are asked about their reasons for being (un)willing to financially contribute, if they think their WTP answer will influence policymaking, and to what extent they think it is realistic that they would financially have to contribute to achieving GES. Lastly, to ensure WTP answers are valid, the respondents are questioned if they understood the WTP questions well, if they thought it was easy to answer the WTP, and if they think a binding fee would be a good instrument to collect money to achieve GES of the North Sea.

The fourth part, lastly, is about generating information about the environmental behavior of the respondents. Questions about if the respondent is a member of an environmental organization, uses eco-labeled detergents, inspires other people to environmentally responsible behavior, and recycles waste are amongst others asked.

3.4. Data collection

The survey data was collected in May 2022, using an internet panel run by a data and evidence-based agency, Kantar. The data collection of Kantar has been financed by the Ministry of Infrastructure & Water Management. Kantar's 20,000 panel members regularly participate in online surveys. To ensure a representative sample of the general public, a random selection of the participants panel was selected (Davern, 2011), and in total 402 surveys were completed. The data collection mode, using internet survey through Kantar's online panel, reduces the chance for social desirability bias and sampling bias (Lindhjem & Navrud, 2011). In the data cleaning process, 1 respondent had to be removed from the data set because she had remarked she did not fill in the survey truthfully. In addition, 6 respondents had to be removed due to implausible lead time/speeding. Thus, the final sample consists of 395 valid respondents.

3.5. Data analysis

Using the statistical software SPSS, the dataset can be further examined. Gathering the results is done in two parts. First, the descriptive analysis is conducted to get a clear idea of the characteristics of the sample set. This helps to determine if the sample population is a good representation of the total Dutch population, and gives a quantitative overview on the engagement, knowledge, and concerns of the sample population regarding the GES of the North Sea marine environment.

Second, the analysis of the contingent valuation is performed using the basic ordinary least square estimation model. Hereby, the stated WTP value can be analyzed in correlation with potentially explanatory variables.

3.6. Complexities of the survey

It is worth mentioning that there are three specific elements that were particularly complex in the formulation and execution of the survey. This had to do with the WTP formulation, valuation context, and income variable.

First, there are specific guidelines on how a correct WTP question is formulated. Amongst others it should be clearly stated who pays (e.g., the respondent individually or for the household), whether the payment is mandatory or voluntary, the frequency of payment (e.g., monthly, yearly), the duration of payment (e.g., one time, the next 10 years), and the method of payment (payment vehicle: e.g., tax, municipality bill) (Johnston et al., 2017). Furthermore, literature suggests a payment vehicle should be binding, as this enables incentive compatibility and prevents free riding behavior. These guidelines should ensure that the WTP question is credible, realistic, and understandable, although they function as mere guidelines since each valuation context determines the exact formulation of the question. These guidelines have been considered as much as possible when formulating the WTP question (questionnaire appendix 3, question 21).

Second, another aspect is a credible valuation context, whereby the circumstances (both current and future hypothetical desired circumstances) are clearly defined and stated (Johnston et al., 2017). For this, there are still scientific knowledge gaps about environmental issues mentioned in the MSFD (Rijksoverheid & Ministerie van Infrastructuur en Waterstaat, 2022). For many environmental indicators the current state is being analyzed as part of the update of the MS1, so the most recent current state of the North Sea is not yet completely defined in governmental papers. This makes it challenging to accurately define them in the survey. To tackle this, the information provided in the survey is derived as much as possible from the initial assessment MS1 published in 2018. In this report the focus lies on the three descriptors mentioned earlier (biodiversity, marine litter, and underwater noise), and are addressed extensively (MinI&W & MinLNV, 2018). In addition, the questions were checked with the relevant descriptor leads from the Ministry of I&W to ensure their applicability within the context of the upcoming update of the MS1.

Third, previous studies have shown that income can be an important determinant of WTP. Typically, in WTP studies, income is an explanatory variable which is included (Bateman & Turner, 1994). However, due to sensitivities of obtaining this information through the survey panel Kantar, this



information could not be provided for this study. Therefore, in this study the income effects on WTP cannot be estimated. In potential follow-up research, it is crucial this information is obtained.

4. Results

4.1. Descriptive statistics

4.1.1. Sociodemographic characteristics of the sample

Table 1 presents the relevant sociodemographic variables of the sample in comparison with the total Dutch population. In general, the respondents have a higher education than the total Dutch population, which is more common in internet surveys (Lindhjem & Navrud, 2011). Also, mean household size and the number of children per household is slightly higher in the sample population, and the sample population is on average 7 years older. These sample variations have been observed in similar studies, whose work also depicted their national populations (Nieminen et al., 2019; Nordzell, 2020; Oehlmann, 2021). Table 2 similarly shows the percentage of respondents per province in comparison with the total Dutch population. Thus, this sample population can be considered representative of the total Dutch population.

Table 1. Sociodemographic characteristics of the sample and total Dutch population. Total Dutch population values are retrieved from the Statistics Netherlands database (CBS), with data from 2021

Sociodemographic characteristics of the sample	Variable description	Mean	Min	Max	Total Dutch population
Sample size (n)	Number of respondents	395			
Mean age (years)	Age in years	49.3	18	85	42.3
Female (% female)	1 if respondent is female, 0 male	47.6%	0.0	1.0	50.7
Household size	Number of people living in respondent's household	2.58	1	6	2.14
Minors per household	Number of children living in respondent's household	2.37	2	6	1.7
High education (%)	Respondent has university degree (HBO-, WO-propedeuse/bachelor/master/doctorate, 0 else)	43.5%	1	7	20.0

Table 2. Percentage of respondents per province of sample population and total Dutch population. Total Dutch population values are retrieved from the Statistics Netherlands database (CBS), with data from 2021

Provincie	Sample population	Total Dutch Population
Groningen	3.3%	3.4%
Friesland	3.0%	3.8%
Drenthe	4.6%	2.9%
Overijssel	7.1%	6.7%
Gelderland	11.6%	12%
Utrecht	6.1%	7.5%
Noord-Holland	12.7%	16.5%
Zuid-Holland	25.3%	21.4%
Zeeland	1.5%	2.2%
Flevoland	3.5%	2.4%
Noord-Brabant	15.9%	14.7%
Limburg	5.3%	6.5%

4.1.2. (Recreational) Use of the North Sea

The first part of the survey focuses on generating an idea of the engagement of respondents with the North Sea area. Most of the respondents (62%), had been at the coast or the North Sea area at least once in the last twelve months, and almost half of the respondents (46.6%) plan to visit the area in the next twelve months (tables 3 and 4). Most of the respondents who had been at the North Sea area the last twelve months, spent their North Sea leisure time in a beach club or restaurant (54.2%) (table 5).

Table 3. Travel frequency of respondent in the last twelve months. N=395

Travel frequency to the Dutch coast or the North Sea area in the last 12 months	Percent
Never	38.2%
1 time	26.6%
Between 1-5 times	21.3%
Between 5-10 times	5.8%
More than 10 times	8.1%

Table 4. Planned travel frequency of respondent in the next twelve months. N=395

Travel intension to the Dutch coast or at the Dutch North Sea area	Percent
Yes	46.6%
Maybe	39.0%
No	14.4%

Table 5. Number of times respondents carried out different leisure activities during the last 12 months. N=244

Activities done in the past twelve months	Never	Between 1-5 times	More than 5 times
Boating or sailing	55.7%	5.6%	.5%
Other water sports: (wind- of kite-) surfing, diving, SUP boarding	58.5%	2.5%	.8%
Spending time at a beach restaurant or club	7.6%	45.3%	8.9%
Observing birds	45.3%	15.2%	1.3%
Swimming	47.8%	12.2%	1.8%
Sport fishing	60.3%	1.5%	0%
Spending time on the beach (sunbathing, walking, jogging, biking or walking your dog)	10.9%	37.7%	13.2%

Table 6. Influence of several factors on respondent's experience in the Dutch coast or at the North Sea area. N=395

Influence on experience on the Dutch coast or at the Dutch North Sea area	Strong negative influence	Light negative influence	No influence	Light positive influence	Strong positive influence	I don't know
Turbid Seawater	10.9%	37.2%	36.2%	3.8%	2.5%	9.4%
Litter in the ocean or on the beach	54.9%	28.9%	5.6%	2.5%	2.8%	5.3%
View offshore wind farms	13.7%	27.8%	43.8%	4.6%	4.1%	6.1%
Flora and fauna	1.3%	2.5%	14.2%	22.8%	52.2%	7.1%
Finding parking spots	7.3%	17.0%	28.1%	18.0%	18.5%	11.1%
Catering facilities (e.g. beach bars)	.3%	6.6%	21.3%	35.9%	29.4%	6.6%
Public toilet availability	2.8%	6.6%	20.8%	29.6%	31.6%	8.6%
Blue flag availability	2.0%	1.8%	37.5%	18.0%	17.2%	23.5%

Furthermore, 69.6% of the respondents are (very) satisfied with the quality of nature of the North Sea area, with the presence of flora and fauna being the strongest positive factor (75%). Factors that have a negative effect on the respondent's experience of the North Sea area are litter in the ocean or on the beach (83.8%), turbid seawater (48.1%) and the view of wind farms (41.5%) (table 6 for full overview). Next to that, more than half of the respondents feel their stress levels decrease when they spend time at the North Sea area (56.9%) (table 7).

Table 7. Statements based on experience. N=395

Statements	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	I don't know
I feel that my stress level decreases when I spend time on the Dutch coast or at the Dutch North Sea area	2.3%	9.9%	20.5%	43.5%	13.4%	10.4%
I feel strongly connected to the North Sea	6.1%	24.3%	31.9%	25.8%	5.6%	6.3%
I am satisfied about the quality and experience of the nature of the North Sea area	1.3%	1.3%	15.4%	50.6%	19.0%	12.4%

4.1.3. Cultural ecosystem services

Respondents were asked to rank the importance of several (cultural) ecosystem services. Cultural ecosystem services in relation to coastal environmental were identified through the CICES Classification on cultural ecosystem services (Haines-young & Potschin, 2011). The two most important identified cultural ES are enjoying the landscape (85.3%) and habitats for plants and animals (73.7%), whereas the least important identified services are spiritual experiences (9.7%) and artistic inspiration (9.6%) (table 8).

Table 8. Importance cultural ecosystem services. N=395

Cultural Ecosystem Services	Very unimportant	Unimportant	Neither important nor unimportant	Important	Very important	I don't know
Recreation and community activities	2.3%	11.4%	22.0%	44.6%	16.5%	3.3%
Artistic inspiration	30.4%	38.5%	16.2%	7.8%	1.8%	5.3%
Educational	11.4%	24.3%	38.0%	18.5%	2.3%	5.6%
Spiritual experiences	32.2%	32.4%	19.7%	8.4%	1.3%	6.1%
Historically and culturally important	8.4%	15.2%	31.1%	37.0%	4.3%	4.1%
Enjoying the landscape	.5%	2.5%	8.1%	50.1%	35.2%	3.5%
Habitats for plants and animals	2.3%	5.3%	15.4%	48.9%	24.8%	3.3%

4.1.4. Knowledge about environmental problems

Several environmental problems were introduced and described in the survey, relating to the three descriptors: biodiversity, underwater sea noise and litter. After the explanation of each issue, the respondents were asked if they had heard about it prior to the survey (figure 6). The most well-known environmental problem was litter, whereby 79% of the respondents said they had heard about it. The least well-known environmental problem was underwater noise, with only 29% of the respondents indicating that they had heard about it. The topics related to biodiversity (wind farms threatening migration flows of birds and seabed disturbing fisheries) were relatively familiar to the respondents, as 60% and 55% had heard about these issues, respectively. Conclusively, 77% of the respondents stated to know a little to quite a lot about the environmental status of the North Sea in general (figure 7).

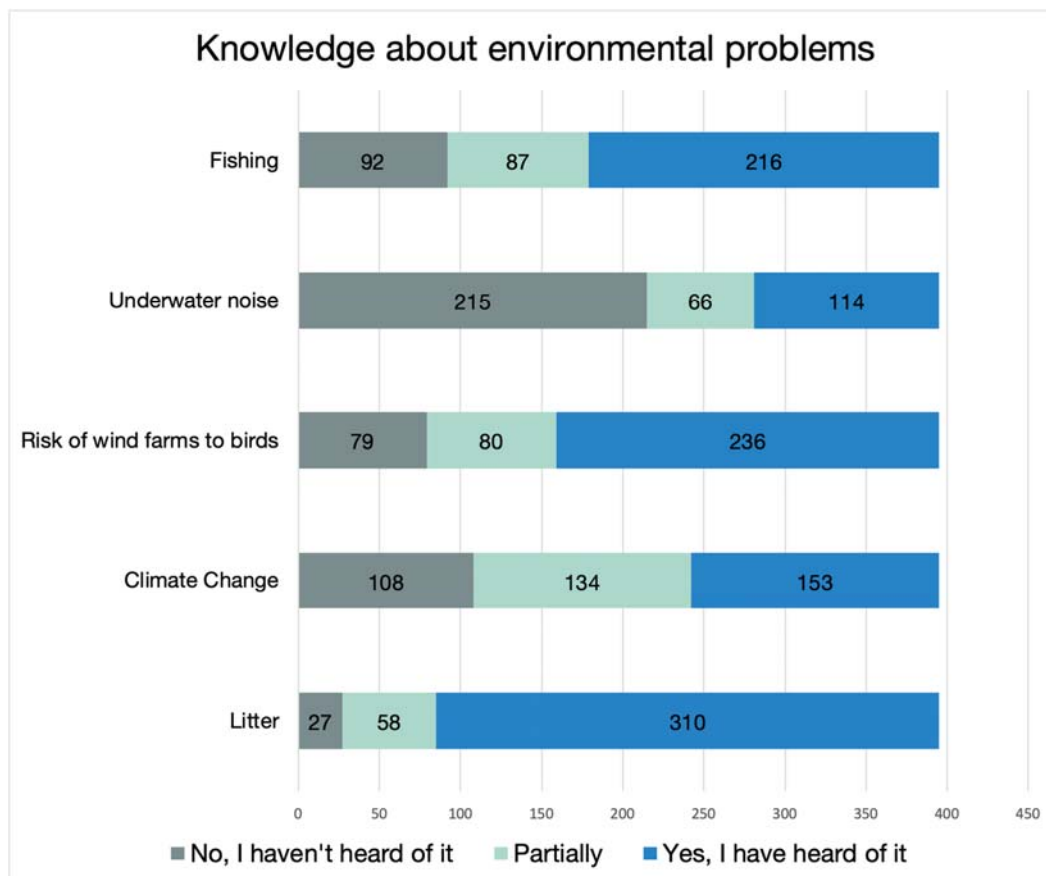


Figure 6. Clustered bar chart of knowledge about environmental problems. "Have you ever heard prior to this survey about the issue ...?" N=395

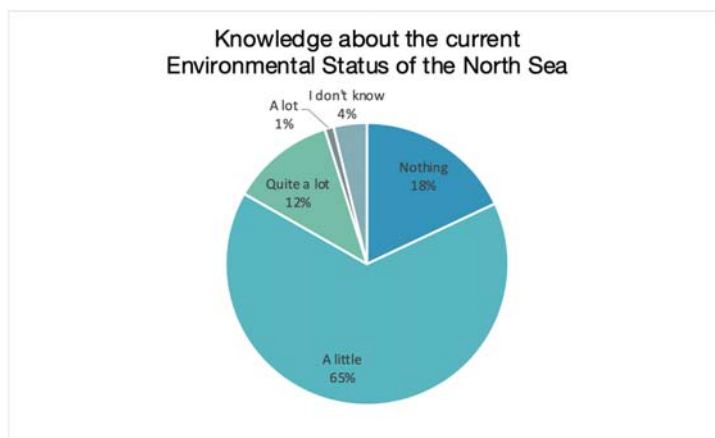


Figure 7. Perceived knowledge about current environmental status of the North Sea. "What do you know about the current environmental status of the North Sea?" N=395

4.1.5. Improved status of the North Sea

Of all respondents, more than 85% think that it is important that GES of the North Sea is achieved, 64.5% think achieving GES should be one of the most important policy focuses, 49.3% think they can influence GES with their own actions, and 18% would go to the North Sea area more often if GES is reached (table 9).

Table 9. Statements on the GES of the North Sea. N=395

Statements on GES North Sea	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	I don't know
I believe that the GES of the North Sea should be one of the most important policy points	1.3%	4.6%	24.1%	45.6%	19.0%	5.6%
It is important that the GES of the North Sea is achieved	0.5%	1.3%	8.6%	55.4%	30.9%	3.3%
I can affect the Good Environmental Status of the North Sea by my own actions	4.1%	13.2%	25.1%	39.2%	10.1%	8.4%
I would go the North Sea more often if the GES is reached		53.7%		18%		28.4%

What is furthermore described in the survey, are the three main transitions of the North Sea Program: nature, energy, and food. To determine the perceived importance of these transitions, respondents were asked to divide 100 points over the three transitions. Adding up the total number of points per category of the total amount of respondents gave the nature transition 45% of the total amount of points. The food and energy transition received almost the same number of points, both 26% (figure 8). Conclusively, nature protection is considered to be more important than the production of food or energy.

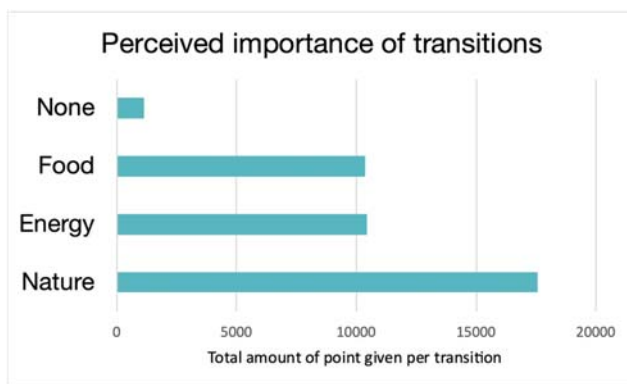


Figure 8. Division of points according to degree of importance between transitions (total amount). N=395

Regarding the perceived importance of single environmental problems (figure 9), respondents were asked which issues they think should be focused on with the measures, dividing 100 points again over several categories (biodiversity, climate change, litter, and underwater noise). The results correspond to some extent to knowledge regarding these problems (figure 6). For example, the most well-known problem, litter, is also considered to be the most important issue to focus on with policy measures. Next to that, the least well-known problem, underwater noise, is also considered to be the least important environmental issue to focus on.

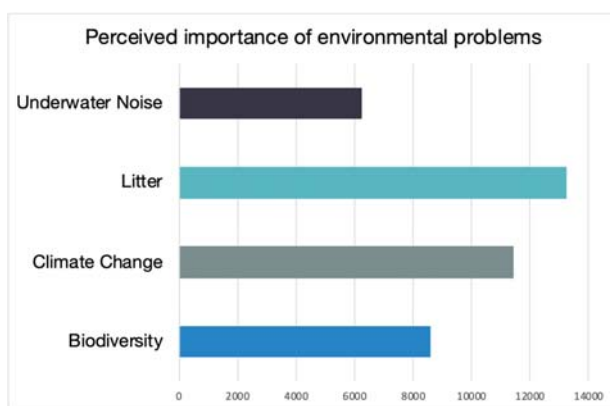


Figure 9. Division of points according to degree of importance between environmental problems (total amount). N=395

4.1.6. Willingness to pay

Of all respondents, 201 (50.9%) stated they were willing to pay something to reach GES of the North Sea, of which 130 (32.9%) stated an exact amount in an open-ended question. The other 71 (18%) respondents who were willing to pay something to reach GES of the North Sea, selected one of the intervals $>€0$, but refused to fill in the open-ended question. Their WTP value is estimated to lie in the middle of their chosen interval. Furthermore, the respondents who stated they were unwilling to pay, assumed to have a genuine zero WTP value (41%). Also, there was the option to state "I don't know" in the payment card question, these respondents (9.37%) were left out of further analysis. In total, 358 WTP responses could be further analyzed (table 10).

An important issue when analyzing explanatory variables in relation to WTP, is determining what to do with protest answers. Although in literature there is no agreed practice to address this problem, a sensitivity analysis is generally seen as a transparent approach (Johnston et al., 2017). This means that the analyses are conducted with and without the protest responses to investigate whether these observations have an influence on the results. Protest responses were in this study identified following the definition of Nieminen et al. (2019), which Oehlmann (2021) also used. Considering these studies, the following answers could be identified as protest responses in the closed-ended question concerning the reasons for not being willing to pay: "I don't believe it is possible to reach Good Environmental Status" and "I think those who pollute the North Sea the most, should pay for the

costs". Considering this definition, 93 respondents could be considered as protesters. In the inferential statistics, estimations are made both including and excluding protesters.

Table 10. Subcategories of sample populations WTP

Sample population categories	N	Percentage	Mean WTP	Median	Min	Max
Total	395	100%				
Stated exact WTP amount	130	32.91%	€53.06	€40	€1	€600
Selected interval payment card > 0, refused open-ended question	71	17.97%	€45.54	€38	€13	€350
Selected interval payment card: 0, refused open-ended question	5	1.27%	€0	€0	€0	€0
Selected payment card option 'I don't know'	37	9.37%	-	-	-	-
Stated WTP, but refused interval and open-ended question	0	0%	-	-	-	-
Stated unwillingness to pay without protest answer	64	16.2%	€0	€0	€0	€0
Stated unwillingness to pay with protest answer	93	23.54%	€0	€0	€0	€0
Final sample category including protest responses	358	90.63%	€27.54	€13	€0	€600
Final sample category excluding protest responses	265	67.09%	€37.21	€25	€0	€600

After answering the WTP question, respondents were given the opportunity to briefly elaborate on their statement. Some remarks that were made, were: "Everything is getting more expensive, more financial obligations will be difficult", "There are many environmental issues, financially I cannot contribute to more", "It all depends on how the costs are distributed. Citizens should not be taxed if fishing companies and large polluters can continue almost free of charge.", and "I stated 130 euros. This is approximately the price you pay for health insurance. You can see this as an investment in the health of the marine environment".

The two most important reasons for the respondents who reported to be unwilling to pay (41%) were because they thought those who pollute the North Sea most, should pay for the costs (53.7%; polluter pays principle) and that financialization should come from the government, not from individual contributions (48.1%) (table 11). There was also an open-ended question to include further remarks. Responses in this realm included "I already spend money on supporting the flora and fauna in my own province" and "I live very far away from the coast. In my living area (which is much nicer), there are also environmental problems that require solutions."

Table 11. Reasons for respondent's unwillingness to pay, N=162

Respondent's reasons for unwillingness to pay	Percentage
The current state of the North Sea is good enough	4,3%
I cannot afford it	34,6%
I don't believe it is possible to reach Good Environmental Status	7,4%
I'd rather use the money for other purposes	18,5%
I don't think the environmental status of the North Sea is important (enough)	6,2%
I think those who pollute the North Sea the most, should pay for the costs	53,7%
The environmental status of the North Sea feels too abstract a concept	4,9%
I think this is the role of the government, and does not necessarily have to be financed by individual contributions	48,1%
I believe there should be stricter regulation and enforcement	36,4%
Other...	10,5%

Of the respondents who were willing to contribute (50.9%), most of the respondents deemed it to be important to contribute because they wanted to ensure a healthy North Sea for future generations (78,5%; bequest value). Furthermore, the second most important reason was because the existence of a healthy ecosystem was important to them (48,8%) (table 12). Next to the described reasons, there was also an open-ended question to include further remarks. An answer in this realm included “This is the problem of everybody – we have to solve this together, so let’s also pay together.”.

Table 12. Reasons for respondent’s willingness to pay, N=201

Respondent’s reasons for being willing to pay	Percentage
I use the North Sea for recreation	22,4%
The existence of a healthy ecosystem is important for me	48,8%
I want to ensure that I will have the opportunity to use the North Sea for recreation in the future	32,3%
I want to ensure that other people in my generation can use the North Sea for recreation	29,9%
I want to ensure a healthy North Sea for the future generations	78,6%
Other...	0,3%

4.1.7. Consequences and certainties of their WTP statements

A small majority of the respondents did not think it was realistic that they would have to financially contribute to the GES of the North Sea (50.6%), although still almost half of the respondents (47.6%) think it is plausible their WTP statement will be considered in future policy making. The validity of the WTP values was tested by extra questions: in general, the WTP question was understood correctly, as >75% stated to have understood the WTP well, and >70% thought it was easy to answer. However, the opinions vary greatly about the credibility of the WTP scenario (table 13).

Table 13. Statements on WTP (consequentiality, credibility, level of difficulty, etc.)

Statements on GES North Sea	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	I don’t know
I think the WTP scenario was credible	24.8%	25.8%	-	32.2%	6.6%	10.6%
I think my WTP statement will influence national policy	8.4%	24.8%	-	37.5%	10.1%	19.2%
I understood the WTP questions well	3.0%	4.8%	13.4%	52.7%	24.1%	2.0%
It was easy to answer the WTP questions	1.5%	9.4%	15.4%	54.9%	16.5%	2.3%
I believe it is possible to achieve the GES of the North Sea	2.3%	8.4%	23.5%	47.3%	6.8%	11.6%
A yearly binding fee would be a good instrument to enable the GES	23.0%	21.5%	18.5%	25.3%	5.6%	6.1%

4.2. Inferential statistics

4.2.1. Model specification

To determine if certain explanatory variables have a significant influence on the dependent variable WTP, a basic ordinary least squares model was used. The determinants of WTP were analyzed by the OLS for the point estimate in the open-ended WTP question, to see how well the WTP value is predicted by numerous independent variables. In the OLS model, the dependent variable was the WTP point estimate from the open-ended question.

4.2.2. Sociodemographic and experiential variables

The models were run with different numbers of variables: sociodemographic variables and experiential values. The sociodemographic variables consist of age (Age), gender (Female), education (High education), and the number of people living in the respondent's household (Household size), perceived knowledge of GES of the North Sea (Knowledge), whether the respondent cares if the North Sea is protected and GES is achieved (Concern), and frequency of visits in the last 12 months (Visit) (see Appendix 3, survey question 1, 9 and 10).

4.2.3. Basic OLS regression model

The results for the two basic OLS regression models are presented in Table 14: one excluding and one including the respondents identified as protesters. Overall, most results are similar across both models. The exceptions and remarkabilities are discussed below.

Considering the model including protest responses, the R^2 is .086, which means that only 9% of the dependent variable WTP is explained by the independent variables. This is a relatively low R^2 value, but not uncommon, proven by e.g., Nieminen et al. (2019)'s study. Furthermore, when looking at the significance levels, the WTP values increase with level of education, household size and degree of concern. So e.g., people were willing to pay more for the protection of the North Sea if they were concerned about the status of the North Sea, and if the respondent obtained a higher education. No significant effects are observed with respect to other variables (interestingly, also not regarding the frequency of visits over the last twelve months).

Table 14. OLS Results for WTP model. Note: Significant variable levels are from 5% OLS=ordinary least squares

OLS						
	Including protest responses			Excluding protest responses		
	Unstandardized coefficients	Standard error	Sig.	Unstandardized coefficients	Standard error	Sig.
Age	.121	.169	.475	.010	.216	.961
Female	-3.033	5.750	.598	-5.408	7.258	.457
High education	9.159	3.421	.008	9.578	4.673	0.041
Household size	-5.467	2.265	.016	-8.546	2.888	0.003
Knowledge	-4.749	3.260	.146	-9.301	4.251	0.030
Concern	8.124	2.326	<.001	9.380	3.203	.004
Frequency visits	-.772	2.200	.726	-2.002	2.753	.468
Constant	-21.060	21.113	.319	13.479	29.370	.647
N	358			265		
R2	.086			.112		
Adjusted R2	.068			.087		



Considering the model excluding protest responses, the R^2 is slightly higher than for the model including protesters, .112. Furthermore, when looking at the significance levels, the level of education, household size and degree of concern are also influencing the WTP. What is additionally striking is that the knowledge variable has an effect on the WTP values. These results therefore indicate that in both models (including and excluding protest responses), a relationship exists between the degree of concern, the level of education, the household size and the WTP values.

5. Discussion & conclusion

5.1. Discussion of results

5.1.1. Dutch general public perceptions of the North Sea marine environment

In this research, the engagement with, knowledge of, concerns with, and financial willingness to contribute to the GES of the North Sea by the general public have been investigated.

Regarding the engagement with the North Sea, responses to questions on spending leisure time at the North Sea indicated that more than half of the respondents had been to the North Sea in the last twelve months (62%) and almost half of the respondents (46.6%) plan to visit the area in the next twelve months. The respondents place high importance on the cultural ES "enjoying the landscape" (85.3%) and "habitats for plants and animals" (73.7%), which is also highlighted by the presence of flora and fauna being the most positive influence (75%). Although marine litter (83.8%), turbid seawater (48.1%) and the view of wind farms (41.5%) are identified as negatively influencing the respondents time at the North Sea area. Considering the last point, respondents could potentially have answered this strategically to send a message to policymakers, since almost half of the respondents think it is plausible their answers in the survey will be considered in future policymaking (47.6%).

With respect to the knowledgeability, 77% of the respondents knew a little to quite a lot about the current environmental status of the North Sea. This is confirmed by the results that 79% have heard of marine litter as an environmental issue. However, only 29% heard about underwater noise as an environmental issue. These results reveal something about the concern respondents later show regarding environmental issues: respondents primarily supported measures to tackle marine litter, whereas problems related to underwater noise were seen as the least important. This implies that knowledge about environmental problems influences the importance people attribute to solving them. A logical policy reaction to these results could be to invest in underwater noise awareness campaigns to ameliorate people's knowledge on the issue.

When looking at the willingness to contribute financially to the achievement of GES of the North Sea, the respondents proved willing to contribute €27.54–€37.21 annually per household. This is remarkably less than in Oehlmann (2021)'s and Nieminen et al., (2019)'s research (€56.24–65.71 and €105–123, respectively). Possible explanations for this could be cultural differences between the countries, but perhaps more specifically, the focal issue of these studies was eutrophication. Eutrophication is more noticeable and has a more direct impact on recreational activities, whereas in this research e.g., the issue of underwater noise remains relatively abstract. Furthermore, in this study 41% of the respondents indicated to be unwilling to financially contribute. This is substantially more than in Oehlmann (2021)'s and Nieminen et al., (2019)'s research, and a little bit more than in Ahtainen et al., (2014)'s research. A possible explanation for this could be that in this research 69.6% of the respondents are (very) satisfied with the quality of nature of the North Sea area and logically do not deem it necessary to ameliorate the environmental status of the sea. Although the results also reveal that over 85% think it is important that GES of the North Sea is achieved, and the majority believe this endeavor should be one of the most important policy points. Considering this, another possible explanation for a relatively low WTP is the valuation scenario and time frame for delivery of environmental change (which is in 2030, so still considerably far away). However, the CVM provides no further data points to research in depth possible other explanations.

The most important reasons for people's willingness to contribute, is that they want to ensure a healthy North Sea for future generations, a result similarly found in Oehlmann (2021)'s and Nieminen et al., (2019)'s research. This highlights the non-use value that people attribute to the marine environment, and confirms the general finding that non-use values are predominant in the valuation of the marine environment by (Hooper et al., 2019).

The most important reasons for respondents to be unwilling to pay is that they think that those who pollute the North Sea most, should pay for the costs (53.7%; polluter pays principle) and that financialization should come from the government, not from individual contributions (48.1%). These reasons were not found in Oehlmann (2021)'s and Nieminen et al., (2019)'s research. A possible explanation for that could be that the political landscape differs between the countries, and more

specifically that in the Netherlands respondents ascribe more responsibilities to polluters and the government to tackle the issues at sea.

All in all, these results highlight that the Dutch population feels considerably engaged with, knowledgeable of and concerned with the North Sea environment, answering the main research question.

5.1.2. Relationships between monetary and non-monetary values and sociodemographic variables

To contribute empirically to the environmental valuation debate, OLS standard regression models are used to show effects and significance levels of the three described variables: concern, knowledge and frequency of visits, in relation to the variable WTP.

Irrespective of whether one includes or excludes protest responses, the frequency of visits did not show any significance level in relation to the WTP. Whereas those who visited the North and Baltic Sea were more likely to state a positive WTP in Oehlmann (2021)'s study, the frequency of visits does not significantly influence the WTP in this research. That the WTP is irrespective of the frequency of visits, is also reflected by the fact that most respondents stated that they would not go to the North Sea more often if GES was reached (table 9), and by the relative importance the respondents attribute to the cultural ecosystem services: respondents find it more important that the environment is a habitat for species (73.7%) than to be used for their own recreational activities (61.1%). Thus, the lack of significant correlation between WTP and frequency of visits, highlights that the North Sea brings contentment for non-users.

For the variable knowledge, the results show a significant relationship when protest responses are excluded but do not show a significant level when protest responses are included. This is the only variable for which a significant difference is found between the models in- and excluding protesters. Knowledge was also significant in explaining the size of WTP by Nieminen et al., (2019), Ahtiainen et al., (2014) and Oehlmann (2021). The significant correlation between knowledge and WTP means that the more knowledgeable people are about environmental problems, the more likely they are to financially contribute to solving these issues. This is unsurprising, strengthened by the fact that the level of education and WTP are also significantly correlating.

Most strikingly, regarding the degree of concern, for both including and excluding protest responses, a strong significant effect is observed in the relationship with the WTP values. In other words, if one thinks it is very important that the North Sea is protected, and the GES is achieved, one is likely to have a higher WTP. The degree of concern could be seen as a variable which touches upon more intangible, perhaps even collective valuation characteristics (Kenter et al., 2014). Therefore, this strong significant correlation means that certain characteristics of the variable concern are also embedded in the WTP. Considering the environmental valuation debate, these findings are in favor of CVM and the monetary valuation of ecosystems, answering the methodological question of this research.

Apart from investigating the effects of these experiential variables, the effects of sociodemographic factors are also explored. Although it could be expected that age would influence WTP (the older a respondent is, the least likely s/he is able to experience the full benefits of GES themselves, as the environmental improvement is delivered in 2030), it does not significantly influence WTP. A reason for this could be that most of the respondents who stated a positive WTP did this because they wanted to ensure a healthy North Sea for future generations (78,5%). Age and gender are both not found to influence WTP for the North Sea significantly. This is similar to the findings of Nieminen et al., (2019), Czajkowski et al., (2015) and Oehlmann (2021). Furthermore, it is found that WTP increases with the household's size. WTP significantly increases with increasing household size and higher education in Oehlmann, (2021)'s study as well, but were not significant in Nieminen et al., (2019), and Ahtiainen et al., (2014)'s results. A reason for this could be that the WTP scenario in this research was for the respondent's entire household, whereas in the similar research, the WTP scenario concerned the individual's financial contribution.

Overall, these regression results determine to what extent monetary and non-monetary valuations correlate: the knowledge variable significantly correlates when protest answers are excluded, and the concern variable strongly significantly correlates with the WTP value. Yet it is worth noting that these correlations could be further explored. The WTP variable remains one-dimensional, whereby factors

such as the value concept, value intention, value scale, and value provider could be further investigated (see appendix 4 for different dimensions of value). More insights on the the public's valuations and perceptions of the marine environment and the challenges it faces, are elicited by the rest of the questions in the survey.

5.2. Avenues for future research

During this research, ideas to further develop this assessment have come to light. First, one of the flaws that CVM has, is that there is the risk of hypothetical bias, which leads to a difference between stated and revealed preference (TEEB, 2010). A way of tackling this issue, is conducting multiple surveys whereby several different WTP contexts are described. As the opinion about whether the WTP scenario was credible or not strongly varied amongst respondents (table 13). The survey therefore could be adapted and improved to make the valuation context as plausible as possible.

Second, a longitudinal survey would consider the potential changes in respondent's opinions over a given period of time. Especially in the context of WTP values, geopolitical shifts can cause changes in people's financial situation. A longitudinal survey would actively consider these kinds of processes.

Third, the data of the location of residence of the respondents could be used. This can determine the distance to the coast and whether this distance holds a significant relation to e.g., the WTP. Furthermore, a travel cost analysis, whereby the respondents' willingness to spend time and money to go to the North Sea area can be conducted. Existing studies of the travel cost include Czajkowski et al., (2015), who undertook this by using the data acquired from Ahtiainen et al., (2014)'s research, and Lankia et al., (2019), who calculated the effects of water quality changes on the recreational benefits of the Baltic Sea.

Fourth, executing similar studies in other neighbouring countries of the North Sea (England, Scotland, Norway, Sweden, Denmark, Belgium, and France), would provide a comprehensive view of the topic in the entire marine area (as has been done with the extensive research of the Baltic Sea by Ahtiainen et al. (2014)). Hereby, EU wide policymaking can be supported more thoroughly, and this will increase the coherence of the MSFD. For this, contact with the United Kingdom Department for Environment, has been established for a possible British chapter of the research.

5.3. Conclusion and policy recommendation

The primary aim of this study was to investigate the engagements with, knowledge of, concerns with, and financial willingness to contribute to GES of the North Sea by the Dutch general public. To examine this, a CVM was used with almost 400 respondents. The CVM focuses on three descriptors defining GES in the North Sea and is designed to contribute to the MSFD's request to contribute to the MS1, to be updated in 2024.

According to the results, the Dutch are considerably engaged with, knowledgeable of, and concerned with the North Sea, as they visit the North Sea region frequently, place high importance on cultural ecosystem services related to enjoying the landscape and existence of habitats for species, think it is important that GES of the North Sea is achieved, and think achieving GES should be one of the primary policy focuses. Furthermore, through a WTP, the results show that the Dutch are willing to contribute €27.54–€37.21 annually per household to the achievement of GES of the North Sea. They particularly want funding to be allocated to marine litter. These results are relatively in line with similar studies in Western Europe (Ahtiainen et al., 2014; Nieminen et al., 2019; Oehlmann, 2021).

The second aim was to examine the extent of correlation between monetary and non-monetary valuation on reaching GES of the North Sea marine environment for the Dutch general public, taking note of the environmental valuation debate. To research this, an OLS standard regression model is used to show the effects and significance levels of the three experiential variables: degree of concern, knowledge and frequency of visits, and WTP. The most remarkable result was that WTP estimates were strongly depended on the variable concern. This supports the idea that there is a correlation between non-monetary and monetary valuation of ES.

However, it remains essential to recognize the one-dimensionality of this correlation, whereby other refinements in the results cannot be further explored. This results in too narrow a perspective. Thus, it



can be stated that monetary valuation should be part of a more extensive valuation assessment. It would be helpful to look at the non-monetary focused methods proposed by Kenter (2018): deliberative and interpretative models. In the context of the Dutch marine environment, a consultative body that investigates different stakeholder's interests regarding the North Sea has already been put in place: the North Sea Consultation (Noordzeeoverleg). This is an independent collaboration between fisheries, the government, and NGOs, based on equality, trust, and understanding of each other's interests. Since this research showed that the Dutch are considerably engaged with, knowledgeable of, and concerned with the North Sea, it leaves little to the imagination that the public can inarguably contribute towards marine policy decision-making. Therefore, these results make a concrete case for why the Dutch general public deserves a seat in the North Sea Consultation. This will ensure the development of a solid consultative foundation that supports sustainable decision-making for the North Sea.

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7. Appendices

Appendix 1. Value definitions to be considered in ecosystem services valuation (Arias-Arévalo et al., 2019)

Table 1. Value definitions to be considered in ecosystem services valuation

Value definitions		Discipline	References	Examples
1) Intrinsic value	Biodiversity and ecosystems are considered ends in themselves.	Philosophy, deontological ethics	Callicott, (1987); Rolston, (1989)	An endangered species conservation because it has the right to exist.
2) Principles	Stable references that guide human realization and thus orient human judgements and actions.	Social psychology, political ecology, environmental law	Schwartz, (2005), Kallis et al., (2013),	Altruism towards future generations
3) Monetary value	Utility measurements through prices.	Neoclassical economics	Peace and Turner, (1990)	Willingness to pay for a particular ES
4) Shared values	Values people hold for biodiversity, ecosystems and ES as citizens.	Sociology, political science	Sagoff, (1986); Kenter et al., (2015)	Aesthetic value of a landscape
5) Ecological value	Degree to which an entity or process contributes to ecological attributes	Ecology, among others	Farber et al., (2002); de Groot et al., (2010)	An Ecosystem's ecological resilience
6) Ways of concern	Distinctive ways in which it makes sense to care about nature and the provided ES.	Philosophy	O'Neill et al., (2008)	A forest's sacredness value

Appendix 2. Qualitative descriptors for determining Good Environmental Status (European Parliament & European Council, 2008)

Qualitative descriptors for determining good environmental status

(referred to in Articles 3(5), 9(1), 9(3) and 24)

- (1) Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
- (2) Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
- (3) Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
- (4) All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
- (5) Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
- (6) Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
- (7) Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
- (8) Concentrations of contaminants are at levels not giving rise to pollution effects.
- (9) Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
- (10) Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
- (11) Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

To determine the characteristics of good environmental status in a marine region or subregion as provided for in Article 9(1), Member States shall consider each of the qualitative descriptors listed in this Annex in order to identify those descriptors which are to be used to determine good environmental status for that marine region or subregion. When a Member State considers that it is not appropriate to use one or more of those descriptors, it shall provide the Commission with a justification in the framework of the notification made pursuant to Article 9(2).

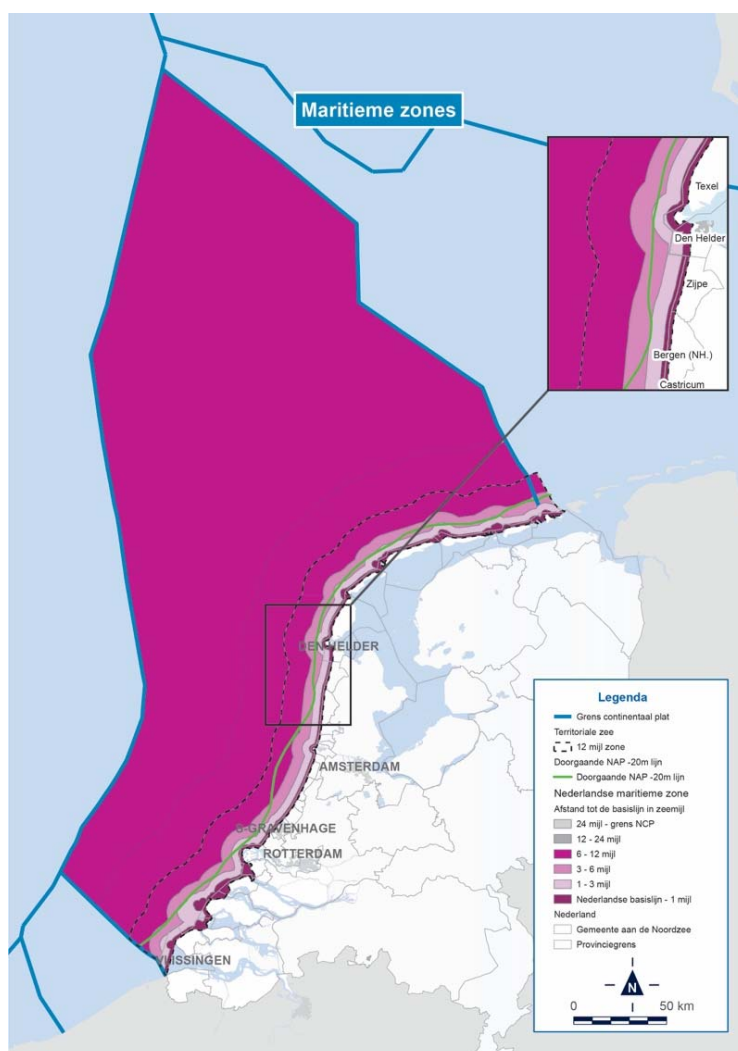
Appendix 3. Questionnaire

A survey on the environmental status of the North Sea

May, 2022

In this survey we explore Dutch citizens' opinions on the environmental status of the Dutch part of the North Sea. It takes approximately 15 minutes to fill in the survey and it does not require any prior knowledge on the subject. Answers will be treated anonymously.

Please note, that by 'the North Sea' we refer to the marine waters of the Dutch marine waters in the North Sea. This area is illustrated in pink in the map below.



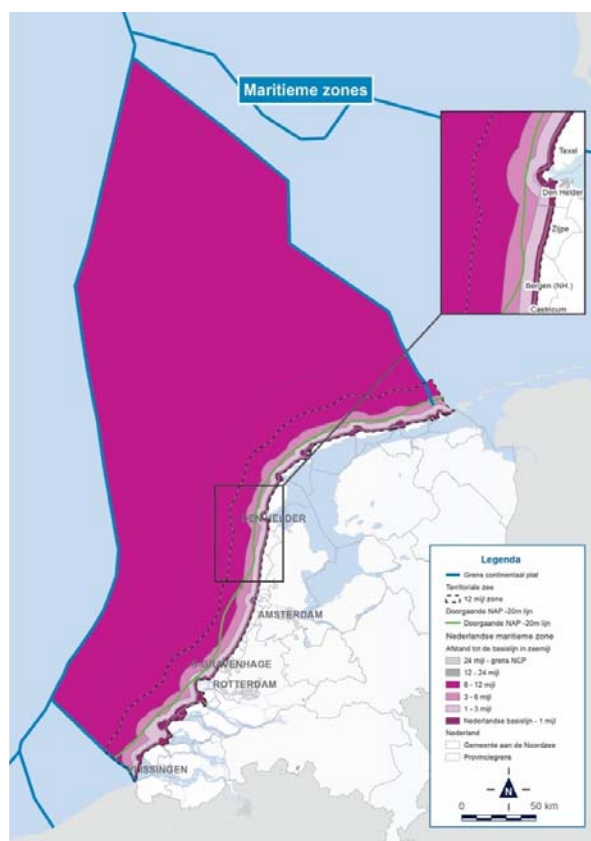
Source: adjusted version of the Noordzeeloket, marine zones of the Dutch North Sea

I. RECREATIONAL USE OF THE NORTH SEA

1. How often have you been to the Dutch coast or at the North Sea area in the last 12 months?

- Never (*proceed to question 5*)
- 1 time
- Between 1-5 times
- Between 5-10 times
- More than 10 times

2. Which coastal town/coastal area have you visited (most often) in the last 12 months? *Have a look at the map of the North Sea below.*



Bron: bewerkte versie van Noordzeeloket, *Maritieme zones in de Noordzee*

3. How many times have you been doing the following leisure activities on the Dutch coast or at the Dutch North Sea area in the last 12 months?

	Never	1–5 times	more than 5 times
Boating or sailing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swimming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other water sports: (wind- of kite-) surfing, diving, SUP boarding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sport fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time at a beach restaurant or club	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time on the beach (sunbathing, walking, jogging, biking or walking your dog)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observing birds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. How satisfied are you in general with the quality and/or experience of nature of the North Sea area?

- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied
- I don't know

5. To what extent did the following factors affect your experiences on the Dutch coast or at the Dutch North Sea area?

	Strong positive influence	Slight positive influence	No influence	Slight negative influence	Strong negative influence	I do not know
Turbid sea water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Litter in the ocean or on the beach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
View of offshore wind farms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Presence of various species of flora and fauna	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finding parking spots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catering facilities, such as beach bars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public toilet availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blue flag availability ¹	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹ The blue flag is an international award given annually to beaches that are safe and clean



6. Please indicate to what extent you agree or disagree with the following statements

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	I don't know
I prefer to spend my free time in forests or parks that on the Dutch coast or at the Dutch North Sea area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer to spend my free time near Dutch lakes or rivers than on the Dutch coast or at the Dutch North Sea area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that my health improves when I spend time on the Dutch coast or at the Dutch North Sea area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that my stress level decreases when I spend time on the Dutch coast or at the Dutch North Sea area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel strongly connected to the North Sea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Are you planning to spend free time on the Dutch coast or at the Dutch North Sea area?

- Yes
- Maybe
- No



8. How important are the following matters to you revolving around the Dutch coast or the Dutch North Sea Area?

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant	I don't know
Recreational activities (such as swimming, sport fishing, boating or bird watching)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enjoying the landscape, getting fresh air, taking in the sounds and smell of the sea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Artistic inspiration (such as painting seascapes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environmental for learning and acquiring new knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spiritual experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Historically and culturally important locations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The living environment for different plants and animals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visiting beach restaurants/bars and/or events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

II. CURRENT STATUS OF THE NORTH SEA

The North Sea is one of the most intensively used seas of the world. It is a sea where fishing, international shipping, offshore wind farms and recreation come together. The North Sea also contains an enormous diversity of species and ecologically special but vulnerable areas.

The **current environmental status of the North Sea**, the ecological system as a whole, is under pressure due to its intensive use. That is why there is national policy set in place that focuses on the **protection of the sea**. The ultimate goal of this policy is to ensure a **Good Environmental Status of the North Sea**.

The **Good Environmental Status** is achieved when the ecosystem is healthy and well-functioning. The aim is to make the North Sea diverse, clean, healthy, and productive, so that the sea can be used sustainably. A healthy North Sea is a sea that is healthy for the current generation as well as for future generations.

9. What do you know about the current environmental status of the North Sea?

- Nothing
- A little
- Quite a lot
- A lot
- I don't know

10. How important do you think that it is that the North Sea achieves a Good Environmental Status and is protected?

Totally unimportant	Both important and unimportant			Very important		
1	2	3	4	5	6	7

- I don't know

11. To what extent do you agree with the following statements?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	I don't know
I believe that the Good Environmental Status of the North Sea should be one of the most important policy points	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can affect the Good Environmental Status of the North Sea by my own actions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



The following questions examine the current challenges and bottlenecks in the North Sea, caused by human activities.

Accelerated climate change poses a threat to the **biodiversity** and ecosystem of the North Sea. Due to the increase in CO₂ concentrations and the rising temperature, various fish and other animal species are leaving the North Sea, because the maritime climate is no longer pleasant for them.

12. Have you heard prior to this survey about the consequences of accelerated climate change and the threat to biodiversity in the North Sea?

- Yes
- Partially
- No

Another reason why biodiversity in the North Sea is under pressure, is because of the impact of **fishing** on biodiversity. In **seabed disturbing fisheries**, for example, nets are dragged over the bottom, which can damage nature on the bottom and disturb habitats of, for example, sole, halibut and monkfish.

13. Have you heard prior to this survey about the disturbance of the North Sea nature by fishing?

- Yes
- Partially
- No

To combat climate change, the Netherlands must have completely switched to the use of renewable energy sources by 2050. The **development of offshore wind energy** plays an important role in this. At the same time, wind farms pose risks for birds: they disrupt the animals on their **migration routes** and collisions with the rotor blades can cause injuries or be fatal.

14. Have you heard prior to this survey about the risk that wind farms pose to birds?

- Yes
- Partially
- No

Another consequence of wind farms is **underwater noise**. Human activities at sea produce a lot of disturbing noise, which bothers animals. An example is that harbor porpoises are chased away from



areas where **piling** is used for the construction of wind farms. **Commercial shipping** also creates zones with high noise levels, which are a nuisance to animals.

15. Have you heard prior to this survey about the effects of underwater noise in the North Sea?

- Yes
- Partially
- No

Due to various actions and measures that have taken place in recent years, such as cleaning up and awareness campaigns for litter, the amount of litter on Dutch beaches has clearly decreased in recent years. However, there is still a lot of litter in the North Sea. This can make animals sick from eating plastic waste or suffocating in plastic bags.

16. Did you hear prior to this survey about litter in the North Sea?

- Yes
- Partially
- No

III. IMPROVED STATUS OF THE NORTH SEA

Many **measures** are being taken to improve the environmental status of the North Sea. These measures are described in the North Sea 2022-2027 Programme.

The task for the coming years is to find the **right balance** between (an expected increase in) economic activities in and around the North Sea and improving the environmental status of the North Sea.

17. What do you think your reaction will be if the North Sea achieves a Good Environmental Status?

- I would go to the North Sea more often for my leisure activities
- I wouldn't go to the North Sea more often for my leisure activities
- I don't know

The North Sea Program contains measures that support three developments:

1. **Nature:** This involves combating pollution and preserving, restoring and strengthening the North Sea ecosystem;
2. **Energy:** Replacing fossil fuels with sustainable energy, such as offshore wind energy, in order to limit greenhouse gas emissions;
3. **Food:** Development of a profitable and sustainable fishery and alternative ways of food production at sea, such as seaweed farming.

18. How important do you think these developments are? *You have 100 points that you can divide over the three developments. The total number of points must add up to 100.*

Nature	_____
Energy	_____
Food	_____
None	_____
Total	100

In order to achieve the **Good Environmental Status of the North Sea**, various policy measures have been formulated, such as closing certain areas at sea for certain activities, reducing marine litter by increasing awareness and cleaning up litter, reducing underwater noise, and enhancing nature and protecting species.



19. Have you heard prior to this survey about measures to achieve the Good Environmental Status of the North Sea?

- Yes
- Partially
- No

20. Which issues do you think should be most focused on with the measures? Arrange the problems below in order of preference, with number 1 having the highest priority and 4 the lowest.

1. Biodiversity

2. Climate Change

3. Litter

4. Underwater sea noise

The North Sea in Good Environmental Status in 2030

Many **measures** must be taken to bring the North Sea to Good Environmental Status. The more measures that can be implemented, the greater the chance that the Good Environmental Status of the North Sea can be achieved by 2030. The costs of the measures could be paid by means of an annual binding fee per Dutch household.

21. Would you be willing to pay any amount for an annual binding fee for your household between 2022 and 2030 to contribute to reaching the Good Environmental Status of the North Sea by 2030?

- Yes
- Maybe
- No (*Proceed to question 26*)

22. In which range is the highest amount you would be willing to pay annually for the North Sea to achieve the Good Environmental Status by 2030?

- €0 (proceed to question 26)
- €25-50
- €76-100
- €201-300
- More than €400
- €1-25
- €51-75
- €101-200
- €301-400
- I don't know (proceed to question 30)

23. You stated that the highest amount you would be willing to pay annually for the North Sea to achieve the Good Environmental Status by 2030 is €XX-XX. What is the exact amount you would be willing to pay such fee?

_____ €



24. Could you briefly elaborate on the answer of the previous question? (then, proceed to question 29)

25. What is/are the most important reason(s) for you not to be willing to pay for the North Sea achieving the Good Environmental Status by 2030? You can select multiple answers.

- | | |
|--|-----------------------|
| The current state of the North Sea is good enough | <input type="radio"/> |
| I cannot afford it | <input type="radio"/> |
| I don't believe it is possible to reach the Good Environmental Status | <input type="radio"/> |
| I'd rather use the money for other purposes | <input type="radio"/> |
| I don't think the environmental status of the North Sea is important (enough) | <input type="radio"/> |
| I think those who pollute the North Sea the most, should pay for the costs | <input type="radio"/> |
| The environmental status of the North Sea feels too abstract as a concept | <input type="radio"/> |
| I think this is the role of the government, and does not necessarily have to be financed by individual contributions | <input type="radio"/> |
| I believe there should be stricter regulation and enforcement | <input type="radio"/> |
| Other (please proceed to question 27 to elaborate) | <input type="radio"/> |

26. Could you briefly elaborate on your answer to the previous question? (Proceed to question 30)

27. What is/are the most important reasons for you to be willing to pay for the North Sea achieving the Good Environmental Status by 2030? You can select multiple answers.

- I use the North Sea for recreation
- The existence of healthy ecosystem is important for me
- I want to ensure that I will have the opportunity to use the North Sea for recreation in the future
- I want to ensure that other people in my generation can use the North Sea for recreation
- I want to ensure a healthy North Sea for the future generations

28. Could you briefly elaborate on your answer to the previous question?



29. Do you think that the willingness of Dutch citizens to contribute financially to the costs of the measures required to achieve a Good Environmental Status in the North Sea in 2030 will influence national policy?

- Most definitely
- Probably
- Probably not
- Definitely not

30. To what extent do you think it is realistic that you would have to financially contribute to achieve the Good Environmental Status of the North Sea by 2030?

- Very realistic
- Somewhat realistic
- Not very realistic
- Very unrealistic
- I don't know

31. What is your opinion on the following statements?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	I don't know
I understood the willingness to pay questions well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was easy to answer to the willingness to pay questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A yearly binding fee would be a good instrument to collect money for the additional measures targeted to improve the status of the North Sea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe it is possible to achieve the good status of the North Sea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



IV. BACKGROUND INFORMATION

32. Are you a member of any environmental organization?

- Yes
 No

33. How much do you agree or disagree on the following statements?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	I don't know
I occasionally litter on beaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use eco-labeled detergents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I only buy sustainably harvested fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my daily life, I always use public transport or walk/cycle instead of driving a car	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a vegetarian	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I inspire other people to environmentally responsible behavior	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I recycle all waste	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. Do you have any further comments? If you would like to comment on the survey, please do so below.

Thank you for participating in the survey!

If you are interested in reading more about these marine topics, you can find information via the [Noordzeeloket](#). This is the government platform about the North Sea, where you can find more about how the space in the North Sea is divided and how the sea is protected.

Appendix 4. Five dimensions of value and seven main types of shared values (Kenter et al., 2014)

