Evaluation Updated Conservation Plan for the Harbour Porpoise in the Netherlands

16 January 2024

1. Introduction

In 2020 the Ministry of Agriculture, Nature and Food Quality published the Updated Conservation Plan for the Harbour Porpoise in the Netherlands, referred to as HPCP hereafter[1] (LNV, 2020). The main objective of this plan is to maintain the favourable conservation status, as assessed in the Habitats Directive. In the North Sea Agreement[2] it is agreed that all species conservation plans, such as the HPCP, should be evaluated every two years. One of the reasons for this evaluation is that the recommendations in this plan need to answer policy questions. For this, it is important to know to what extent the recommendations have been followed up and where amendments or new additional recommendations are needed.

This evaluation has been done through a series of interviews with all relevant stakeholders involved in the HPCP, which are the Ministry of LNV, Rijkswaterstaat, the Ministry of Defence, scientists, as well as other stakeholders, such as partners in the North Sea Agreement. On 26 January 2023, a stakeholder meeting took place, and on 10 October 2023, the evaluation was discussed in an Noordzeeoverleg (NZO) expert session on species conservation plans. Finally, the Harbour Porpoise Advisory Committee (HPAC)[3] provided their advice, which was discussed on 21 November 2023 and will be published on the website of Wageningen Marine Research. The discussions of those sessions and the HPAC advice have also been incorporated in this evaluation.

2. General results

Of 94 recommendations made in the Harbour Porpoise Conservation Plan in 2020, 59 were given high priority, 29 medium priority, and six low priority. Two years after starting this plan, seven of the 94 recommendations have been finalized, and 63 have been taken on board and are ongoing. Four recommendations are no longer considered relevant. Nine recommendations relate to the EU LIFE project '*Coordinated Development and Implementation of Best Practice in Bycatch Reduction in the North Atlantic Region'* (CIBBRiNA) and will most probably be taken up by the time of the next evaluation (2024/2025), and potentially also finalised. Eleven recommendations have not been taken on board (yet) for various reasons. In the following chapters, it is described which recommendations have been followed up or could benefit from a different approach, and which recommendations have become outdated. New or alternative recommendations that have not been touched upon in the HPCP 2020 are suggested in bold. In the next paragraphs this is outlined following the chapters from the HPCP: legislative and policy context; stakeholder consultation and engagement; population ecology, abundance, and distribution; stranding events and strandings research, bycatch, and underwater noise.

An important notion is that the general recommendation to "Assess and address temporal and spatial cumulative impact of anthropogenic activities," should continue to be pursued with an increase in priority. Since 2020, no new types of anthropogenic activity have started in the North Sea, however, new possible activities on the North Sea are being investigated, such as solar or wave energy and carbon capture storage. Plans for offshore wind development have also increased significantly. An expanding use of the North Sea should be factored into conservation efforts, as increasing activities could lead to an increase in the cumulative impact of disturbances on the harbour porpoise. Currently, the need to be able to

[1] https://www.rijksoverheid.nl/documenten/rapporten/2020/11/16/updated-conservation-plan-for-the-harbour-porpoise-phocoena-phocoenain-the-netherlands

[2] https://www.noordzeeloket.nl/en/policy/north-sea-agreement/

[3] The Harbour Porpoise Advisory Committee (HPAC) is an independent national committee established following a recommendation from the first Harbour Porpoise Conservation Plan (2011). The HPAC is commissioned and funded by the Ministry of Agriculture, Nature and Food Quality to give advice and feedback regarding research papers, research needs and knowledge gaps. All advice reports from the Committee are publicly accessible and can be found on the website of Wageningen University and Research

measure cumulative effects is described rather extensively in the MONS research programme, but to date no project has started to follow up on this recommendation. The Monitoring Onderzoek Natuurversterking Soortenbescherming (MONS) research programme will focus more on risk assessment rather than developing a method for combining effects on species cumulatively. A follow-up project could focus on investigating a method for filtering cumulative effects of sounds from disturbances by other factors.

The HPAC advises an approach where various stressors are separated whilst identifying the possible effects of said stressors. This could then be followed by an analysis to see where in the North Sea stressors aggravate one another, and to quantify this further. This approach would be in line with the current work within OSPAR to define pressures and factors that contribute to cumulative impact, and to express these impacts in Sankey diagrams. **In accordance with the advice of the HPAC this approach will be further explored.**

2.1. Legislative and policy context

All six recommendations in this chapter have been taken up and are on schedule or ongoing, such as streamlining with the ASCOBANS North Sea Harbour Porpoise Conservation Plan and applying generic or N2000-specific species protection requirements for activities at sea. Since 2020 there have been a number of legal developments, one of which being the entry into force of the Dutch "Decision on amendments to the Special Areas of Conservation under the Habitats Directive in line with present values" in November 2022. The amendments include the harbour porpoise as a target species for several N2000 areas, which were wrongfully excluded in the original designation. Furthermore, in November 2022 the European Commission declared the first ever set of threshold values for underwater noise. However, the Netherlands has decided not to adopt these threshold values in the next Marine Strategy, as they are considered to lack sufficient scientific basis and leave too much room for interpretation. The next Dutch Marine Strategy will use the assessments prepared for the latest OSPAR Quality Status Report. Another development is the REPowerEU amendment of the Renewable Energy Directive (2018/2001/EU) that aims to speed-up renewable energy development on land and at sea (2022/0160(COD)). Lastly, one important development to take into account is the presentation by the European Commission of the new European nature restoration regulation, which is to be adopted in 2023. Once it has entered into force, it will be directly applicable in the Member States. This new regulation aims to restore ecosystems, habitats and protect species in the European Union, both on land and at sea.

With regards to the recommendations in the HPCP it is reiterated that, for the harbour porpoise, the conservation approach should be generic and international. Additionally, it is concluded that protection under Natura 2000 has limited effect, as the current Natura 2000 areas are not of any (known) specific importance for the species. **It is recommended that areas of special significance for the harbour porpoise are determined and taken up in the network of protected areas**. This might be possible using data provided by the pilot tagging research or additional Passive Acoustic Monitoring (see chapter 2).

With specific regard to noise, the offshore wind industry has pursued mitigation measures to minimise the impact on the harbour porpoise during the construction phase, as is indicated under the KEC (Framework for Assessing Ecological and Cumulative Effects). Additionally, the KEC has advised to include a noise limit of SELSS (750 m) 160dB (re 1 μPa^2s), instead of 168 dB, as a mitigation measure in plot decisions. Besides wind farms**, an additional recommendation is to investigate the possibilities of applying speed limits to reduce shipping noise in the North Sea.** See also chapter 2.6 Noise.

2.2. Stakeholder Consultation and Engagement

The four recommendations made in 2020 have been picked up or achieved. Stakeholders from the NGO community have noted that they consider the HPCP to be too much of a research plan, and they would like to see more emphasis on measures being implemented. Additionally, NGOs requested more frequent updates on the progress of the HPCP (besides the North Sea Agreement formal process) and suggestions made were: organising an annual stakeholder meeting, circulating an annual newsletter, or using existing fora such as "Noordzeeloket" for instance. A platform with ongoing results would keep the HPCP topical and relevant, especially for partners who would like to

collaborate in reaching common goals or recommendations. **It is recommended that such a platform is created.**

2.3. Population ecology, abundance & distribution

Almost all of 20 recommendations in this chapter are ongoing and on schedule. No further steps have been taken to pursue cross-border, multi-methodology approaches to investigate harbour porpoise ecology. **Therefore, a recommendation is to integrate harbour porpoise ecology into research under the MONS-research programme, such as food ecology or a study on areas of importance (e.g. breeding grounds) for the harbour porpoise and the effects of climate change on the species and its habitat.** The effects of climate change on the harbour porpoise population are especially important: it is urgent, with potentially detrimental effects, including increasing the impact of other disturbances on the harbour porpoise population.
It is crucial to take steps to analyse the harbour porpoise food web, and the health of its habitats and the ecosystem, in order to better determine the conservation status for the harbour porpoise, as is also required under the Marine Strategy Framework Directive, specifically for Descriptor 1 Biodiversity, Criterium 5 Habitat Quality. This is also important for new activities planned in the North Sea, as well as assessing the effects climate change may have on the ecosystem. Therefore, a priority should be to investigate which habitats are present in the North Sea, and to what extent these are important for the harbour porpoise and its prey. Several discussions took place on the need for further research on the effects of climate change on the harbour porpoise and its habitat, such as a possible shift in food sources, water temperature and its effect on the health of harbour porpoises, as well as the spread of infectious diseases in different patterns. However, to establish causal links to climate change as the source of deterioration in the harbour porpoise population is difficult. In the light of the many uncertainties, **it is recommended that the possible effects due to climate change should be identified, and measures should be investigated that could decrease the expected impact.** This should be done in collaboration with relevant work strands in OSPAR and ASCOBANS.

With regards to contaminants, the Netherlands structurally monitors PCBs in adult males and with that provides a significant contribution to the 'candidate' OSPAR indicator[4] for POPs in blubber of adult males. Males tend to have higher levels of contaminants, because they do not have a way to offload contaminants and are therefore more likely to have a decreased life expectancy. These animals can be used to signal a larger problem in the population. **Another recommendation is to screen for other contaminants, such as PFAS, regularly, so these can be flagged as emerging, following an OMMEG recommendation**. Lastly, collaborative research by UU and WMR on health status, reproduction and contaminants has resulted in 2021 in a publication[5] about PCB levels in stranded harbour porpoises along the North Sea coastal zones. **A new recommendation is to structurally assess effects of contaminants by linking Utrecht University data on health and reproduction to contaminants in monitoring programmes, instead of ad hoc on a research basis.**

From both the models that are currently used for assessing impact of e.g., construction of wind farms (iPCoD and DEPONS), the shortcomings and disadvantages are quite well known, including which assumptions could be improved. **A recommendation is to improve the iPCoD model by adding in a recovery factor**, thereby factoring in that the harbour porpoise population does recover after a disturbance. The results of the study at the Borssele- and Gemini wind farms could provide the necessary input for this. **Another recommendation to improve the iPCoD model is to improve knowledge on the average lifespan of harbour porpoises and the reproduction rate of female harbour porpoises in the wild, and include these in the model.** The DEPONS model is currently based on data provided by Danish tagged harbour porpoises. Data collected following the launch of the pilot tagging project in the Netherlands could be included in the DEPONS model. This way, the model can be expanded to be make more accurate predictions for a larger part of the North Sea. It can be further improved by increasing knowledge on the harbour porpoise food ecology and the effect of climate change on food ecology and the species. Under

[4] https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/pcb-marine-mammals-pilot/
[5] https://edepot.wur.nl/551475

Wozep, there are plans to explore opportunities to optimise the use of the iPCoD and DEPONS models by including population recovery into the population effect calculations, and adding data about tagged animals in Dutch waters. **A new recommendation with high priority is therefore to investigate how the two models (iPCoD and DEPONS) can be used complementary**.

Potsdam University in Germany is about to finalise a study on Northern Atlantic harbour porpoises, where they have applied whole genome resequencing. Part of this study is to relate the genomic information to environmental parameters. Dutch harbour porpoise samples have not yet been included in this study. The question remains how this recommendation could help to answer the immediate policy questions, and what kind of data and knowledge this would provide. However, this seems to be a low-hanging fruit recommendation. Therefore, it is questioned whether the recommendation needs extra effort to include Dutch samples in the German genetic study.

Recommendations to programme the new aerial survey sampling cycle for 12 years structurally, as well as 6-yearly participation in SCANS, have all been achieved. In the discussion of recommendation to integrate and analyse data from different aerial survey collection methods at national and regional scale, it is said that the two aerial surveys are not directly comparable as the methods and the objectives differ. However, both surveys include the registration of harbour porpoises. The new cycle of the SCANS surveys is altered in such a way that in a period of 10+ years, a statistical comparison can be made, as well as evaluating if the MWTL surveys are sufficient. By that time, high-definition digital imagery techniques (HiDef) should have been implemented more structurally. The HPAC supports the development of HiDef for surveys, and in line with their advice **all marine mammal survey methods should be reconsidered in the light of HiDef as soon as possible.**
Abundance and distribution of harbour porpoises have a significant influence on the possible/future use of the North Sea. In an international context, a North Sea regional map has been produced by Gilles *et al.* (2022), which is currently being used to describe the distribution for e.g., MSFD reporting, however, this is only based on SCANS (like) data. Such maps are not detailed enough to be used for, e.g., planning of activities at sea. **Creating more detailed maps in time and space is considered a significant priority and should be achieved within a shorter time span.** More detailed maps on the Dutch part of the North Sea could be developed using MWTL aerial survey data.

In the section on technical monitoring and research methodologies all recommendations are well underway, and no additional recommendations are needed.

The HPAC notes concern regarding the, in their view, development that the responsibility for investing in research for the harbour porpoise is shifting towards market parties in tender procedures. Tender procedures in the Netherlands recently worked with an ecology score, allotted to mitigating measures to prevent harbour porpoise disturbance. This requires market parties to fund research for the protection of harbour porpoises. Such research is patented by the market party, as it could provide an advantage in future tender procedures. This means that, on one hand, there are a lot of means available for research, but that, on the other hand, the focus and methods of research are spread over multiple tenders and market parties. This can result in differing methods and can make it difficult for research and results to complement one another. The earlier mentioned Wozep and MONS are two large research programs that try to fill knowledge gaps in accordance with policy needs. **In order to optimise the use of means available, it is recommended that there is a structural approach to see whether the proposed extra research within tenders is also organised in such a way that it is most efficient for the protection of harbour porpoises.**

2.4. Stranding events and stranding research

Registration of stranded Harbour Porpoises on the Dutch Coast
All but one recommendation in this chapter have been picked up and are ongoing. With the launching of the new website www.stranding.nl to register stranded marine mammals, the first recommendation has been achieved. The Ministry of LNV has provided funding for the maintenance and necessary amendments of the new portal. A next step could be to expand the website for a European-wide registration. Steps are also being taken under ASCOBANS to explore a similar

registration database at a regional level, and under other international cooperation, such as ICES, IWC and ACCOBAMS, interest has also been shown in collaborating to create an international stranding database. **Therefore, a new recommendation would be to collaborate with the ICES, IWC, ASCOBANS and ACCOBAMS to develop an EU wide database to accommodate international data.**

To make sure that the national stranding database receives more input, it could be helpful to promote the website amongst coastal municipalities and the general public that will visit the beaches to the stranding website. This way the public will be aware of the steps they can take when they come across a stranded marine mammal on the beach. In addition to more data, this could improve the quality of data collected from stranded animals. With simple small additions, such as a picture of the belly and of total length, aspects like sex and age can eventually be determined for animals that are not investigated by experts. In some cases, plausible causes of death could be identified by pictures as well, although it should be taken into account that causes of death determined by pictures are secondary to causes of death determined by necropsies and have a larger margin of error. **It is recommended to explore whether causes of death determined through the use of pictures could also be incorporated in databases.** With regards to municipalities, several experts noted that the efforts on the Wadden islands to register/cooperate in the volunteer network are increasingly limited. **It is recommended to send a letter to encourage these municipalities to participate in reporting strandings and registering stranded marine mammals.**

Pathological investigation of stranded Harbour Porpoises
In August 2021[6], in a time span of 10 days, 190 harbour porpoises stranded on the Dutch Wadden Islands. A drift modelling study was done, which determined the origin of these animals to be northwest of the Frisian Front. Nearby was a big patch of toxic algae, and a hypothesis was that these animals might have died from these algae. Further research could not confirm this. It showed instead that the animals had most likely died due to a bacterial infection, causing blood poisoning, and soon after, acute death. As soon as a Mass Stranding Event (MSE) or Unusual Mortality Event (UME) is signalled, it is of specific and great importance for stranding researchers to receive fresh carcasses as soon as possible in order to study, among others, the hearing organs. Damage to the hearing organ is difficult to diagnose and only possible if the carcasses are very fresh (within 12-24 hours, depending on fixative and foreseeable techniques). It would be beneficial to have clear guidance and best practice documents for MSE or UME response. In addition, neighbouring countries should be contacted, to review the geographical extent of the problem. **Therefore, the most important recommendation is to have best practice documents when mass strandings occur, including protocols for outreach to neighbour countries.** For the MSE of 2021, a human search and rescue drift model was used to identify the origin of mortality of the harbour porpoises, and this proved successful. **Therefore, another recommendation is to expand the use of drift models into the investigation of MSEs and UMEs and to improve the research into the cause of death.**

With regards to recommendations which have not (yet) been picked up, the recommendation to assess social biases of stranding network, comparing with other stranding networks (e.g., other countries or other species as birds)), remains at a low priority. However, a first step to take on board this recommendation could be **to reach out to other countries to share knowledge and compare stranding networks and the causes of death of the stranded harbour porpoises. This could partly be done by implementing a European-wide strandings database and making the portal accessible to professionals of the strandings network**. The recommendation to apply a nested approach to the selection of cases for pathological research, as well as the spatiotemporal analysis can (partly) be picked up in the CIBBRiNA project and taken up by the upcoming work by UU and TNO, looking at impact from UXO and strandings data.

2.5. Incidental bycatch

In this chapter, most recommendations have been incorporated in the EU LIFE CIBBRiNA project, which has been granted in July 2023. Project starting date is 1 September, and the project will run

[6] https://www.uu.nl/nieuws/massa-stranding-bruinvissen-onderzoeksresultaten

for six years. The Ministry of LNV is the coordinating beneficiary of the project. The CIBBRiNA consortium consists of 45 partners from fisheries organisations, science, government and NGOs from 13 European countries, including Iceland, Norway and the UK. The Stakeholder Advisory Board consists of another 30 organisations. The main objective is to minimise and, where possible, eliminate bycatch mortality of priority endangered, threatened and protected (ETP) species of marine mammals, birds, turtles, and elasmobranchs. This will be achieved through EU cross-border cooperation, involving industry, scientists, authorities, and other relevant stakeholders, to establish regionally coordinated mitigation in selected case studies, supported by monitoring and assessment programmes. For this, a mitigation toolkit will be co-created, building on a review of current approaches, and learning from case studies conducted in a "safe environment" of mutual trust and cooperation. CIBBRiNA will ensure the long-term sustainability of the recommended tools and procedures by embedding these in policy and best practice going forward.

As the Dutch gillnet fleet is not included as a case study in CIBBRiNA, due to the small scale of the fleet, **it is recommended this is included as a separate case study in MONS, building on CIBBRiNA outputs**. This would include building a relationship of mutual trust, in order to improve monitoring, which does not have to wait for CIBBRiNA. The recommendation to prioritise cooperation with industry to reduce bycatch in any project could be strengthened to: **Actively involve and recruit fishers in the reduction of bycatch, both by monitoring and helping with creating and testing new mitigation measures.** In addition to involving fishers from the start being a fundamental principle in CIBBRiNA, this recommendation could possibly be further implemented by adding an obligation to participate in monitoring as a requirement for bottom-set gillnet fisheries in N2000 areas. Currently, a revision/extension of the management plans of N2000 areas along the Dutch Coastal Zone is under way, where terms of conditions can be added to the management plans.

There are two recommendations concerning research with bycaught harbour porpoises offshore. So far, the work has not been very fruitful, as only one dead harbour porpoise has been caught since the start, and two of three fishers have ceased fishing since the project started. **Therefore, it is recommended to reassess this project within the Ministry of LNV, RWS, WMR and UU**. The need for new fishers to cooperate needs to be discussed, as well as the possibility of cooperating with foreign vessels in Dutch waters. Lastly, the possibility of cooperating with neighbouring countries can be discussed, to create a framework wherein foreign vessels could contribute to this research, or research data on bycaught harbour porpoises could be shared/aligned.

Most of the recommendations within the section on international cooperation have been met under the LIFE CIBBRiNA project and are met by cooperating with other national authorities under ASCOBANS, IWC and OSPAR.

In terms of mitigation measures, several alternative gear use methods have been tried but none have proven to be effective enough, or when they have, not suitable for the strong currents in the North Sea. Therefore, it is necessary to investigate the possibilities of alternative fishing gear that is suitable for the North Sea, as well as being more selective in order to reduce the incidental bycatch. Fishing with pingers has also been studied, however, pingers are rather expensive, require frequent battery checks by the fishers, they add noise to the environment and results vary. Such concerns need to be addressed for measures to be applicable. Currently, area closures cannot be justified, but this could change if areas are proven to be of significant importance or a preferred habitat for the harbour porpoise. Besides those knowledge gaps, current fishing practices have not been shown to have an impact on the harbour porpoise population, possibly due to the low fishing activity of commercial bottom-set gillnet fisheries. If the fishing activity (by bottom-set gillnets) were to increase, the combination of habitat use and impact of fishing has been assessed to increase, and this could lead to area closure. In CIBBRiNA, a suit of proven and promising mitigation measures will be tested and assessed on suitability and applicability, in order to be rolled out systematically on a larger scale and long term. The HPAC supports the CIBBRiNA approach and in addition advises to combine this with research regarding negative effects of various fishing methods, and **to formulate a long-term goal for fishing methods with such negative effects.**

At the moment, registration of harbour porpoise bycatch and fishing activity by recreational fishers with bottom-set gillnets on coast lines is scarce. Enforcement is managed by local municipalities, and due to limited administrative capacity and the low numbers of fishers registering bycatch, there is not much known about the practices and the bycatch of harbour porpoises (or other species for that matter). As there are only a few municipalities in the Netherlands with the authority to grant permits for this type of fishery, **a recommendation is for the Ministry to write a letter to these municipalities, expressing the need for more monitoring and compliance of fishing practices.** This would address the existing recommendations to continue quantifying fishing effort and controlling compliance, as well as to promote outreach to recreational fishers. **The recommendation to share experiences with other countries on recreational fisheries and bycatch should be executed with a higher priority.**

2.6. Underwater noise

Offshore wind
All recommendations related to offshore wind are being covered in the RWS Wozep ecological research programme and are on schedule. A study by TNO, WMR and WaterProof has been conducted at Borssele Windpark to measure the behaviour of the harbour porpoises before, during and after piling (De Jong *et al*., 2022). During the piling, a decrease in harbour porpoise acoustic activity was observed within a radius of 7 km. In addition to this research, data of a similar study at the construction site of Gemini Windpark, where no noise-reduction mitigation measures were taken, have been analysed to compare with the Borssele results. The measurements demonstrated that the mitigation measures were effective and the disturbance area in the mitigated wind farm was much smaller than for wind farms without noise reduction measures. The data of this study proved to be insufficient to draw conclusions whether a frequency weighted sound exposure level (SEL) better correlates to harbour porpoise absence than the unweighted SEL. In other words, there was not sufficient evidence that less acoustic energy at higher frequencies leads to fewer disturbed animals.

The maximum Sound Exposure Level threshold for the Wind Farm Site Decisions (SEL at 750 meter distance during piling) was decreased from 168 decibel to 160 decibel (re 1 μPa^2s) due to the cumulative effect from the rapidly rising numbers of wind farms in Dutch waters, as calculated in the KEC. It is important to stress that a maximum of 'harbour porpoise disturbance days' has been set, which with current plans will not reach its limit by 2030. However, it is not certain if the plans after 2030 can remain within this limit. This means that after 2030, it is uncertain whether, with a statistical certainty of 95%, piling will not reduce the population by more than 5%, based on current calculations. Improving the knowledge base could relax the limitations to a certain extent. Therefore, changes will have to be made, which could range from improving models to making predictions more accurate, to making policy decisions about acceptable levels of disturbance. A priority remains improving the models and minimising uncertainties. Maintaining a statistical certainty of 95% might not be feasible, when considering the anomalies in the current available data. Another issue is that other North Sea countries appear to use different approaches, e.g., not factoring in disturbance in the models, only fatalities, which clearly has vastly different outcomes. As the KEC also takes into account the cumulative impact from piling activities from bordering countries, this can lead to Dutch plans being restricted mainly due to differing approaches. It is therefore crucial that countries continue to exchange views on licensing approaches and acceptable levels of impact.

In addition, **it is considered a priority to study the impact of alternative construction methods of which vibro piling is the most promising alternative compared to impact pile driving**. Currently efforts are made within Wozep, as well as Ecowende and abroad, to commission this research.

Since October 2021, as part of Wozep, a Passive Acoustic Monitoring (PAM) study is being undertaken at the Borssele Windpark to investigate if an operational wind farm is a suitable habitat for the harbour porpoise. **Masking effect studies of operational offshore wind farms would be very useful for the future due to the large numbers of wind farms planned to be built in the North Sea, therefore it is recommended to prioritise those studies. If a significant**

change in behaviour can be attributed to masking, the effects should be included in the models used to calculate disturbance levels, such as iPCoD. It should be noted that studies in captivity offer unique opportunities to investigate effects of noise, such as masking.

Another recommendation is to study the relationship between harbour porpoise presence and activities related to the operational wind farm, such as maintenance shipping.

Seismic surveys
The recommendations with regards to seismic surveys have all but two (determine a threshold for disturbance of harbour porpoises taking into account moving sound sources and determining noise budgets for individual industry sectors) been picked up. It should be noted that since 2020, only one seismic survey took place, in 2022. Just before this survey, the Dutch Petroleum Company (NAM) performed sea trials and modelling of 4 different reduced-impact seismic sources as part of a commitment under the North Sea Agreement. The output of the three different source array configurations and one new source type were monitored and analysed. The test, modelling and monitoring data were used to compare one source to the other. Whereas the seismic survey monitors the amount of acoustic signal returning to the surface from the subsurface, in this test, the amount of underwater noise from the sources was monitored. The study has been completed and is now under review by TNO. A full Environmental Impact Assessment (EIA) was not done, but an effects analysis and nature assessment were done. An EIA could be conducted in the future, using modelling to predict the sound levels from seismic sources. The underwater sound monitoring was undertaken to measure what actual sound levels were received at various distances. These measurements can be used to validate and update the models used for EIA. Because NAM committed to making its data public, other companies have applied to use the data set to improve their own models too.

Noise mitigation is also being investigated by the industry. For example, Shell has developed a different source array configuration to reduce the amount high-frequency noise. Reduction of high-frequency noise can be achieved by optimising airgun arrays. The latter requires adaptation of the hardware. New types of airguns that minimise high-frequency output are also commercially available. Therefore, there seem to be low-cost solutions which could be applied at a wide scale. **It is recommended these positive results are shared more broadly, at the national level within the North Sea Agreement, and work towards a Code of Conduct, as well as internationally, to start with collaboration partners in the North Sea region.** The results do assume that frequency weighting has an effect (see also the section on offshore wind), meaning that higher frequencies affect porpoises more than low frequencies do. Although this conjecture is suggested by the shape of the generalised hearing sensitivity curve for very-high frequency cetaceans and is therefore highly likely, this has not been sufficiently demonstrated by data, specifically for harbour porpoise. **Another recommendation is to explore how this data can be collected.**

The two recommendations which have not started, have been halted purposefully, also due to the other developments listed previously. Noise budgets for sectors seem to provide an unwanted incentive for a 'market' in noise budgets. The threshold for disturbance, based on a KEC-like framework, does not seem like an opportune method to assess this activity. This method offers challenges for wind farms, among others due to other countries using other approaches. As the seismic activities in the Netherlands are so very small compared to neighbouring countries, it is not a suitable way to proceed unilaterally.

UXO (unexploded ordnance)
As explosions can cause immediate damage to hearing organs and hearing loss in harbour porpoises, and with bigger explosions even physical damage, this topic needs a specific framework taking the very immediate risks into account. The clearance of UXOs is the main reason for underwater explosions in the Netherlands. In 2021, the Ministry of LNV, Ministry of Defence, RWS, Utrecht University and TNO formed an interdepartmental working group on UXOs to discuss emerging issues and projects undertaken related to UXOs. UXOs need to be cleared if they are located near a shipping route or a planned wind farm or other activity. With the largescale roll out

of new wind farms in the North Sea, clearances are not expected to decrease. Therefore, it is of importance that all necessary and prescribed mitigation measures are used, as is part of previous recommendations and ongoing. Furthermore, it continues to be recommended to systematically record the details of clearances, so that the effectiveness of the mitigation measures can be monitored over time. The interdepartmental UXO working group is discussing a suite of research questions related to UXO's and strandings, for which funding opportunities are explored. **It is recommended that the interdepartmental working group on UXO's is involved in the drafting, funding, and execution of this research, to ensure information is gathered that can inform policy of all three departments. In addition, it is recommended to link this research with MONS.** The recommendation on restrictions of clearances in N2000 has become obsolete as it has been defined in N2000 area management plans that clearances at sea are in general not allowed in Natura2000 areas The recommendation to monitor whether alternative technologies for clearance of munition at sea become available, is ongoing and being discussed in the UXO interdepartmental working group. In the Netherlands, explosives are not used for demolition or anything other than clearances, therefore, that recommendation has become redundant.

Sonar
As sonar sounds in the southern part of the North Sea do not pose a threat so far, this recommendation did not have a high priority. However, if the use of sonar systems mentioned were to increase, they might become more of a threat to marine mammals than they currently are in the Dutch part of the North Sea. **Therefore, it is important to closely follow the development and use of these systems**.

Continuous noise

With regards to continuous noise, all recommendations are ongoing or finalised. Results from the Joint Monitoring Programme for Ambient Noise North Sea (JOMOPANS) have been put into interactive soundscape maps of the North Sea. Shipping noise in the Southern North Sea is shown to increase the background noise level with 20 to 30 dB compared to the natural sound from surface waves due to wind, especially in the English Channel and the North Sea between the United Kingdom and the Netherlands. This is mainly caused by the busy shipping routes in a narrow and shallow sea (these are the quickest route between several big European ports such as Antwerp, Rotterdam, and Hamburg). The proposed follow-up project of JOMOPANS, Defining and Evaluation Management Scenarios to Keep the North Sea Soundscape Healthy (DEMASK), focuses on how to deal with continuous sound. The project will also do impact assessments, investigating the effects of slower marine traffic and creating low noise areas in protected silence areas. Mitigation measures for shipping noise include reducing speed, for which IFAW calls attention, at EU and International Maritime Organization (IMO) level, with their project Blue Speeds: slower shipping to save the ocean[7]. At IMO level, updated Guidelines for Underwater Radiated Noise, in which the Netherlands has played an active role, have been adopted at the most recent session of the Maritime Environmental Protection Committee (MEPC80).

Recreational shipping mainly takes place in adjacent waters to the North Sea, e.g., the Wadden Sea, Eastern Scheldt or the North Sea Coastal zone. RWS has conducted a pilot study on noise pollution in the Wadden Sea. Further study is needed on the soundscape of the Wadden Sea, shallow water sound propagation and noise from recreational vessels. It is important to stress this as a knowledge gap, as harbour porpoises have started to reside in the Wadden Sea more often. The pilot study has provided the first insight in the noise exposure. **The next evaluation should consider the potential impact on porpoises.**

Four out of five of the general recommendations on noise are ongoing. The only one that has not been addressed, is the recommendation to provide an overview based on studies which acoustic deterrent devices (ADDs) potentially can cause a risk and which types can be used safely. Approaches differ per country: in Denmark use of ADDs is discouraged, while in the Netherlands, ADDs are sometimes mandatory to prevent Permanent Threshold Shift (PTS) from the source noise, resulting in hearing damage. To note, KEC 4.0 concludes that the risk of PTS due to piling

[7] http://www.bluespeeds.org/

(for offshore wind) is negligible, so the use of ADD's is not needed there, when the mitigation measure of a noise limit is applied during the piling. A key aspect using ADDs is that the way in which the tool is used is key to a successful operation, for instance by setting provisions in the permit such as time, frequency and how the ADD functions in relation to the source noise. A downside of using ADDs is that they add more sound in a certain area, which can cause animals to flee far from this location. However, species-specific acoustic deterrents (for porpoises, seals, and fish) are also produced, where the source level is specifically adapted to deter these species just far enough away from a piling site to prevent PTS, while not causing the animals to flee further away than necessary. Most other commercially available deterrents have been developed to deter seals from aquaculture farms and have extremely high source levels that shrink biologically important habitat for animals.

3. Conclusion

The majority of recommendations (72) are on schedule or ongoing. Eleven recommendations are no longer relevant or have been completed. 34 recommendations have been added or amended based on this evaluation and are assigned (new) priority and a timeline in Annex 1. These recommendations are an addendum to the Action Plan in the HPCP 2020. New recommendations have been marked orange, whereas revised recommendations have been marked blue.

Recommendation summary	**Category: research, monitoring, management, mitigation or policy measure**	**Priority*: Top, High, Medium, Low**	**Time scale: short-term= <3 yr, medium-term = <6 yr, long-term = >6 yr, ongoing**	**Focal Point: in bold is lead**	**Started**
General					
Assess and address temporal and spatial cumulative impact of anthropogenic activities, should continue to be pursued with an increase in priority	All	Top	<6yr	Ministries of **I&W**, LNV, Def, EZK, European Commission, OSPAR & ASCOBANS	**X**
Explore the approach as advised by the HPAC to separate and identify effects of stressors contributing to cumulative effects	All	High	<6yr	Ministries of **I&W**, LNV, Def, EZK, European Commission, OSPAR & ASCOBANS	
Legislative & Policy context					
Determine areas of special significance for the harbour porpoise and take these up in the network of protected areas	Management	High	>6yr	**Ministry of LNV**, I&W, Def, EZK,	**X**
Stakeholder consultation & engagement					
Create a platform with ongoing results to keep the HPCP topical and relevant	Management	Medium	<3yr	**Ministry of LNV**, RWS (Noordzeeloket)	
Population ecology & status					
Population ecology					
Integrate harbour porpoise ecology into research under the MONS-research programme, such as food ecology or a study on areas of	Research	Medium	<3yr	Ministry of LNV, **RWS**	Plans in MONS for this are now being developed

importance (e.g., breeding grounds) for the harbour porpoise and the effects of climate change on the species and its habitat.					
Identify the possible effects due to climate change, and investigate measures that could decrease the expected impact.	Research	High	ongoing	**Ministry of I&W**, LNV and research institutes	**X**
Improve the iPCoD model by adding in a recovery factor and by improving knowledge on the average lifespan of harbour porpoises and the reproduction rate of female harbour porpoises in the wild and including this knowledge in the model.	Research/Management	Medium	<3yr	**Ministry of EZK**, LNV and I&W	This work is underway in Wozep
Investigate how the two models (iPCoD and DEPONS) can be used complementary.	All	High	<6yr	**Ministry of EZK**, LNV and I&W	This work is underway in Wozep
Population status: abundance and distribution					
All marine mammal survey methods should be reconsidered in the light of HiDef as soon as possible.	Monitoring	Medium	ongoing	Research institutes, Ministries of LNV	X
Creating more detailed distribution maps, in time and space, is considered a significant priority and should be achieved within a shorter time span.	Management	High	<6yr	Ministries of **I&W** & LNV and at international level with North Sea countries	
Pollution					
Screen for other contaminants, such as PFAS, regularly, so these can be flagged as emerging, following an OMMEG recommendation	Research/Monitoring	Medium	ongoing	**Research institutes**, Ministry of LNV, I&W	**X**
Structurally assess effects of contaminants by linking Utrecht University data on health and	Research	High	<3yr	**Ministry of LNV,** Research institutes	

reproduction to contaminants in monitoring programmes, instead of ad hoc on a research basis.					
In order to optimize the means that are used within tenders, it is recommended that there is a structural approach to see whether the proposed extra research within tenders is organized in such a way that it is most efficient for the protection of harbour porpoises.	Management	Medium	<3yr	**Ministry of EZK, I&W, LNV, RWS**	
Stranding events & stranding research					
Registration of stranded harbour porpoises on the Dutch Coast					
Collaborate with the ICES, IWC, ASCOBANS and ACCOBAMS to develop an EU wide database to accommodate international data.	All	High	ongoing	**Ministry of LNV,** Research institutes	**X**
Promote the stranding website amongst coastal municipalities and the general public that will visit the beaches, to make sure that the national stranding database receives more input.	Management	Medium	<3yr	**Municipalities**, Ministry of LNV	**X**
Explore whether causes of death determined through the use of pictures could also be incorporated in databases	Management	Medium	<3yr	**Ministry of LNV,** Research institutes	**X**
Send a letter to encourage these municipalities to participate in reporting strandings and registering stranded marine mammals.	Management	Medium	<3yr	**Ministry of LNV**	**X**

To reach out to other countries to share knowledge and compare stranding networks and the causes of death of the stranded harbour porpoises. This could partly be done by implementing a European-wide strandings database and making the portal accessible to professionals of the strandings network.	Management/Monitoring	Medium	<6yr	**Ministry of LNV** in cooperation with other North Sea countries, Research institutes, stranding networks	**X**
(Pathological) investigation of stranded harbour porpoises					
Expand the use of drift models into the standard protocol to investigate the origin of MSEs and UMEs and to improve the research into the cause of death.	Monitoring/Research	High	<6yr	**Ministry of LNV**, RWS, Ministry of Defence in cooperation with Research institutes	**X**
The most important recommendation is to have best practice documents when mass strandings occur, including protocols for outreach to neighbour countries.	Management/Monitoring	High	<6yr	**Ministry of LNV** in cooperation with other North Sea countries, Research institutes	
Incidental bycatch					
Include the Dutch gillnet fleet as a separate case study in MONS, building on CIBBRiNA outputs.	Research and Management	High	<6yr	**Ministry of LNV** in cooperation with RWS	Plans in MONS for this are now being developed
Actively involve and recruit fishers in the reduction of bycatch, both by monitoring and helping with creating and testing new mitigation measures	All	High	<3yr	**Ministry of LNV** and other partners in bycatch	**X**

				projects such as CIBBRiNA	
Reassess the offshore porpoise project within the Ministry of LNV, RWS, WMR and UU	Research/Management	Low	<3yr	**Ministry of LNV**, RWS, WMR and UU	
Recreational fisheries					
Write a letter to the municipalities that have authority to grant permits for bottom-set gillnets on coast lines, expressing the need for more monitoring and compliance of fishing practices.	Management	Low	<3yr	**Ministry of LNV**	**X**
The recommendation to share experiences with other countries on recreational fisheries and bycatch should be executed with a higher priority.	Management	High	<6yr	**Ministry of LNV** in cooperation with other North Sea countries	
Underwater noise					
Offshore wind					
It is considered a priority to study the impact of alternative construction methods of which vibro piling is the most promising alternative compared to impact pile driving.	Research/Mitigation	High	<3yr	**Ministry of EZK**, LNV and I&W	**X**
Prioritise masking effect studies of operational offshore wind farms. If a significant effect on behaviour can be attributed to masking, this should be included in the models used to calculate disturbance levels.	Research/Mitigation	High	<6yr	**Ministry of EZK**, LNV and I&W	
Study the relationship between harbour porpoise presence and activities related to the operational wind farm, such as maintenance shipping.	Research/Mitigation	Medium	<6yr	**Ministry of EZK**, LNV and I&W	**X**

Seismic surveying					
Share positive results of noise mitigation by airguns more broadly, and work towards a Code of Conduct both nationally (North Sea Agreement) and internationally (to start collaboration North Sea region)	Management/Policy/Mitigation	High	<6yr	**Ministry of LNV**, EZK and I&W, oil&gas industry	**X**
Explore how data for frequency weighting for airgun noise mitigation can be collected.	Research	Medium	<3yr	**Ministry of LNV, and oil and gas industry,** EZK and I&W in cooperation with Research institutes	**X**
Unexploded Ordnance (UXO)					
Involve the interdepartmental working group on UXO's in the drafting, funding and execution of the research on strandings, drift models and impacts of UXO, to ensure information is gathered that can inform policy of all three departments. In addition, link this research with MONS.	Policy/Research/Management	High	<3yr	**Ministry of LNV**, Def, I&W	**X**
Sonar					
Closely follow the development and use of sonar systems.	Monitoring	Low	ongoing	**Ministry of LNV,** Def, I&W	**X**
Continuous noise					
The next evaluation should consider the potential impact of recreational vessel noise on porpoises.	Research/Monitoring/Policy	Medium	<3yr	**Ministry of I&W**, LNV	
Investigate the possibilities of applying speed limits to reduce shipping noise in the North Sea.	Policy	High	<6yr	**Ministry of I&W,** LNV, Def	**X**