

This document has been reviewed but not 'officially' signed-off by Defra's Better Regulation Unit and Office of Chief Economist teams. This is because the proposed approach falls out of scope of the Better Regulation Framework as it doesn't result in a UK SI nor have a direct impact on UK businesses.

De Minimis Assessment (DMA)

For Self-Certified Measures in Defra

Title of Measure	Spatial Management Measures for Sandeel Fishing
Lead Department/Agency	Department for Environment, Food and Rural Affairs (Defra)
Expected Date of Implementation	March 2024
Origin (Domestic or International)	Domestic
Date of Assessment	08/01/24
Lead Departmental Contact	
RMT ID / Legislative ID	

Rationale for intervention and intended effects

Sandeels are an important forage fish in the North Sea, contributing to the marine ecosystem and forming a large component of the diets of marine mammals, seabirds, and predatory fish including commercially valuable species.

Sandeels are highly sensitive to changing environmental conditions and the increased effects of climate variation likely negatively impact the health of the North Sea sandeel stocks. This pressure combined with the continued removal of sandeels through fishing methods risks further declines of threatened and vulnerable species in the wider marine environment, which rely on sandeels as a food source. In particular, reduced food availability reduces the resilience of seabirds to diseases such as avian flu.

Overfishing of sandeel stocks is an example of a market failure; it leads to an inefficient distribution/usage of goods in the economy. Overfishing occurs due to the tragedy of the commons, where fishers act individually based on the aim of maximising profits, while not considering the actions of other fishers or the impact on wildlife. Consequently, the removal of sandeels by fisheries has the potential to impact the wider ecosystem through reducing the availability of sandeels at the bottom of the food chain.

Defra is introducing management measures to protect the marine ecosystem in English waters of the North Sea, in particular the risk posed by the overfishing of sandeel stocks.

Viable policy options (including alternatives to regulation)

Option 0 – Do Nothing

This [status quo] option would mean that Defra take no specific action. Non-UK vessels could continue to catch their allocated quota for sandeels in the North Sea. UK vessels have had no quota apportioned to them since 2021 by the UK Government, as such it is assumed UK vessels will continue to not partake in sandeel fishing.

Option 1 – Closure of English Waters within the North Sea (preferred option)

This option includes viable measures for spatial management measures for sandeel fishing in English waters. Implementation would be through licence conditions invoked by the Marine Management Organisation (MMO). The following measures would apply to all vessels catching sandeels:

- Full closure of English Waters within the North Sea. This option would see full closure of sandeel fishing within English waters of the sandeel assessment and management areas SA1r, SA3r and SA4¹.
- Closure of English waters within SA4 and SA3r.
- Closure of English waters within SA1r.

Option 2 – Technical gear restrictions

Sandeels are mainly caught for industrial purposes. They are currently targeted with highly specific otter trawls of a pelagic or semi-pelagic design with cod end mesh sizes of ~20mm. This option considers implementing changes to the mesh design, such as increasing mesh size, and gear configuration used for industrial sandeel fishing purposes.

Option 3 – Temporal measures

This option considers only allowing sandeel fishing for part of the year.

Option 4 – Management of the sandeel activity through a voluntary agreement

This would involve the development of voluntary codes of practice to protect the biomass of sandeels in the North Sea.

¹ See Figure 1 in Supporting Evidence section for the location of each sandeel assessment and management area.

Description of Novel and Contentious Elements (if any)

- The proposed measures will impact EU registered vessels, mostly from Denmark. Over 99% of the total UK and EU value of sandeel landed from English waters has historically been landed by EU vessels, with revenue worth around £41.2m each year (2015 – 2019 average)².
- The loss of EU access to fisheries in English waters could affect relations with the EU, as it is likely the proposals will result in employment and business losses in Denmark.
- Spatial management measures in English waters only, risk displacing fishing to Scottish and EU waters, or on to other species.

Assessment of Impacts on Business

The preferred option, spatial management measures, would affect all vessels in the sandeel fishery who would fish in the closed areas. Fishing activity data indicates that 1 UK fishing vessel recorded quota-managed sandeel landings from English waters between 2015 and 2020³. At least 25 non-UK vessels⁴ are estimated to be sandeel fishing in English waters, of which 0-5 vessels⁵ are thought to be landing their sandeel catches in UK ports.

Since 2021 the UK has not apportioned sandeel quota to UK vessels. This means that only non-UK vessels with sandeel quota, who would have otherwise fished in English waters, will experience ongoing impacts as a result of the proposals. Sensitivity testing is included, in the Supporting Evidence section, for a scenario where sandeel quota is apportioned to UK vessels.

Brief Assessment of Distributional Impacts

Distributional impacts are expected to be limited to geography. As these impacts only affect vessels fishing within English waters, we would expect to see a decline in revenue of non-UK vessels which would have otherwise fished in English waters. However, profit loss may be mitigated if fishers turn to catch other species. The rest of the United Kingdom would be unaffected.

Brief Assessment of Small Business Impacts

Only non-UK vessels are expected to be impacted by the proposals, as such it is not proportionate to assess small business impacts.

Brief Assessment of Wider Impacts

² Based on analysis using data provided to Defra by the Marine Management Organisation (MMO). 'Landed' refers to the process of catching/fishing the sandeels and then landing the sandeels into a port on land. Figures are presented in 2021 prices.

³ Data provided to Defra by the Marine Management Organisation (MMO)

⁴ Data provided to Defra in the Call for Evidence indicated that on one particular day at least 25 non-UK vessels were recorded trawling for sandeels off the North-East coast of England

⁵ Data provided to Defra by the Marine Management Organisation (MMO)

Closure of sandeel fishing is expected to bring about environmental benefits. The primary environmental benefit is improvements in the resilience of sandeel stocks and the wider marine ecosystem, including marine mammals, seabirds, and predatory fish in the North Sea area. The extent to which these benefits are realised will depend on the size of the spatial closure, if fishing activity is reduced as opposed to displaced, the time it takes for the sandeel stocks to increase and external factors such as the continued negative impacts of climate change. These benefits are not monetised although they are detailed in advice from scientists⁶.

The expected reduction in sandeel landings by non-UK vessels, predominately Danish vessels, could increase the price of fishmeal and fish oil as fewer sandeels are available as a production input. This will likely have an indirect impact on UK's fishmeal importers, such as aquaculture farms, as Denmark made up around a fifth of their imports by value in 2021⁷.

Summary of monetised impacts

A 3.5% discount rate has been used as per the Green Book guidance⁸. Costs are presented in 2021 prices and a 2024 present value base year, over a ten-year appraisal period.

Costs which fall on UK businesses have been monetised. These include on-going costs of sandeel catches which would have otherwise been caught. Due to the international nature of the fishing sector, two definitions of UK businesses have been included. Firstly, vessels with a UK flag and secondly vessels which land their catches into UK ports. This difference informs the range presented in monetised impacts. Control and enforcement costs are estimated to be £0 as they will come from the MMO's existing budget.

- **Estimated Present Cost (£0 - £4.5M)**
- **Estimated Business Net Present Cost (£0 - £4.5M)**
- **Estimated Equivalent Annualised Net Costs to Business (£0 - £0.5M)**

As UK-flagged vessels already receive no sandeel quota, it is assumed there will be no transitional costs in the lower bound. Under the UK businesses definition of vessels which land their catch into UK ports, up to five vessels will experience transitional costs when familiarising themselves with the new policy. This is estimated to be less than £100 in total.

Rationale for producing an DMA (as opposed to an IA)

⁶ Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](https://www.defra.gov.uk/news/2019/09/what-are-the-ecosystem-risks-and-benefits-of-full-prohibition-of-industrial-sandeel-fishing-in-the-uk-waters-of-the-north-sea-ices-area-iv/)

⁷ Trade statistics collected by HM Revenue & Customs – available at <https://www.uktradeinfo.com>

⁸ [HM Treasury: The Green Book](#)

The fast-track appraisal route is appropriate as this policy falls under the “low cost” criteria – equivalent annual net direct cost to business (EANDCB) is under £5m, as detailed in the initial assessment of impact on business above.

	Name, Role	Date
Departmental sign off		
Economist sign off (senior analyst)		
Better Regulation Unit Sign off		
Confirmation of self- certification by the BRU G7 Economist		

Supporting evidence

The policy issue and rationale for Government intervention

1. Sandeels are an important forage fish in the North Sea, contributing to the marine ecosystem and forming a large component of the diets of marine mammals, seabirds, and predatory fish including commercially valuable species⁹.
2. Sandeels increased availability is hence linked to the increase in abundance and health of commercial fish species. They are also an important food source for many seabird species and marine mammals, such as seals, toothed whales, and baleen whales. Declines in the abundance of sandeels due to fishing has shown to impact the breeding success of UK seabirds, most notably in kittiwakes¹⁰.
3. Sandeels are highly sensitive to changing environmental conditions and the increased effects of climate variation can negatively impact the health of the North Sea sandeel stocks. This pressure combined with the continued removal of sandeels through fishing risks further declines of threatened and vulnerable species in the wider marine environment, which rely on sandeels as a food source¹¹.
4. As such, sandeels require appropriate protection measures to mitigate the risks of declining stock levels and vulnerable species in the wider marine environment which rely on sandeels as a food source¹². Defra is implementing spatial management measures to increase the resilience of sandeel stocks and the wider ecosystem within English waters of the North Sea.
5. The fishing of sandeels likely causes negative outcomes in the marine environment as a result of 'market failures'.
6. To date fisheries management approaches have not considered the impact of sandeel fishing on the wider ecosystem and the longer-term resilience of sandeel populations – this activity has a negative externality associated with it.

⁹ Engelhard, G.H., Peck, M.A., Rindorf, A., C. Smout, S., van Deurs, M., Raab, K., Andersen, K.H., Garthe, S., Lauerburg, R.A., Scott, F. and Brunel, T., 2014. Forage fish, their fisheries, and their predators: who drives whom?. ICES Journal of Marine Science, 71(1), pp.90-104

¹⁰ Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P. and Wilson, L.J., 2004. The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. Journal of Applied Ecology, 41(6), pp.1129-1139.

¹¹ Natural England, Cefas and JNCC., 2022. What are the ecosystem risks and benefits of full prohibition of industrial sandeel fishing in the UK waters of the North Sea (ICES Subarea 4)?

¹² Sarah Cunningham, David Donnan, Katie Gillham, Ben James, Lisa Kamphausen, Suzanne Henderson - NatureScot, Peter Chaniotis and Eirian Kettle., 2022. JNCC and Phil Boulcott and Peter Wright - Marine Scotland Science. Towards understanding the effectiveness of measures to manage fishing activity of relevance to MPAs in Scotland. NatureScot Research Report No 1292

7. Industrial fishing is responsible for almost a third of the sandeel biomass removed in the North Sea¹³.
8. The current mechanism for managing stocks is not considered to be effective. Scientific advice takes no account of area closures when advising on total allowable catches (TACs), so current advice on catches in English sandeel management areas does not consider that some sandeel habitats are closed to fishing. Additionally, sandeels may be vulnerable to local depletion and evidence of spatial differences in mortality at the scale of grounds > 28 km apart has been found¹⁴. While there may be little effect at a stock level, local depletions even within a year could affect sandeel availability to local predators.
9. Given the vulnerable state of sandeel biomass in English waters and knock-on impact for predators such as seabirds, the UK government is committed to doing more to protect them. This can be achieved by not removing this biomass of sandeel (a common good) by commercial fishing vessels.

Policy objectives and intended effects

10. To increase the biomass of sandeel stocks and therefore increase the food availability for higher trophic level predators such as seabirds within the wider ecosystem within English waters of the North Sea.

Policy options considered

Option 0: Do Nothing

11. In a do nothing option, there would be no spatial management measures for sandeel fishing. EU vessels could continue to catch their 97% share of the total EU-UK quota for sandeels in the North Sea¹⁵. UK vessels have had no quota apportioned to them since 2021 by the UK Government. This DMA assumes UK Government will continue to not apportion sandeel quota and as such UK vessels will not partake in sandeel fishing of stocks managed by quota.
12. The current measure of not apportioning sandeel quota to UK vessels does not achieve the policy objective; to increase resilience of sandeel stocks and the wider ecosystem within English waters of the North Sea. Evidence suggests over 99% of the total UK and EU value of sandeel landed from English waters has

¹³ Calculated using Ecopath with Ecosim base estimates. Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](https://www.defra.gov.uk/consult/consultations/what-are-the-ecosystem-risks-and-benefits-of-full-prohibition-of-industrial-sandeel-fishing-in-the-uk-waters-of-the-north-sea-ices-area-iv/)

¹⁴ Jensen *et al.*, 2011

¹⁵ [Written record of fisheries consultations](#) on 11 March 2022 between the United Kingdom and the European Union about sandeels in 2022

historically been landed by EU vessels, worth around £41.2m each year (2015 – 2019 average)¹⁶. As such, the current non-regulatory approach has no impact on the majority of sandeel fishing in English waters.

Option 1 – Closure of English Waters within the North Sea (preferred option)

13. This option includes viable measures for spatial management measures for sandeel fishing in English waters. Sandeel fishing tends to be large-scale commercial fishing where the catch is processed into fish meal, fish oil or food used in agriculture. Implementation would be through licence conditions set by the MMO¹⁷. No vessels would be allowed to partake in sandeel fishing within the proposed options:

- Full Closure of English Waters within the North Sea. This option would see full closure of sandeel fishing within the English waters of SA1r, SA3r and SA4.
- Closure of English waters within SA4 and SA3.
- Closure of English waters within SA1r.

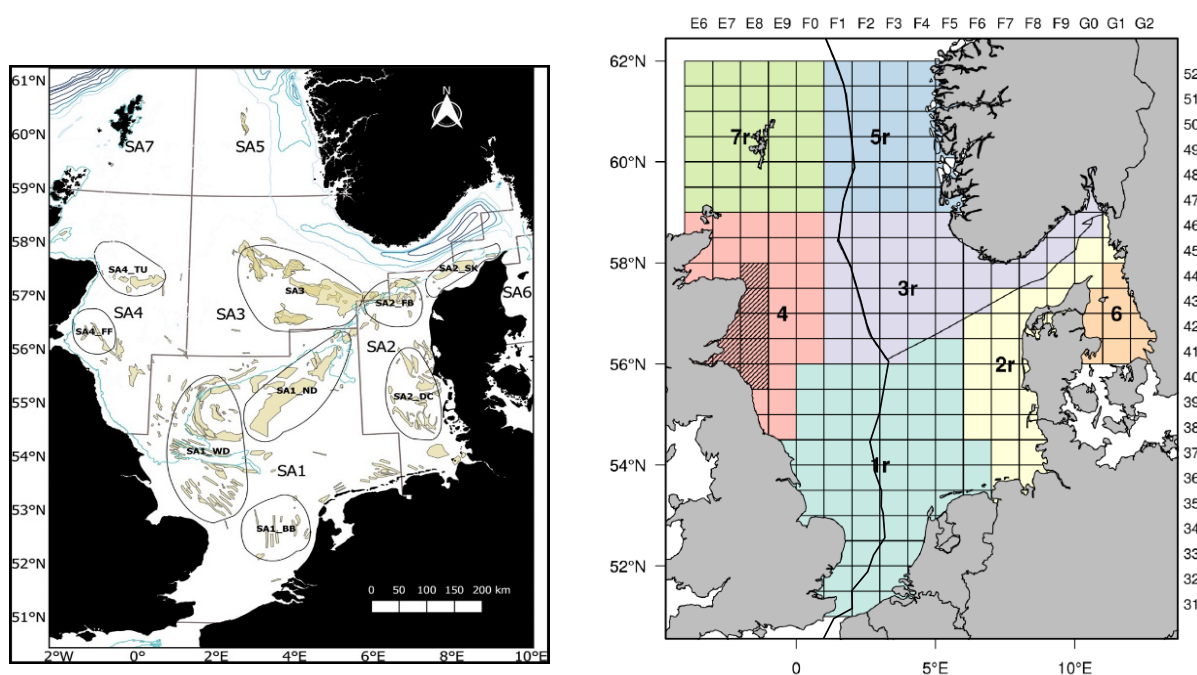


Figure 1: 1a (left): Sandeel assessment and management areas in the North Sea. The borders of the UK, EU, and Norwegian Exclusive Economic Zones (EEZ) are shown as black lines. The closed part of Sandeel Area 4 is shown with hatched markings (adapted from ICES, 2022). 1b (right): Sandeel habitat areas across the seven sandeel stocks.

¹⁶ Based on analysis using data provided to Defra by the Marine Management Organisation (MMO). 'Landed' refers to the process of catching/fishing the sandeels and then landing the sandeels into a port on land. Figures are presented in 2021 prices.

¹⁷ [Understand your fishing vessel licence - GOV.UK \(www.gov.uk\)](https://www.gov.uk/understand-your-fishing-vessel-licence)

Policy Option 2: Technical Measures

14. Sandeels are mainly caught for industrial purposes. They are targeted with highly specific otter trawls of a pelagic or semi-pelagic design with cod end mesh sizes of ~20mm. Technical measures, such as gear configuration, would continue to allow the removal of substantial quantities of sandeels and would not increase the abundance of sandeels available to other marine creatures which are dependent on them as a food source.
15. Other technical measures, such as increasing the mesh size, would in effect render the fishery unviable due to the small size of sandeels and therefore have the same outcome as Option 1. Due to their small size, increasing the mesh size means it is very likely sandeels will escape the catch, making the fishing activity uneconomical.
16. Option 2 does not meet the policy objective to increase the resilience of sandeel stocks and is therefore not considered further in this assessment.

Policy Option 3: Temporal Measures

17. This option considers only allowing sandeel fishing for part of the year.
18. For biological and management reasons the annual availability of sandeel is limited to a relatively short period from April to the end of June, during which time it is targeted. There is not a viable sandeel fishery outside of this period. The North Sea sandeel fishery is strictly seasonal, being restricted to 1st April – 31st July, although it usually finished towards the end of June by which time national quotas have been taken. In any case the seasonal nature of the fishery is dictated by the timing of the sandeel's overwintering fasting period, where they bury themselves in the seabed sediment to avoid predation from typically August until April.
19. Given the large-scale fishing capacity of the vessels partaking in sandeel fishing, allowing fishing even during part of the April to June period would serve to concentrate fishing activity and removals; and not reduce sandeel mortality.
20. Option 3 does not meet the policy objectives and is therefore not considered further in this assessment.

Policy Option 4: Voluntary Measures

21. This option would involve the development of voluntary codes of practice to manage sandeel fishing in English waters in the North Sea.

22. Defra has considered this option in light of Better Regulation principles¹⁸ which require that new regulation is introduced only as a last resort.
23. However, the government's expectation is that management measures for fishing should be implemented through regulation to ensure adequate protection of sandeel biomass is achieved, and all vessels, regardless of their nationality, are impacted equally by the proposed option.
24. Furthermore, it is highly unlikely that that we could reach a voluntary agreement with the Danish industrial fleet. Responses to Defra's call for evidence outlined that Denmark is reliant on UK waters to target sandeels, and that the Danish economy would be impacted by a change in regulation, both economically and socially¹⁹.
25. Option 4 is deemed unlikely to meet the policy objectives. It is not considered further in this assessment.

Expected level of business impact

26. All impacts analysed are for the preferred Option 1 compared to Option 0, 'do nothing'. For the purposes of the analysis, Option 1 is assumed to be full closure of English waters within the North Sea.
27. Partial closures of the same waters are assumed to have similar but smaller impacts.
28. Defra has used the best available evidence to assess the impact of management Option 1, however assumptions have been made in the development of this assessment.
29. Assumptions are set out throughout the DMA whilst key assumptions are also listed below:
- Estimated costs are likely to be an overestimate. Costs are based on the values of fish landed, rather than operating profit. Furthermore, vessels are likely to offset some of the lost revenue by fishing in other areas or for other species.
 - Analysis assumes UK Government will continue to not apportion sandeel quota. As such UK vessels do not partake in quota-managed sandeel fishing in the do nothing scenario, against which the costs of the proposal are

¹⁸https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/317555/betterregulationassessment2014.pdf

¹⁹ Summary of responses for 'Future Management of Sandeel and Norway pout in UK waters: call for evidence' October to November 2021. Future management of Sandeel and Norway pout in UK waters: call for evidence - GOV.UK (www.gov.uk)

measured. This is a reasonable assumption, and has also been tested in the 'Sensitivity Analysis' section.

- As this policy only concerns sandeel fishing in English waters, the data used in this analysis relies on an apportionment method used by the Marine Management Organisation (MMO) to estimate which country's waters landings of sandeels have occurred in. This is not a robust assumption as there is no evidence that landings are caught equally across ICES rectangles²⁰, but there is also no evidence to suggest that landings aren't caught equally across ICES rectangles. There is no alternative to relying on this assumption due to the availability of data, even if this does limit the reliability of the results. Despite this, most ICES rectangles in English waters do not straddle the English boundary, hence this assumption is assumed to not have a large impact on sandeel landings data.
- The majority of the data used in this de minimus assessment (DMA) is sourced from MMO, with the reliability issues outlined above in apportioning the data to the English waters, but the underlying data is reliable.
- All impacts are assumed to occur over a ten-year appraisal period, discounted at a rate of 3.5% each year, as per Green Book guidance²¹.

30. The closure of sandeel fishing in English waters of the North Sea may result in the following costs:

- a. Direct costs to the fishing industry from reduced access to fishing grounds
- b. Direct cost of fisheries patrol vessels and inspections
- c. Direct familiarisation costs to the vessels
- d. Indirect costs to the fishing industry associated with displacement to other fishing grounds; and
- e. Indirect costs to the fish processors and fishmeal importers associated with a decline in their factor input, sandeels.

31. An upper limit of the direct costs to the fishing industry has been monetised. Indirect costs to businesses are described qualitatively due to the uncertainties with these costs being realised.

32. The closure of sandeel fishing in English waters of the North Sea may result in the following benefits:

²⁰ ICES rectangles are used as bounding areas for calculation of fish statistics. They are approximately 30 nautical miles by 30 nautical miles. More information can be found at [ICES statistical rectangles](#).

²¹ [HM Treasury: The Green Book](#)

- a. Direct benefits to the wider marine ecosystem; and
- b. Indirect benefits to the fishing industry resulting from increased stock of other commercially valuable species.

33. The benefits associated with the proposed management are difficult to value and are therefore described as non-monetised costs.

Monetised costs

34. This de minimis assessment (DMA) considers the economic impact to UK businesses and individuals. Economic impacts to international businesses and individuals, including vessels registered outside of the UK, are not in scope for the headline costs figures. They are briefly assessed in Annex 1.
35. Due to the international nature of the fishing sector, it is not always obvious how to define businesses as being UK-based. Because Business Impact Target (BIT) analysis estimates impacts on UK GDP, the section below contains discussions of the merits of different options and presents the costs under different definitions of “UK businesses”.
36. In all options, most vessels are neither UK-flagged nor landed into a UK port. If either of these criteria are taken as the definition of a UK business, the costs of the policy fall largely on non-UK businesses. By contrast, because the scope of the policy is limited to English waters, if all vessels operating in English waters are considered UK businesses regardless of other connections to the UK, the cost to UK businesses is equal to the total costs of the policy.
37. Table 1 below summarises costs UK businesses may face under three possible definitions of UK businesses.

Table 1 – Costs to UK businesses of foregone revenue, 2021 prices²²

Definition of UK business	Number of vessels	Net Present Costs (£m)	Equivalent Annual Net Direct Costs to Businesses (£m)
(a) UK-flagged vessels fishing for sandeels in English waters of the North Sea	0	0.0	0.0
(b) All vessels landing sandeels into a UK port	0 – 5	4.6	0.5
(c) All vessels fishing for sandeels in English waters, landed into any UK or non-UK port	>25	354.3	41.2

²² Based on analysis using data provided to Defra by the Marine Management Organisation (MMO)

38. There are not expected to be additional compliance costs. The cost of fisheries patrol vessels and inspections will likely be absorbed by the Marine Management Organisations' (MMO) existing fisheries compliance systems.
39. The costs monetised in Table 1 relate to the expected revenue of sandeel landings from fishing that would have otherwise occurred in English waters within the North Sea. A breakdown of the methodology by business type is provided below.

(a) UK-flagged vessels

40. The costs of the preferred Option 1 have been assessed against Option 0, the 'do nothing' scenario. This assumes UK vessels are not allocated sandeel quota in both Option 0 and Option 1. As a result, there are no direct costs to UK vessels as a consequence of this policy.

(b) Vessels landing into a UK port

41. Non-UK flagged vessels are currently allowed to fish for sandeels if they hold quota and will sometimes chose to land in UK ports. Closing sandeels fishing in English waters will limit the ability of non-UK vessels to catch sandeels and dissuade them from landing into UK ports. This will result in a loss of revenue for these UK ports and UK businesses who may process the sandeels, which have historically all been in Scotland²³.
42. The proposals are estimated to impact between 0 and 5 non-UK flagged vessels which sometimes land sandeels into UK ports²⁴.
43. Landings of sandeels by non-UK vessels into UK ports have varied year to year, averaging 2,300 tonnes between 2017 and 2021, with an annual average value of £540,000 in 2021 prices. Applying this cost across a 10-year appraisal period, discounting at 3.5% each year gives a net present cost to business of £4.6 million.
44. This is an upper estimate of the potential cost to UK businesses. The estimate is based on the value of sandeel landings into UK ports from all waters as opposed to just English waters. Furthermore, the value of sandeel landings relates to businesses' revenue, rather than their profit margins. The realised annual cost of Option 1, closure of English waters within the North Sea, is likely to be lower than £540,000.

(c) All vessels in English waters

The proposals will also impact non-UK vessels that fish in English waters, regardless of where they land, as they are currently unaffected by the UK

²³ [Sea Fisheries Annual Statistics 2021, MMO](#) – UK and foreign landings by port

²⁴ Based on 2017 – 2021 landing data provided to Defra by the Marine Management Organisation (MMO)

Government's decision not to apportion quota to UK vessels. Closing sandeel fishing in English waters will therefore deprive these vessels of the revenue they would have been able to obtain if the fisheries remained open.

45. EU vessels landed an average of nearly 240,000 tonnes of sandeels from English waters annually between 2015 and 2019, worth £41.2m in 2021 prices²⁵. Assuming this policy is implemented in 2024, using a 10-year appraisal period and discounting at 3.5%, this is a net present cost of £354m.
46. Vessels sandeel fishing in English waters are either UK or EU flagged²⁶ and therefore the above figures are reasonable estimates for vessel revenue.
47. Additionally, the value of sandeel landings relates to businesses' revenue, rather than their profit margins. The realised annual cost of this policy is likely to be lower than £41.2m.
48. Vessels with a (a) UK flag and/or (b) landing into a UK port are the most reliable definition of UK businesses. These businesses will impact UK GDP, whereas (c) vessels flagged in a non-UK country and not landing into the UK are assumed not to impact the UK GDP. This definition of UK businesses has therefore been disregarded and the cost estimates are not included in the total cost of the proposals.

Familiarisation costs

49. As with any change to regulation and/or guidance there will be some transitional costs associated with the vessels impacted familiarising themselves with the changes. Defra estimate the total policy familiarisation costs to be less than £100.
50. Guidance on the closure of the sandeels fishery is expected to be around 550 words²⁷. Based upon the lower limit of reading technical text at 50 words per minute²⁸, this would mean a time required of 11 minutes per vessel. Between 0 and 5 vessels are expected to be impacted by the proposals²⁹. This means a total industry familiarisation time of 0 – 1 hours.
51. Fishers usually receive a crew share rather than a fixed salary, so incomes can vary dramatically across different vessel size and types. The average salary for employees in fishing and aquaculture in 2021 was £32,937³⁰. There are 52.1

²⁵ Based on 2015 – 2019 landing data provided to Defra by the Marine Management Organisation (MMO)

²⁶ STECF data for 2003-2016 <https://stecf.jrc.ec.europa.eu/web/stecf/dd/effort/graphs-annex>; STECF data for 2014-2020 <https://stecf.jrc.ec.europa.eu/dd/fdi/2022>.

²⁷ This assumes that the guidance will be around the same length of the closure of the Blue Ling fishery in ICES division 7a (Article 29(f) of Council Regulation (EC) 850/98 - <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01998R0850-20150601&qid=1463153613173&from=EN>)

²⁸ EFTEC (2013), "Evaluating the cost savings to business from revised EA guidance – method paper"

²⁹ As set out in Table 1, using UK business definitions (a) and (b).

³⁰ ONS, Earnings and Hours worked, ASHE table 4, [Earnings and hours worked, all employees: ASHE Table 4 - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/peopleinwork/earningsandworking/ashe)

weeks in a year, assuming the statutory annual leave of 5.6 weeks including bank holidays³¹ this leaves 46.5 working weeks. Assuming an average 36 hour working week³², this means 1,674 hours worked a year. A salary of £32,937 split across 1,674 hours generates a wage per hour of £19.68. Applying a 22% uplift for non-wage hourly labour costs, results in a wage cost per hour of £24.01. The 0 – 1 hours spent reading the updated regulations across all vessels would therefore generate a familiarisation cost of around £20. Rounded to the nearest hundred means this cost is presented as less than £100 throughout the DMA.

Non-monetised costs

52. This section qualitatively describes the potential direct cost of displacement, and indirect costs which may fall on the processing sector and fishmeal importers.

Displacement

53. The closure of fishing grounds can lead to displacement of fishing activity which can result in various costs. Displacement is dependent on the intensity and distribution of fishing activity within the site before the closure and on external factors such as sandeel distribution, total allowable catch/quota, fuel prices. The closure of the sandeel fishery within English waters is therefore likely to lead to some displacement of fishing activity onto other locations and other species such as sardines.
54. Given the scientific uncertainty associated with possible displacement, it is not appropriate to quantify these costs. Displacement impacts may however be reduced if the sandeel fishery is also closed in Scottish waters, as is currently being considered by the Scottish government³³.
55. The potential impact of displacement does not remove the requirement to ensure that sandeel fishing is managed to pursue environmental protection measures.

Processing sector

56. The fishmeal and fish oil processing sector in the UK is not expected to be significantly impacted by the proposed closures. There were no landings of sandeel, an input into some fishmeal and fish oil, into UK ports from industrial fishing in 2021 and 2022³⁴. Previous to this, landings averaged approximately 4,000 tonnes annually, worth £0.9m each year. All landings were into Scottish ports. This includes landings into the UK by non-UK vessels.

³¹ [Holiday entitlement: Entitlement - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

³² ONS Average actual weekly hours of work for full time workers, 2021 and 2022 average [Average actual weekly hours of work for full-time workers \(seasonally adjusted\) - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)

³³ [Proposals to close fishing for sandeel in all Scottish waters: consultation - Scottish Government consultations - Citizen Space](https://www.gov.uk)

³⁴ 2022 landings based on provisional MMO data - [2022 UK and foreign vessels landings by UK port and UK vessel landings abroad: provisional data - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

Table 2: Landings into UK ports of sandeels from stocks managed by quota³⁵

Year	Tonnes	Value (£m)
2018	4,200	0.9
2019	1,800	0.5
2020	5,600	1.5
2021	0	0.0
2022	0	0.0

Fishmeal and fish oil imports

57. The expected reduction in sandeel landings by non-UK vessels, predominately Danish vessels, could increase the price of fishmeal and fish oil as fewer sandeels are available as a production input. This will likely have an indirect impact on UK's fishmeal importers, such as aquaculture farms, as Denmark made up around a fifth of their imports by value in 2021³⁶.

Benefits to the UK

58. Closure of the sandeel fishery in English waters will contribute to the overall resilience of the marine ecosystem in the area and improvements in the marine environment as summarised in Table 3. The fishing industry may also benefit indirectly if the stock of other commercial species increases (e.g., whiting, haddock)³⁷.
59. Benefits associated with the proposed management are difficult to value and are therefore described here as non-monetised costs. Where possible, a sense of scale is given.
60. Closure of the sandeel fishery would allow an increase in the sandeel biomass with a secondary impact up the food chain. Increasing the food available to animals up the food chain is expected to increase animal numbers, bringing both environmental benefits and economic fishing opportunity benefits. However, these benefits will take time to come through as the animal population takes time to increase.
61. Seabirds would be the biggest beneficiaries if sandeel biomass were to increase. Sandeel availability has been linked to seabird breeding success and survival. Ecosystem model simulations predict a full prohibition in UK waters could lead to an increase in seabird biomass of 4-8%³⁸. Benefits to commercially important predators (e.g., cod, whiting, saithe, and haddock) are expected to be more

³⁵ 'Based on analysis using data from the Marine Management Organisation (MMO) of stocks 'NS Sandeels IIa(EC),IV(EC)' and 'Sandeel IV Norway'. [Monetary values are as reported by the MMO in the year of landing.](#)

³⁶ Trade statistics collected by HM Revenue & Customs – available at <https://www.uktradeinfo.com>

³⁷ As set out in Table 3

³⁸ Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](#)

limited and complex, with a mixture of responses to full prohibition of sandeel fishing in UK waters. However, it is important to note that the body condition for some commercial species has been linked to sandeel availability.

62. As the proposals relate to English waters only, the increase in species' biomasses may vary from the ecosystem model stimulations which predicts a full prohibition in all UK waters. Despite this, evidence suggest most sandeel fishing in UK waters occurs in English waters³⁹ and as such the ecosystem model stimulations provide a suitable indication of the ecosystem benefits.
63. Direct benefits to the overall resilience of the marine ecosystem are summarised in Table 3 below.

³⁹ Based on analysis using data provided to Defra by the Marine Management Organisation (MMO).

Table 3: Summary of ecosystem benefits⁴⁰

Impact type	Impact	Summary of ecosystem impact
Benefit	Increased sandeel resilience	Fluctuations in sandeel stocks are largely driven by extraneous factors (e.g., hydroclimatic factors). Even if fishery exploitation rates are low, the risk of stock collapse exists. However, the risk of collapse increases with increasing exploitation pressure. Reducing exploitation by prohibiting fishing in English waters may increase sandeel resilience.
Benefit	Increased seabird resilience	Increased population resilience for seabirds for which increased sandeel availability can positively impact on reproductive success (e.g., kittiwakes). Increased resilience for seabirds to diseases such as avian flu.
Benefit	Increased occurrence of marine mammals within English waters	Previous studies have linked the abundance of sandeels to the distributions of marine mammals in the North Sea. Therefore, if management actions led to an increase of sandeels in the English waters, we might expect to observe an increased occurrence of marine mammals in English waters.
Benefit	Improved condition of other commercial fish	Predatory fish have flexible diets and are likely to compensate for declines in sandeel availability. However, increased sandeel availability and consumption has been shown to positively correlate with the body condition of some commercial fish (e.g., whiting, haddock, and plaice) which relates to growth, reproduction, and survival chances.
Benefit	Progress towards Good Environmental Status (GES)	Several substantiated links have been made between the abundance of sandeels and the survival and breeding success of birds, mammals, and commercial fish, linking to the targets and indicators of the UKMS and GES descriptors (D1, D3, D4).

64. There may also be indirect benefits to the fishing industry. The industry may benefit from increased stock reliability of commercially valuable fish such as whiting, haddock and plaice. As discussed in paragraph 60, increases in commercially valuable fish are uncertain as well as the future quota uptake by the fishing industry, hence indirect benefits to the fishing industry have not been quantified.

⁴⁰ Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](https://www.defra.gov.uk/news/2017/04/what-are-the-ecosystem-risks-and-benefits-of-full-prohibition-of-industrial-sandeel-fishing-in-the-uk-waters-of-the-north-sea-ices-area-iv/)

Risks/Unintended Consequences

65. The proposed measures will likely impact EU registered vessels, mostly from Denmark. Over 99% of the total UK and EU value of sandeel landed from English waters has historically been landed by EU vessels, worth around £41.2m each year (2015 – 2019 average)⁴¹.
66. The loss of access to fisheries in English waters could affect relations with the EU, including Denmark, as they are likely to lead to employment and business losses overseas. These are further explored in Annex 1.
67. There is a small risk that displacement of fishing to other areas and other species could reduce the overall ecosystem benefits and fishing industry benefits. This is a small risk as Scotland are also considering the closure of sandeel fishing in Scottish waters⁴². If this is put in place, it is unlikely sandeel fishing activity would be displaced within the UK. It is likely that sandeel fishing effort will be displaced into EU waters of the sandeel management areas. If the total allowable catch (TAC) is not reduced, as we have witnessed previously, then overall removals of sandeels may remain the same the impact merely shifts.
68. Displacement onto other species may still occur. It is possible that, in response to reduced harvest opportunities for sandeels, vessels may shift focus to other species such as sprat in the English Channel. This risk has the potential to be harmful if stocks, where data is limited, are overexploited.
69. Scientific risks are further set out in the advice request, published alongside the consultation⁴³. These include risks associated with the full prohibition of sandeel fishing in UK waters of the North Sea, risks associated with extraneous factors, and risks associated with evidence uncertainty.

Sensitivity Analysis

70. The decision by the UK government not to apportion sandeel quota in 2021 and 2022, has resulted in UK vessels being unable to land industrially fished sandeels. This means that at present the closure of sandeel fishing in English waters does not have a direct cost on UK flagged vessels, as set out in Option 0. It is however possible that without the closure that the UK could have apportioned sandeels quota in the future. In this scenario, there would be a loss in revenue from sandeels caused by this policy.
71. Prior to the UK decision not to apportion quota, UK vessels landed an average of 1,350 tonnes of sandeels fished in English waters each year between 2017 and

⁴¹ Based on analysis using data provided to Defra by the Marine Management Organisation (MMO).

⁴² [Proposals to close fishing for sandeel in all Scottish waters: consultation - Scottish Government consultations - Citizen Space](#)

⁴³ Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](#)

2020⁴⁴. The average value of these catches is £280,000 a year in 2021 prices⁴⁵. In a hypothetical future scenario where the UK decides to allocate sandeel quota to UK vessels, closing sandeel fishing in English waters would deprive these vessels of this revenue. Over a 10-year appraisal period this would be a net present cost of £2.4 million to UK vessels.

72. Sensitivity testing is conducted in Table 4 for each definition of UK businesses. Vessels with a (a) UK flag and/or (b) landing into a UK port are the most reliable definition of UK businesses. These businesses will impact UK GDP, whereas vessels flagged in a non-UK country and not landing into the UK are assumed not to impact the UK GDP.

Table 4 – Equivalent annual direct costs to UK businesses, 2021 prices ⁴⁶

Definition of UK business	Costs assuming quota is apportioned	Costs in central scenario
(a) UK-flagged vessels fishing for sandeels in English waters	£0.3m	£0.0m
(b) All vessels fishing for sandeels landing into a UK port	£1.0m	£0.5m
(c) All vessels fishing for sandeels in English waters, landed into any UK or non-Uk port	£41.4m	£41.2m

73. As a result, it is possible to conclude that even in a scenario that allowed UK vessels to continue to land sandeels from quota-managed stocks, the cost to UK businesses of closing sandeel fishing in English waters is relatively low.

Monitoring and Evaluation

74. Traditionally, most information regarding the abundance of sandeels has originated from scientific monitoring of the fishery itself⁴⁷. Full prohibition of sandeel fisheries from UK waters of the North Sea will disrupt the source of such data making monitoring the effectiveness of the closure difficult. Under a full prohibition of sandeel fishing in UK waters of the North Sea, a viable alternative will be needed to monitor sandeels, likely beyond the scope of monitoring for

⁴⁴ Based on 2017 – 2021 landing data provided to Defra by the Marine Management Organisation (MMO)

⁴⁵ Based on 2017 – 2021 landing data provided to Defra by the Marine Management Organisation (MMO) and applying GDP deflators.

⁴⁶ Based on analysis using data from the Marine Management Organisation (MMO)

⁴⁷ Wright, 1996; Furness, 2002

commercial fisheries to capture the links between sandeels and food web dynamics and identify progress towards GES.

75. It should also be noted that sandeel stocks experience high levels of natural fluctuation due to the influence of environmental variation on sandeel recruitment and population. As such it may not always be possible to attribute changes to the spawning stock biomass of sandeels to a prohibition of sandeel fisheries. In addition, evaluation of the policy should be done over at least a five-year period to account for natural fluctuations in sandeel stocks over the years. This will be considered further in the final stage DMA.
76. DEFRA will also continue to monitor the spawning stock biomass of species outlined in the sandeel consultation evidence report⁴⁸ to see whether other fish species, such as whiting, have benefitted from any measures introduced. ICES annual reports and catch advice⁴⁹ on these stock levels will be considered to provide a reasonable baseline and monitor stock level changes. As is the case for sandeels stock levels, the impact of other external environment factors should also be considered when evaluating the impact of the proposals. This will be considered further in the final stage DMA.
77. Government will continue to monitor sea bird populations⁵⁰, although note that population sizes of seabirds are likely to be impacted by a number of different factors, such as the introduction of new offshore wind farms and Avian flu.

⁴⁸ Research done jointly by Natural England, Cefas and JNCC. [What are the ecosystem risks and benefits of full prohibition of industrial Sandeel fishing in the UK waters of the North Sea \(ICES Area IV\)? \(defra.gov.uk\)](#)

⁴⁹ [Latest advice \(ices.dk\)](#)

⁵⁰ [Seabird Monitoring | JNCC - Adviser to Government on Nature Conservation](#)

Annex 1 – Non-UK impacts

Although the focus of the DMA is the impact on UK businesses and UK individuals, vessels registered in other countries also fish sandeels in English waters and land them in non-UK countries, such as Denmark.

EU vessels landed 240,000 tonnes of sandeels from English waters on average between 2015 and 2019, worth £41.2 million a year in 2021 prices. Using the worst-case scenario that 100% of these landings are lost, and applying a discount rate of 3.5%, the net present cost over the 10-year appraisal period to non-UK vessels is estimated to be £354 million.

It is important to note these costs are based on values of landed fish, rather than operating profit. The costs to non-UK vessels are therefore considerably overestimated as the costs are based solely on revenue. Furthermore, as per UK vessels, non-UK vessels are likely to offset some of their lost revenue by fishing in other areas.

During the call for evidence from October to November 2021, Defra received figures from international fish processing businesses suggesting there will be indirect costs to their businesses. The figures detailed that 66% (£37 million) of average annual Danish export value of fishmeal and fish oil, made from sandeels, was from sandeels caught in UK waters (2016 – 2020). The Danish fishmeal and fish oil factories also directly employ ~500 workers in coastal communities and derive additional economic activity in the local communities. This employment and economic activity may be heavily reduced if fish processing businesses don't find alternative input sources.