

Remote Electronic Monitoring (REM)

Business and Regulatory Impact Assessment (BRIA)

March 2024

Business and Regulatory Impact Assessment (BRIA) on Remote Electronic Monitoring (REM)

Introduction

Remote Electronic Monitoring (REM) relates to the use of imagery, sensors, and a Vessel Positioning System (VPS) to independently monitor fishing operations, effort (fishing activity at sea), and/or catch. In this paper we explore the impact of such a requirement as it specifically applies to two fishing fleet segments – pelagic and scallop dredge vessels.

Two partial BRIAs (one relating to pelagic vessels and one relating to scallop dredge vessels) were prepared alongside the public consultation on the usage of REM¹. The consultation asked a range of questions relating to the mandatory rollout of REM to pelagic and scallop dredge vessels and also asked for views regarding broader rollout of REM to additional fleet segments (i.e. beyond pelagic and scallop) in the future. However, given that any broader rollout is still at an early stage of development, separate BRIAs have not yet been produced for these additional fleet segments. Following the public consultation, the two partial BRIAs have now been updated to support the draft Scottish Statutory Instrument (SSI) which is being introduced to require REM onboard pelagic and scallop dredge vessels.

As outlined below in the full BRIAs, REM requirements are being imposed on scallop and pelagic vessels to strengthen existing enforcement mechanisms in relation to the regulation of sea fishing activity in the Scottish zone or by Scottish scallop and pelagic vessels wherever they are fishing. The high resolution data generated from REM systems will also enhance the evidence base on which decisions are taken by the Scottish Government or other relevant public bodies, including the provision of scientific advice and decisions relating to wider marine planning. The use of REM is also expected to help deliver the confidence and accountability that consumers and members of the public want to see from seafood products.

The specific cost of purchasing REM systems, regardless of the fishing fleet segment concerned, is difficult to quantify precisely given that fishers will procure their systems on the open market. As a result, the price charged for REM systems is anticipated to vary between different providers and may reflect whether vessels are purchasing REM systems on an individual basis or in greater quantities as organised buying groups. Nevertheless, based on previous trials, voluntary schemes and knowledge of the systems which are used in some areas (both in the UK and outwith the UK) or are proposed to be used in future², we have presented as much information as possible in these BRIAs. Likewise, the operational costs associated with the REM systems, particularly those relating to data transfer and storage costs, will vary depending on the vessel layout, the type of fishing operation, length of time at sea etc, along with variations relating to services procured on the open market.

¹ [Marine resources - remote electronic monitoring \(REM\): business and regulatory impact assessment - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/bria-rem/pages/introduction.aspx)

² [Technical guidelines and specifications for the implementation of Remote Electronic Monitoring \(REM\) in EU fisheries](#)

We have provided estimates on those costs within these BRIAs, however, the exact costs for individual vessels are likely to vary. Through the public consultation, we asked respondents to indicate whether they foresaw any barriers to vessels meeting the costs of REM systems themselves. Whilst a number of consultation responses identified that there may be some barriers to the fishing industry of meeting REM costs, the responses acknowledged that these barriers were not evenly met across the different fishing fleet segments. On this basis, the decision was taken by the Scottish Government that the issue of funding for REM should be taken on a fleet segment by fleet segment basis.

Regarding businesses which will be impacted by this policy, the most directly impacted businesses will be those operating the fishing vessels themselves; but also the supply chain associated with REM hardware and software, and the Scottish Government.

Business and Regulatory Impact Assessment

Title of Proposal

Remote Electronic Monitoring (REM) on pelagic vessels fishing in Scottish waters and Scottish pelagic vessels wherever they fish.

Purpose and intended effect

Background

As announced in the Future Fisheries Management (FFM) Strategy³, the Scottish Government is introducing legislation making it a legal requirement that all pelagic vessels must have a fully operational Remote Electronic Monitoring (REM) system installed on board while fishing in Scottish waters and, for Scottish pelagic vessels, wherever they are fishing.

Pelagic vessels for the purposes of this policy are defined as fishing boats which:

- *are 12 metres or more in length;*
- *are equipped with at least one of a Refrigerated Sea Water (RSW) system, a Chilled Sea Water (CSW) system or freezer storage capabilities;*
and
- *uses fishing nets in the Scottish zone (or, for Scottish fishing boats, in any waters) for the primary purpose of fishing for small pelagic species of fish⁴.*

REM as a monitoring and data collection tool was first trialled in Scotland in 2008. At the time, it was utilised as part of a large scale monitoring scheme in the Scottish fishing industry during the Cod Recovery Plan (CRP) (2009-2016), offering a Fully Documented Fishery (FDF) monitoring scheme. Vessels took REM on-board in return for incentives, namely additional cod quota and an increased days at sea allowance. The FDF scheme enabled Scottish Government officials to build up a considerable level of expertise and experience of operating an REM scheme successfully, and demonstrated to the Scottish Government that REM can work as an effective enforcement tool. It also acted as the catalyst for the comprehensive development of REM technology in a scientific context⁵, with research ongoing into best practice for extracting accurate scientific data from video footage, developing methodologies for the assessment of fish and shellfish stocks using REM, and development of Machine Learning (ML) software which can deliver automated image recognition of fish caught as they are processed on the on-board conveyor belt systems used by some types of fishing vessels.

Implementing REM requirements for pelagic vessels on a mandatory basis is a first for the UK, while a similar Danish scheme has been implemented since 2022^{6,7}.

³ [Future fisheries: management strategy - 2020 to 2030 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/future-fisheries-management-strategy-2020-to-2030/pages/1-introduction-to-the-strategy.aspx)

⁴ Defined for the purposes of the REM SSI as including mackerel, herring, horse mackerel, anchovy, sardine, blue whiting, argentines, sprat, and boarfish.

⁵ [Scottish science applications of Remote Electronic Monitoring | ICES Journal of Marine Science | Oxford Academic \(oup.com\)](https://www.ices.dk/science/remote-electronic-monitoring/)

⁶ [Danish electronic monitoring projects \(fiskeristyrelsen.dk\)](https://www.fiskeristyrelsen.dk/en/da/elektronisk-overvaagning/)

⁷ [Danes agreement to onboard cameras | Fishing News](https://www.fishingnews.com/news/industry/danes-agreement-to-onboard-cameras/)

The Scottish pelagic fishery is a significant part of the Scottish fishing industry and, in 2022, pelagic species represented 68% by tonnage and almost half (44%) by value (£274.5 million) of total landings taken anywhere by Scottish vessels, as seen in the Scottish Sea Fisheries Statistics 2022⁸. Most of these landings are landed by 21 vessels (2022 count) with Marine Directorate data indicating they employ over 250 people. Mackerel was the most valuable species landed accounting for 35% of the total value of Scottish landings taken anywhere in 2022. Historically, pelagic species have made up the majority of catches landed abroad from Scottish vessels with around 95% of the tonnage landed abroad in recent years being pelagic fish. The UK's fleet of 27 trawlers over 40 meters has been consistently profitable, with data from the EU's Scientific, Technical and Economic Committee for Fisheries (STECF)⁹ showing the fleet's net profits¹⁰ exceeded 30% of revenue every year save one between 2014-2019. The most recent published data dates from 2019, however, analysis of the change in costs, the change in available fishing quota, and the price of fish since 2019 indicate that profits are not anticipated to have radically changed from the 2019 figures.

Pelagic fisheries are seasonal and data from 2017-2022 shows that the first catching season peaks during the first six weeks of the year, starting again late summer up to November. The fishery has a consistently high quota uptake for both the West Coast of Scotland and North Sea. For example, between 2020-22 the UK uptake of quota exceeded 100% for both west coast mackerel and North Sea herring. This is possible because of a practice called "Inter-annual" flexibility¹¹, which is the regulated and legislated means by which the UK is permitted to operate beyond its '100%' limit.

Objective

The objectives of the policy are to deter non-compliance with fisheries legislation and ensure compliance with key legal requirements such as the landing obligation, to enhance our understanding and knowledge of pelagic fisheries and stocks and to deliver confidence and accountability in the activities of fishing vessels at-sea.

Effective fisheries management relies on vessels fishing at sustainable levels and on vessels complying with their obligations under legislation regulating sea fishing activity, which are in place to ensure that fishing is undertaken safely and responsibly and within environmental limits. Sound fisheries management is underpinned by robust scientific advice – the more data we have and the greater the confidence level in that data, the more confident we can be in our management decisions and the scientific assessments that underpin them. In turn, this can support increased consumer confidence in the product on offer.

⁸ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](https://www.gov.scot/resources/documents/2022/06/Scottish-Sea-Fisheries-Statistics-2022.pdf)

⁹ [STECF 22-06 - EU Fleet Economic and Transversal data fleet segment.xlsx - Economic and Social Analyses - European Commission \(europa.eu\)](https://ec.europa.eu/fisheries/steecf/22-06/eu-fleet-economic-and-transversal-data-fleet-segment.xlsx)

¹⁰ This net profit is based on the Seafish estimate and excludes tax. Net profit: the result of subtracting finance costs, depreciation and interest costs from operating profit.

¹¹ Inter-annual flexibility permits either: (a) a Coastal State (CS) to carry forwards unused quota into the following calendar year, up to a maximum of 10% of the CS's adapted quota, or (b) a Coastal State fish in excess of its adapted quota by up to 10% in the current calendar year. A 1:1 (tonnes) deduction is made to the CS in the following calendar year

The introduction of REM supports the Scottish Government's Purpose, which is to focus on creating a more successful country with opportunities for all of Scotland to flourish through increased wellbeing, and sustainable and inclusive economic growth. It does this by supporting the delivery of sustainable fisheries management, and supporting the fishing industry to operate in a sustainable way.

REM also supports the delivery of two of the National Performance outcomes contained within the National Performance Framework. These are: Economy – we have a globally competitive, entrepreneurial, inclusive and sustainable economy, and Environment – we value, enjoy, protect and enhance our environment. It does this by ensuring the fishing industry remains competitive in an international context by enhancing the sustainability and transparency of fishing operations, by ensuring that legislation intended to protect the marine environment and fish stocks is complied with, and by enhancing the evidence base from which the Scottish Government makes decisions regarding the marine environment.

Rationale for Government intervention

The Scottish Government makes decisions using the best available evidence and, where there is a data gap, seeking to find new ways of accessing data. Where data is available, there may still be an issue with data accuracy. For example, current landing monitoring methods do not always properly identify misreporting of catch between fishing areas. This negatively influences the sustainable area-based management of the fishery. Introducing REM devices will ensure a better information flow between fishing activity and marine compliance / science officers and will support sustainable management of the stocks and compliance with current legislation.

In addition, there are a number of positive benefits that could be gained by the wider implementation of REM. In particular, raising Scotland's international reputation for pursuing more sustainable practices, through more rigorous monitoring of bycatch, and, similarly, enhancing Scotland's reputation in technological adoption by incorporating wider use of REM within current business practices. Enhancing Scotland's reputation in these ways has the potential to boost Scotland's standing in the global seafood industry.

With the above objectives in mind, intervention through legislation is assessed to be the most effective method of effectively delivering mandatory REM requirements, and REM is assessed as being the most effective method of delivering the objectives identified.

Consultation

Within Government

Consultation has been undertaken with officials within the Marine Directorate of the Scottish Government, including policy, compliance and science experts and marine analysts/economists.

Within the UK we have also engaged with DEFRA, the Marine Management Organisation (MMO), the Welsh Government and the Northern Ireland Executive on overlapping areas of interest. In an international context we have engaged with the EU, Norway and other Coastal State partners to highlight the policy to them and seek feedback.

Under the terms of the Trade and Cooperation Agreement between the UK and the EU, a formal notification of the SSI will be made to the Specialised Committee on Fisheries.

Public Consultation

A full public consultation¹² on the use of REM took place from 15 March to 7 June 2022. The consultation sought views on the implementation, impact and general principles of the use of REM in the pelagic sector.

Responses to the consultation were mixed between individuals and organisations, and between environmental / conservation groups and fisheries organisations. They were helpful in providing a rounded view of stakeholder opinion on a number of key questions. In total the consultation received 48 valid responses.

We published our analysis report¹³ of the responses to the REM consultation in August 2023.

Specific feedback received as part of the consultation has been used to shape the policy further, including (but not limited to) the following topics:

- **Lead-in time for the pelagic industry to prepare for REM requirement:**
The consultation proposed 12 months as a reasonable timeframe from the time the REM SSI becomes law and before mandatory REM requirements come into legal effect, for pelagic vessels to become compliant with the legislation. Whilst the majority of respondents appeared to agree with this proposition, some argued that it could take up to 36 months for Scottish and non-Scottish vessels to become compliant with the legislation. This led to us consulting further with electronic monitoring specialists and operational experts. We have therefore provided for a long lead-in time for the pelagic requirements to take effect (the SSI will be laid on 22 March 2024, with the mandatory REM requirement taking effect on 7 March 2026).
- **Definition of pelagic vessels:**
The consultation defined pelagic vessels as "Refrigerated Sea Water/Chilled Sea Water (RSW/CSW) and freezer vessels, over 12 metres, fishing for small pelagic and blue whiting." This definition set out to be as encompassing as possible for all vessels which could be defined as pelagic vessels. However, some responses suggested the definition could be clearer with some

¹² [Marine resources - ensuring long term sustainability: remote electronic monitoring \(REM\) consultation - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/)

¹³ <https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/>

proposing the inclusion of other species and others recommending net mesh size be used as a classifier of pelagic vessels. We took these responses into account in preparing a suitable legislative definition for pelagic vessels, which for the purposes of this policy are defined as fishing boats which:

- *are 12 metres or more in length;*
- *are equipped with at least one of a Refrigerated Sea Water (RSW) system, a Chilled Sea Water (CSW) system or freezer storage capabilities;*
and
- *uses fishing nets in the Scottish zone (or, for Scottish fishing boats, in any waters) for the primary purpose of fishing for small pelagic species of fish¹⁴.*
- **System specification:**
The consultation asked for views on a draft system specification aimed at supporting the delivery of the science and compliance benefits. Although the majority of respondents agreed that the intended benefits would be realised, some suggested that standardising systems across different vessel types and different countries may undermine the level playing field principle. We addressed this concern through the inclusion of precise technical specifications setting out minimum standards for REM systems as part of the REM requirements that must be met. Provided these technical specifications are met, individual vessels will be able to procure and install REM systems that accommodate different layouts and vessel types. By setting standards which must be met by REM systems, this approach ensures that the systems provide the required data, without requiring total uniformity at a vessel level.

Business

Views on REM were sought as part of the National Discussion Paper on Future Fisheries Management¹⁵, which was published in March 2019. Engagement with industry representatives has taken place through the Fisheries Management and Conservation Group (FMAC).

We have engaged with developers of REM systems to ensure that current REM technology is capable of meeting the ‘technical specification’ minimum standards which the SSI will require.

Options

Option 1: Do nothing

Option 1 is the ‘Do nothing’ option; this is the baseline scenario. Under this option, the proposed REM requirement would not be rolled out to pelagic vessels in Scottish waters or to Scottish pelagic vessels fishing in any waters. Accordingly, no additional management measures would be required.

¹⁴ Defined for the purposes of the REM SSI as including mackerel, herring, horse mackerel, anchovy, sardine, blue whiting, argentines, sprat, and boarfish.

¹⁵ [Future of Fisheries Management in Scotland: National Discussion Paper \(www.gov.scot\)](http://www.gov.scot)

Option 2: Introduction of legislative requirement for REM on relevant vessels

Option 2 involves introducing a legislative REM requirement that all fishing vessels which meet the definition of a pelagic vessel for the purposes of the REM SSI must have an REM system installed onboard, comprising cameras, winch sensors and Vessel Positioning Systems (VPS) and operational when fishing in the Scottish zone or, for Scottish pelagic vessels, wherever they are fishing.

Sectors and groups affected

The following sectors have been identified as groups who will be affected by the proposal:

- Scottish pelagic fishing industry
- Wider UK and International pelagic fishing industry operating in Scottish waters
- REM suppliers
- REM maintainers/repairers
- Internal Scottish Government – Scottish Government Marine Directorate Compliance and Science
- Courts and the Crown Office and Procurator Fiscal Service – if criminal prosecutions are pursued.

Benefits

Option 1: Do nothing

No change would be required from an industry perspective, with no additional benefits being incurred.

Option 2: Introduction of legislative requirement for REM on relevant vessels

The introduction of an REM compliant fleet will principally allow for full documentation of catches, presenting a variety of benefits covering three main areas:

1) Enhance Scottish Government compliance capabilities by increasing the data available to assess fishing vessel compliance.

REM can act as a deterrent to non-compliant activity, such as illegal discarding of catch, and can create a level playing field for all vessels that use it within a fishery and where there are appropriate levels of monitoring and analysis. Therefore, REM aims to ensure greater levels of compliance and as such more sustainable Scottish fisheries with fewer occurrences of illegal practices. REM will, therefore, enhance the Scottish Government's abilities to demonstrate accountability in Scottish fishing practices, to deliver confidence that fishers are complying with fisheries rules and regulations, and to supplement our existing enforcement tools used as part of our world-class compliance system. Over time, with further development of tools such as

machine learning (ML), REM could be used in place of existing methods allowing efficiencies in fisheries compliance activities.

Fisheries, fishers and both fishery-dependent and fishery-independent data collection were all severely impacted by the COVID-19 pandemic. In many fisheries this resulted in a combination of sampling programmes being suspended, and when operational, a very limited observer availability due to quarantine rules. Globally, however, REM programmes were only marginally impacted, demonstrating the resilience of remote monitoring in its ability to provide continued uninterrupted data collection regardless of external extenuating factors. Therefore, these benefits highlight the advantages of having multiple monitoring methods in place to ensure an evidence base for continued fisheries management in unprecedented situations.

A monetary value to these compliance benefits has not been estimated due to the fact that the use of REM has, up until this point, not been widespread, the lack of international examples to draw on, and the unknown element of the level of non-compliance with the landing obligation. European Fisheries Control Agency analysis from 2015-2017 suggests significant levels of discarding across the EU fleet but notes that estimates are not available due to the lack of data and that REM could be instrumental in improving the picture¹⁶. Research into the impact of electronic monitoring on the discarding of small cod in the Scottish demersal fisheries indicates that electronic monitoring does decrease instances of discarding¹⁷.

2) Enhance Scottish Government Science capabilities by increasing data available for informing scientific advice.

This will enhance the information available for stock assessments and wider marine planning purposes. REM technology offers a range of scientific benefits, by supporting and building upon existing fisheries-dependent data collection methods such as independent fishery observers, industry-science partnerships, vessel monitoring systems (VMS) and logbooks.

REM technologies can improve the timeliness, quality, cost-effectiveness and accessibility of scientific data to ensure the data utilised for fisheries management decision making is of high quality. If used on a large scale, and as more tools are developed and implemented such as ML, REM data streams can be integrated with existing data collection programmes to support stock assessments, support other scientific research interests and wider decision-making in the marine environment.

Consequently, this is expected to help deliver benefits in relation to fisheries stock management, which in turn can help lead to more responsible, traceable and sustainable fishing. Scientific involvement in co-developing and deploying REM technology is therefore of significant importance, with Scottish Government compliance and science both co-beneficiaries of this system.

¹⁶ [Microsoft Word - Executive Summary MAC LO Compliance Evaluation in NS and NWW 2015 - 2017 August 2019 \(europa.eu\)](#)

¹⁷ [Impact of electronic monitoring on fleet wide discarding of small cod in Scottish demersal fisheries | ICES Journal of Marine Science | Oxford Academic \(oup.com\)](#)

As the tools to support REM are developed and improved in future, such as ML, the data generated by REM could ease the reporting burden and duplication of effort on behalf of fishers and fisheries management organisations. Information such as a vessel's location, fishing effort, gear, and most importantly from a fully documented fisheries management perspective, the types and quantities of retained or discarded catch could be automatically determined and reported.

A monetary value for the benefit of additional data and the resulting benefit of enhanced scientific research and advice has not been estimated due to the fact that, up until now, the use of REM has not been widespread, the fact that there is a lack of international examples to draw on, and the unknown element of how much discarding is affecting stock assessment accuracy.

3) REM will support and enhance the reputation of Scottish seafood, with a demonstration of compliance by fishing vessels and delivering confidence to consumers that fishing is being undertaken responsibly and sustainably.

In addition to REM improving accountability in our fishing practices, consumers are expected to have more confidence that Scottish fish is caught sustainably, and REM is anticipated to improve the reputation of Scottish fishing in general. This confidence in sustainability has also been noted in the significant price premium that MSC certification can convey (5-25% dependent on species^{18,19,20}), with REM expected to help reinforce pelagic fishing's credentials with a possible increase in value to fishers as a result. While the MSC certification for mackerel is currently suspended, MSC does note the different levels of sustainability in different fisheries thus potentially allowing Scottish fisheries to have a higher ranking even when there is not international agreement on quotas. This could potentially also help in maintaining international market access and accessing international markets such as the USA where stricter evidence on marine mammal bycatch is required²¹.

The price and trade benefits of REM for the pelagic fleet are difficult to quantify as the body of evidence available relates primarily to the existing MSC certification for this fleet rather than any certification above this level. However, for every 1% increase in the price of pelagic fish, the estimated total benefit to Scottish fishers could be around £2.7m per annum based on the total value of landings in 2022²². While the precise benefit is uncertain, it is clear that even a small benefit would have a positive monetary impact.

Summary of Benefits

Non-Monetised – Option 1: Do nothing

1. No additional costs for the fishing industry

¹⁸ [New survey sees seafood consumers placing sustainability before price and brand | SeafoodSource](#)

¹⁹ [Evidence of price premium for MSC-certified products at fishers' level: The case of the artisanal fleet of common octopus from Asturias \(Spain\) - ScienceDirect](#)

²⁰ [Price premiums for ecolabelled seafood: MSC certification in Germany - Asche - 2017 - Australian Journal of Agricultural and Resource Economics - Wiley Online Library](#)

²¹ [International Marine Mammal Bycatch Criteria for U.S. Imports | NOAA Fisheries](#)

²² [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](#)

Non-Monetised – Option 2: REM

1. Potential reduction in discarding/unlawful practices due to increased compliance – leading to improved health of fish stocks, in turn improving catch yields and future economic gains.
2. Increased quantity and accuracy of data for science and compliance assessments.
3. Marine ecosystem benefits including enhanced sustainability of fishing practices.
4. Helping establish the tools and capabilities of ML through collected data to further improve the capabilities of REM.
5. Possible future savings in compliance and science data collection as the technology develops.
6. Fishing accountability and increased consumer confidence, improved reputation for Scottish catch, potential improvement in competitiveness of the product and improved access to markets. Total estimated monetized benefit could be £2.7m for every 1% increase in price.

Costs

Option 1: Do nothing

This option is not predicted to create any additional costs to the sectors and groups outlined above.

However, failure to introduce REM among the fleet would mean that existing challenges around data gaps would remain and constraints to enforcing compliance with existing legislation (particularly the landing obligation) would continue. This would likely result in continued discarding taking place resulting in higher fish mortality rates and less fish available for future years. Pelagic stocks have been noted by the European Fisheries Control Agency as both an area lacking information on discards and an area that is estimated to have significant levels of discarding²³. In the event of discards continuing or absence of accurate information on discards it is more likely that precautionary steps will need to be taken in regards to stock assessments which typically result in more conservative quotas or greater variability in quotas. This could be detrimental to the fishing industry both in loss of short term fishing opportunities and in terms of impacting business planning.

By doing nothing, Scottish seafood could become less attractive to consumers and potentially lose market share or price premium if competitors prove the sustainability and compliance of their fisheries. This can be seen with more stringent requirements being introduced for imports to the USA market²⁴ which is both a possible export market and a possible competitor for pelagic fish in some high value markets.

²³ [Microsoft Word - Executive Summary NS LO Compliance Evaluation Report August 2019 \(europa.eu\)](#)

²⁴ [International Marine Mammal Bycatch Criteria for U.S. Imports | NOAA Fisheries](#)

In 2022, pelagic species represented 68% by tonnage (293 thousand tonnes) and 44% of value (£274.5 million) of the total landings by Scottish vessels²⁵. Given the outsized quantity and value of this segment, a substantial loss of competitiveness, unsustainable fishing, or other negative impacts from inaction could have a measurable impact on the Scottish rural economy and the Scottish fishing industry.

As Option 1 is the baseline option the costs and risks above have not been monetised so as to not double count the benefits. Instead the benefits of Option 2 can be considered as costs avoided and risks avoided.

Option 2: Introduction of legislative requirement for REM on relevant vessels

The exact costs for REM will vary depending on the size and type of vessel, and the different costs charged by commercial operators. The estimates provided in Table 1 below are from a limited sample of businesses offering these services but as the market matures the businesses offering these services could change. Given the small number of vessels affected (21 Scottish vessels and an estimated 39 non-Scottish vessels) it is not expected that this legislation will increase demand for REM systems above what businesses are able to supply. We have engaged with a number of suppliers through the development of the legislation and no concerns regarding availability have been raised. Internationally, the demand for this type of system is growing fast, with no identifiable supply issues, for example over 1,400 vessels had it in 2018, with it being common for over 200 vessels per year to be added to this²⁶. We do not expect that the price of these systems will increase due to this legislation, although that is always possible in a commercial environment. Vessel owners will be free to choose which system they purchase, as long as it meets the minimum standards in the technical specifications for REM systems for pelagic vessels, which will be published by Scottish Ministers under the REM legislation.

The technical specifications will set out the type of data which must be captured by an REM system and how this must be stored and transferred for analysis. The costs associated with these different data requirements will vary depending on the system provider used and the type of activity the fishing vessel is engaged in. For example, some pelagic vessels will be at sea for longer than others and will therefore generate larger quantities of REM data in relation to these longer fishing trips.

There is a requirement for REM data to be uploaded to a data storage system (which can include a 'cloud' or physical server based storage system). This means that costs will be incurred both for transfer of data and subsequent storage of that data. The responsibility for sourcing REM systems which comply with the applicable technical specifications and for paying for data transfer services and cloud storage rests with the fishing industry, and they will be able to procure the system and data package that best suits their business model. This level of flexibility will allow for competition within the market.

²⁵ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/statistics-2022-23/pages/250-260-fisheries-and-aquaculture-statistics-2022-23.aspx)

²⁶ [Electronic monitoring in fisheries: Lessons from global experiences and future opportunities - Helmond - 2020 - Fish and Fisheries - Wiley Online Library](https://www.fishbase.org/abstract/2021/10/electronic-monitoring-in-fisheries-lessons-from-global-experiences-and-future-opportunities-helmond-2020-fish-and-fisheries-wiley-online-library)

The largest component of data being captured by the REM systems is in relation to camera footage. Whilst winch sensor and vessel positioning system device data (VPS) will need to be uploaded to server storage in real time, for the camera data there is flexibility in relation to when the data transfer takes place – this can be at sea, utilising existing data packages onboard the vessel, or in port, providing that transmission is completed by the deadline specified in the technical specifications for REM systems for pelagic vessels. Again, this means that the fishing industry can tailor their operations to their business model. For example, if they have a quick turnaround in port, they may wish to upload data whilst at sea, whilst still meeting the mandatory deadlines for completing the data transfer.

Most, if not all, pelagic vessels will already have existing data systems in place onboard, for example, to provide broadband and television packages for crew members. Based on discussions with commercial suppliers to the fishing industry, it is our assumption that these existing packages can be adapted and utilised for the purposes of REM data transfer, at little or no additional cost.

The whole system costs can be broadly split into three categories: 1) the initial upfront cost of hardware (system and installation), 2) the recurring cost of data transfer and system software / licences, 3) the ongoing maintenance of hardware and replacement kit. It should be noted that these are estimates only.

Estimated costs of the REM system for a pelagic vessel (2023 prices)

- Estimated system cost: £6,590 - £13,070
- Estimated installation cost: £1,940 - £4,360
- Estimated installation cost – Data transfer: £0 - £2,470
- Estimated annual running cost – Maintenance: £1,210 - £3,270
- Estimated software licence cost: £310 - £420
- Estimated annual running cost – Data transfer: £700 - £2,000
- Estimated annual running cost – Data storage: £510 - £5,310

Summary of Costs

- Annual cost Year 1 and replacement years (excludes maintenance): £10,050 - £27,630
- Annual cost Year 2 onwards: £2,730 - £11,000

Notes:

- System cost, installation cost, and annual system maintenance cost figures were estimated from the EU REM technical guidelines²⁷ with 50% added to the maximum range to account for the additional cameras expected.
- Data transfer and storage costs were estimated based on non-public estimates provided by current and prospective REM system suppliers and public Starlink prices²⁸.
- Software licence costs were estimated from the scallop REM rollout.

²⁷ [Microsoft Word - REM Technical Guidelines and Minimum Requirements \(europa.eu\)](#)

²⁸ [Starlink Business | Maritime](#)

- Figures for REM systems were converted from Euro to GBP using the 2022 average exchange rate as published by the ONS²⁹ and were adjusted to 2023 prices from 2019 prices using the Treasury's September GDP deflator³⁰.
- Figures for data transfer and storage were in current (2023) GBP prices.
- The broad range for the cost of annual data storage reflects the fluctuation in business operating models and the expected variation between commercial providers.

System costs

The lifespan of the system is estimated to be on average 5 years in line with industry estimates, although systems can last a longer or shorter time depending on the quality of maintenance. For the purposes of the analysis, a full system repurchase is expected every 5 years, with the first update in year 6.

The system costs for the Scottish pelagic fleet are likely to be on the upper end of the cost range due to the size of these vessels meaning that extra cameras will be required in order for REM systems to meet the minimum standards set out in the technical specifications. However, this cost will vary by vessel according to vessel size and layout, and how they choose to automatically transfer data. The costs will also vary for non-Scottish vessels, again depending on size and layout of vessel and how they transfer data. Additionally, the maintenance costs may, in practice, be lower than estimated as pelagic vessels often have specialist engineers onboard and thus vessel owners may be able to reduce the costs of installation and maintenance through using this existing resource.

Data Transfer

Three different types of data are collected by the REM systems. The winch sensor and VPS data is required to be automatically uploaded to a data storage system in real time, whilst the vessel is at sea. The costs associated with the first two data types are expected to be minimal due to the low volume of data transferred and is expected to be absorbed either through existing vessels systems or through the REM system purchased.

The third data type is the camera data. Vessel owners have the option to begin uploading data whilst at sea or, where the fishing trip which the data relates to has been completed, to upload all of the data at sea. We anticipate many may do this by utilising existing broadband and data packages (although in some cases these may need to be upgraded). The potential need for upgrades is particularly relevant for vessels that have a large amount of data to upload (because of the trip length, particularly for freezer vessels) or fishers who wish to have a quick turnaround in port before recommencing fishing activity. Alternatively, vessels can choose to upload camera data when they return to port, provided that this is completed within a 5 working day window starting from the time of arriving in port. However, if a vessel starts a new fishing trip during that 5 working day window, then the data transfer must be completed immediately before the start of that new fishing trip.

²⁹ [Average Sterling exchange rate: Euro XUMAERS - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/economy/monetary-and-price/average-sterling-exchange-rate/euro-xumaers)

³⁰ [GDP deflators at market prices, and money GDP September 2023 \(Quarterly National Accounts\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/gdp-deflators-at-market-prices-and-money-gdp-september-2023-quarterly-national-accounts)

Providing that the deadline set out in the technical specifications for uploading the camera data is met, the choice regarding when to upload camera data remains with the vessel and will vary depending on their existing data capabilities and expected fishing activity.

Data should be uploaded to the data storage system and stored in an accessible format so that Scottish Ministers can access and download data as required for both science and compliance purposes. This cost is expected to be met by industry and is included in the annual running cost of the system.

Data Transfer costs

The cost to the vessels of transferring the data to the data storage system will range depending on access to port Wi-Fi, the vessel's own data package, or if the vessel has to upgrade to a new data package.

It is expected that many vessels will use a combination of existing satellite data packages and port internet services to transfer the required data. However, due to the lack of available data on the existing satellite data packages for the fleet and their current use it is not possible to say with certainty there will be no additional costs. As such it is assumed that where satellite internet is needed it would be purchased as an extra rather than utilising existing capacity.

Analysis of trip length and time spent in port between trips in the Scottish pelagic fleet suggests that between 2017 and 2022 some vessels have trips that would not have enough port time to use slow internet and so would need to utilise satellite internet while at sea or change their fishing patterns. It is estimated that a pelagic vessel would require, on average, satellite internet one month within a year to transfer/upload data.

Due to the high average value caught on each trip, it is much more likely vessels would opt to purchase satellite internet rather than remain in port for longer especially given the availability of single month packages. Furthermore, according to our data, almost all of the Scottish pelagic vessels would require satellite internet over a 5 year period, with each year seeing a different cohort of vessels not having sufficient port time to satisfy their upload requirements.

The cost of installing satellite internet on a vessel is estimated to be £2,470 as shown by Starlink, a service which provides monthly packages with a one-time installation cost. The running cost of satellite internet is estimated to be between £700-£2,000 per month depending on the data needs, using known values from current REM providers and satellite internet services. As such, the total annual cost is expected to range between £700-£2,000 per annum (the same as the per month cost with the assumption of a single month of data required per annum) with a first year additional cost of £2,470.

The costs to the non-Scottish fleet are assumed to be the same as those of the Scottish fleet due to the lack of available data on vessel patterns and current satellite internet capacities in these fleets.

Data Storage costs

Server storage is difficult to quantify as there are many factors that can affect cost. For example, cloud storage cost is typically measured not just as the absolute amount of space that is utilised, but also the amount of traffic it creates on the cloud providers network. So, the level of uploads, reads and writes, can influence the costs involved.

The estimates here are based on a number of assumptions based on analysis carried out using information from existing REM suppliers and includes a rolling storage consumption of either 2 or 6 terabytes (TB) (e.g. initially storage costs might in reality be lower until the capacity is reached and older data needs to be deleted), and a best estimate.

We have also estimated a broad range, with the actual costs likely to fall somewhere in between. The actual costs will depend on overall quantity of data, whether data is always available or combined with 'cold line' storage³¹ and only retrieved on request, and assumptions about how much data is accessed.

To create these cost estimates we have looked at several vendors known to be used by REM providers and other fisheries management agencies. Different vendors will have different costs, and final costs will be market driven. It is also likely that third party REM providers will have their own contracts with cloud storage providers, which means that the costs could well be lower for individual vessels as they may benefit from REM providers' existing packages.

In summary:

2 TB standard storage = £42-147/month

2 TB cold line storage = £35-52/month (+ £40-80 if data needs to be retrieved)

6 TB standard storage = £117-442/month

6 TB cold line storage = £58-156/month (+ £120-241 if data needs to be retrieved)

The cost of storage per vessel is likely, therefore, to be somewhere in the range of £510 - £5,310 per year.

6TB is likely to be the maximum storage needed annually. It will take time in the initial year for this capacity to be reached, if it is reached at all, as the level of data builds up. Data will need to be stored for up to 1 year, although there is provision for earlier deletion if authorised by the Scottish Government.

Payment of these costs

The pelagic industry will accrue benefits from the use of REM, notably enhanced reputation and consumer confidence by having a well regulated and monitored fishery. On this basis, and also based on the current profitability of the Scottish

³¹ 'cold line' storage is a data storage service which has lower storage costs but has limits on access with the expectation data would be stored without access or use for a prolonged period of time such as several months.

pelagic fishing fleet, it is the Scottish Government's position that the pelagic fleet is sufficiently well resourced to fund any REM technologies without the need for any public funding and that the payment of these costs should be met by the industry themselves. The maximum purchase and installation costs of REM (£27,630 maximum per vessel) are estimated to be less than 1% of the average UK's pelagic vessel's annual net profit (£3.8 million average net profit for UK vessels between 2016-2019).

Pelagic vessels will be responsible for all costs associated with sourcing, purchasing, installing and maintaining REM systems (including data transmission and storage costs and costs for Scottish Ministers' access to the data storage system) which meet the requirements set out in the system specification.

Cost of additional penalties

As explored above, it should be stressed that Scottish Government seeks to use this policy to encourage compliance with sea fisheries legislation and to deter non-compliant fishing activity. If fishers comply with all of the legal duties and obligations which apply to pelagic fishing activity, then an REM system will not identify any breaches of legislation. This policy will ensure existing compliance efforts are supplemented with REM data, but otherwise will continue as at present. As such, there should be no extra enforcement penalty costs to fishers except to those who are not currently complying with applicable legal obligations. These have not been estimated as the current compliance status of each vessel is unknown.

Public sector costs: Enforcement costs

To supplement existing Marine Directorate Compliance efforts, the REM system will be able to detect non-compliance, while its very presence may deter it in the first instance. Government officials will continue to deal with non-compliance appropriately and proportionately if it occurs.

REM systems will also be applied to non-Scottish vessels fishing in Scottish waters.

While there are additional costs associated with expanding the team reviewing REM data, these are to be balanced internally from the other compliance efforts so there will be no overall additional cost. This is achieved through taking a risk based approach to resourcing different compliance and detection activities. There may be an impact on other operational priorities, particularly during pelagic fishing seasons, as resources are focussed on REM analysis and enforcement. There may be some minimal costs associated with purchasing specialised software for analysis or server storage for downloaded data. These costs are expected to be absorbed through existing budgets and are estimated to range between £4,000 - £30,000 annually.

Public sector costs: Science costs

There would be a need to expand the team reviewing the REM data for scientific reasons particularly to review bycatch and interactions with protected, endangered and threatened species. These extra costs are estimated to be £80,000 in the first two years and then £40,000 in subsequent years (in 2023 prices).

Summary of Costs

Non-Monetised – Option 1: Do nothing

1. No additional direct costs for the fishing industry or public purse.
2. Indirect costs continuing practices of illegal discarding which can result in higher stock mortality than expected with the knock on effect on future fishing productivity.
3. Possible loss of competitive position and reduction in price received in future. Estimated up to £2.7m cost to the industry for every 1% drop in pelagic fish price.

Non-Monetised – Option 2: REM

1. There are no major costs expected which are not monetised below.

Monetised – Option 1: Do nothing

1. None

Monetised – Option 2: REM

1. Cost of REM systems per vessel ranges between £10,050 - £27,630 in the first and sixth year and between £2,730 - £11,000 each other year. With 21 vessels in the Scottish pelagic fleet the total cost to the Scottish fleet is expected to range between £211,050 - £580,230 for the Scottish Pelagic fleet in the first and sixth year and between £57,330 - £231,000 and for the Scottish Pelagic fleet each other year. The costs in the first and sixth years are likely to be on the upper end of the range due to the large size of the Scottish vessels meaning 8 to 12 camera systems may be required.
2. Between 2018-2021 there is an estimated 39 pelagic vessels fishing in Scottish waters from the rest of the UK or from foreign countries. The estimated total cost for this fleet is expected to range between £391,950-£1,077,570 in the first and sixth year and £106,470-£429,000 for each other year.
3. Enforcement system costs ranging from £4,000-£30,000 in total. With these costs borne by the Scottish Government. The cost to the non-Scottish fleet are assumed to be the same as those of the Scottish fleet due to the lack of available data on vessel patterns and current satellite capabilities in these fleets.
4. Scottish Government Marine Directorate's Science, Evidence, Data and Digital Portfolio support costs estimated to be around £80,000 in the first two years and then around £40,000 thereafter. With these costs borne by the Scottish Government.

Regulatory and EU Alignment Impacts

Intra-UK trade

No impact. There is no expected impact on intra-UK trade as this will only impact the act of fishing in Scottish waters (or, for Scottish vessels, the act of fishing in any waters) and will not have any effect on downstream purchases or sales. We have engaged with other UK fisheries administrations in relation to SSI, to ensure that are informed and aware of the impacts on non-Scottish UK vessels.

International Trade

Limited/No impact. This policy should have no impact on imports or exports of goods or services, nor on the trade flows between countries. Domestic and foreign businesses will be impacted in the same way within Scottish waters but only Scottish vessels will be subject to REM requirements outwith Scottish waters. This position is not expected to confer any advantage to domestic or foreign businesses due to the low cost of the system relative to the average annual net profits of Scottish pelagic vessels (<1%).

Non-Scottish vessels may be reluctant to use REM and this may impact on the overall attractiveness of pursuing fishing opportunities in the Scottish zone. However, these impacts are thought to be minimal or short-lived given the general direction of travel by other Coastal States (particularly the EU) towards the mandatory use of REM within their waters.

EU Alignment

The EU is taking steps to consider a role for REM in certain fisheries in the future as part of their wider review of the control and enforcement regulation³². The SSI will advance the standards shared with the EU, creating a temporary period of divergence while it progresses its own development of REM. We have undertaken engagement and consultation with the EU on this REM policy and development of the SSI and are also seeking to share our learning from its development internationally, including with the EU.

Scottish Firms Impact Test

This section has been informed by evidence gathered during the consultation phase.

The UK's fleet of 27 pelagic trawler vessels over 40 metre has been consistently profitable, with data from the STECF³³ showing this fleet making net profits exceeded 30% every year save one between 2014-2019. Net profit per UK Pelagic vessel has often been over £4 million per annum between 2016-2019 as shown by the STECF data. As the majority of the UK fleet consists of Scottish vessels³⁴, it is expected that the cost of installing and maintaining the REM device (see costs section) will have only a marginal impact on the profits of the subjected businesses.

³² "Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy (OJ L 343, 22.12.2009, p. 1–50)

³³ [STECF 22-06 - EU Fleet Economic and Transversal data_fleet segment.xlsx - Economic and Social Analyses - European Commission \(europa.eu\)](#)

³⁴ No public data available specifically for the Scottish fleet

The total cost is expected to range between £10,050-£27,630 per vessel in the first year, affecting 21 vessels (2022 figure³⁵), and £2,730-£11,000 per vessel each year thereafter. With the average revenue per Scottish pelagic vessel estimated to be £13 million in 2022³⁶ and using the lower estimate of 30% net profit we arrive at a per vessel profit of £3.9 million per annum, where the REM costs per vessel represent less than 1% of net profits.

As a result, the introduction of mandatory REM requirements to the Scottish Pelagic fleet is not expected to materially impact their businesses and is not expected to have impacts for the further supply chain.

Competition Assessment

The introduction of REM on a level playing field basis in relation to pelagic fishing activity within the Scottish zone will ensure Scottish pelagic boats are not out-competed by non-Scottish vessels not having the same requirement when fishing in Scottish waters.

With the reputation of Scottish pelagic seafood expected to be enhanced as a result of demonstrating compliance with sea fisheries legislation such as the landing obligation (bringing these products more in line with public demand), this is anticipated to make the competitiveness of these products more favourable compared with substitute goods.

It should be noted that there could be some advantage gained by the non-Scottish pelagic fleets if their respective national governments choose to fund some or all of the costs of the REM systems. However, there is no guarantee that any third country governments will offer any funding to affected vessels within their pelagic fleet and, given the relative cost of the system against the turnover (<1%) and profits (<1%) of these businesses, any funding which was offered to third country pelagic vessels is anticipated to have only a negligible impact on overall competitiveness, with all vessels still required to operate and maintain the system, regardless of who funds it.

Furthermore, the requirement on Scottish Pelagic vessels to operate an REM system outside of Scottish waters should not impact on their competitiveness due to the low value of the fisheries caught outside of Scottish waters (~10% of total landed value as evidenced by Marine Directorate management data) and the fixed cost nature of the system meaning that the extra cost of running the system while fishing outside of Scottish waters is negligible.

Competition Filter Questions

Will the proposal directly limit the number or range of suppliers? E.g. will it award exclusive rights to a supplier or create closed procurement or licensing programmes?

³⁵ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/sea-fisheries-statistics-2022/pages/10-introduction.aspx)

³⁶ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/sea-fisheries-statistics-2022/pages/10-introduction.aspx)

No. Any supplier with the capabilities to supply REM systems which meet the technical specifications for REM systems for pelagic vessels (which will be published by the Scottish Ministers) will be able to do so.

Will the proposal indirectly limit the number or range of suppliers? E.g. will it raise costs to smaller entrants relative to larger existing suppliers?

Limited / No Impact. The proposal is not anticipated to limit the ability of any supplier to provide REM systems, regardless of size or existing business provision.

Scale should not affect the competitiveness of larger suppliers over smaller. The only consideration will be whether an REM system meets the minimum standards set out in the technical specifications.

Will the proposal limit the ability of suppliers to compete? e.g. will it reduce the channels suppliers can use or geographic area they can operate in?

Limited / No Impact. Introduction of REM will not directly affect firms' routes to market or the geographical markets they can sell into.

Will the proposal reduce suppliers' incentives to compete vigorously? e.g. will it encourage or enable the exchange of information on prices, costs, sales or outputs between suppliers?

No. Introduction of REM is not expected to reduce suppliers' incentives to compete vigorously.

Consumer Assessment

The consumer in this is considered to be those who purchase the fish from the pelagic fleet. It is not expected the consumer will be impacted, in terms of the price paid by consumers for pelagic fish, as the cost to the pelagic fishing industry is expected to be negligible (<1%). However, it is expected to improve consumer confidence in the sustainability of the product they are purchasing.

Consumers could also be considered the pelagic vessel owners – the impacts on this group of people are considered throughout this BRIA.

Test run of business forms

No business forms have yet been produced, however, we will undertake a test run to ensure ease of use once forms are ready.

Digital Impact Test

Digital Impact Test Filter Questions

Does the measure take account of changing digital technologies and markets?

Yes. This is working with industry to move to a new and increasingly mature digital technology through remote electronic monitoring with the possibility of increased use of ML to review the footage from cameras forming part of REM systems. Drafting of the SSI and the accompanying technical specifications has taken account of the need to future proof the requirements to allow for future digital developments.

Will the measure be applicable in a digital/online context?

Yes. REM data will be uploaded, accessed, and processed digitally.

Is there a possibility the measures could be circumvented by digital / online transactions?

No. There are no transactions in this process.

Alternatively will the measure only be applicable in a digital context and therefore may have an adverse impact on traditional or offline businesses?

No. The REM process contains a mix of traditional offline processes e.g. the installation and operation of physical hardware and digital processes (the capture, transmission, storage and analysis of digital REM data).

If the measure can be applied in an offline and online environment will this in itself have any adverse impact on incumbent operators?

No. REM systems are likely to be supplied and operated by a mix of existing suppliers, and new suppliers, with no restrictions in place as long as the technical and operational requirements of the legislation are met.

Legal Aid Impact Test

Individual vessel masters could require access to legal aid if prosecuted for an offence under the REM SSI.

Enforcement, sanctions and monitoring

This policy will provide a new, enhanced method of enforcing compliance with existing legislation regulating sea fishing activity. Penalties will be applied in instances of non-compliance in line with existing sea fisheries offences.

Where a breach of fisheries regulations has been detected, it will be reported as appropriate to the prosecuting authorities. This can result in either a Fixed Penalty Notice of up to £10,000, or a fine of up to £50,000 on summary conviction, or a fine on conviction on indictment.

The Scottish Government will review the data recorded by REM systems in order to check compliance with legislation regulating sea fishing activity. The frequency of review will be risk based.

The Scottish Government will remain the relevant competent authority with responsibility for scientific studies, compliance, monitoring and enforcement of the requirement to have a compliant REM system on board.

Implementation and delivery plan

Consultation timescales

The consultation on REM, ran between March 2022 and June 2022. Consultation analysis was published on 14 August 2023.

Preparation of draft legislation

The draft REM SSI will be laid before the Scottish Parliament on 22 March 2024. The pelagic 6 month preparatory period will come into force on 7 September 2025 and the main pelagic REM regime will come in to force in on 7 March 2026.

Post-implementation Review

The intention is to maintain regular scrutiny of the policy,

Summary and recommendation

Option 2, introduction of a legislative requirement for REM on relevant pelagic vessels is the recommended option.

As explored in detail above, this policy is consistent with the strategic context and outcomes of the Fisheries Management strategy³⁷, namely:

- Overarching principles of sustainability – the policy will deliver full accountability of catch from the pelagic fishing sector, allowing for long term sustainability and growth.
- Environmental outcomes – further from the above, the policy will allow for more accurate calculation of catches, based on certainty that the amount of fish being extracted is known and accurate.
- Economic outcomes – thorough management of this fishery will ensure it remains productive and resilient, allowing for long term economic growth.
- Ensuring high levels of compliance can safeguard the health of fish stocks which in turn reflects in sustainability and potential long term growth in the industry. Additionally, signalling sustainable fishing practices is anticipated to value to the landed product and maintain international competitiveness.
- Social outcomes – further from above, as the policy supports the sustainable growth of this fishery, the wider benefits that flow from this industry are expected to be realised in the communities which the workforce and processing facilities are drawn from.

Option 1

Total benefit per annum (2023 prices): Non-Monetised

- No change to existing practices.

³⁷ [Future fisheries: management strategy - 2020 to 2030 - gov.scot \(www.gov.scot\)](https://www.gov.scot/resources/documents/2020/09/Future_fisheries_management_strategy_-_2020_to_2030.pdf)

Total cost per annum (2023 prices): Non-Monetised

- No additional costs for the fishing industry or public purse.
- Indirect costs continuing practices of illegal discarding which can result in higher stock mortality than expected with the knock on effect on future fishing productivity.

Option 2

Total benefit per annum (2023 prices): Non-Monetised

- Potential reduction in discarding/unlawful practices due to increased compliance – leading to improved health of fish stocks, in turn improving catch yields and future economic gains.
- Increased quantity and accuracy of data for science and compliance assessments.
- Marine ecosystem benefits including enhanced sustainability of fishing practices.
- Helping establish the tools and training data sets required for ML through collected data to further improve the capabilities of REM.
- Savings in data collection compared to traditional methods and possible future savings in compliance and science data collection.
- Fishing accountability and increased consumer confidence. Improved reputation for Scottish catch, potential improvement in competitiveness of the product and improved access to markets. Monetised benefit to the industry could be up to £2.7m for every 1% increase in price.

Total benefit per annum (2023 prices): Monetised

- There is no figure for total monetised benefits for REM due to the uncertainty in this new scheme.

Total cost per annum (2023 prices): Non-Monetised

- There are no major costs expected which were not monetised below.

Total cost per annum (2023 prices): Monetised

- Cost of REM systems per vessel ranges between £10,050-£27,630 in the first and sixth year and between £2,730-£11,000 each other year.
- With 21 vessels in the Scottish pelagic fleet the total cost to the Scottish fleet is expected to range between £211,050-£580,230 for the Scottish Pelagic fleet in the first and sixth year and between £57,330-£231,000 for the Scottish Pelagic fleet each other year. The costs in the first and sixth years are likely to be on the upper end of the range due to the large size of the Scottish vessels meaning 4 to 12 camera systems may be required.
- Between 2018-2021 there were an estimated 39 pelagic vessels fishing in Scottish waters from the rest of the UK or from foreign countries. The estimated cost for this fleet is expected to range between £391,950-£1,077,570 in the first and sixth year and £106,470-£429,000 for each other year.
- Enforcement system costs ranging from £4,000-£30,000 in total. With these costs borne by the Scottish Government.

- Scottish Government science support costs estimated to be around £80,000 in the first two years and then around £40,000 thereafter. With these costs borne by the Scottish Government.

Summary of monetised costs of each option

Option 1

- Year 1: £0
- Year 2: £0
- Year 3: £0
- 10 Year total: £0

Option 2 – Minimum of Range

- Year 1: £687,000
- Year 2: £239,420
- Year 3: £193,984
- 10 Year total: £2,676,319

Option 2 – Maximum of Range

- Year 1: £1,767,800
- Year 2: £743,961
- Year 3: £681,463
- 10 Year total: £8,200,179

Note: Figures have had a 3.5% discount rate applied in line with the [Treasury Green Book](#).

Declaration and publication

I have read the Business and Regulatory Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs. I am satisfied that business impact has been assessed with the support of businesses in Scotland.

Signed: Mairi Gougeon

Cabinet Secretary for Rural Affairs, Land Reform and Islands

Date: 20.03.2024

Scottish Government Contact point: inshore@gov.scot

Business and Regulatory Impact Assessment

Title of Proposal

Remote Electronic Monitoring (REM) on scallop dredge vessels in Scottish waters and Scottish scallop dredge vessels wherever they fish.

Purpose and intended effect

Background

In accordance with articles 4(b) and 6 of the Regulation of Scallop Fishing (Scotland) Order 2017 (SSI 2017/127)³⁸ (The 2017 Order), around 20 British registered fishing vessels which dredge for King Scallops financed the on-board installation of an REM system so that they can deploy 10 dredges per side in the 6-12 nautical mile area within the Scottish zone. The Scottish Government uses the REM data generated to validate that the number of dredges deployed do not exceed statutory limits by use of:

- (i) spatial data (i.e. where and when a vessel is fishing); and
- (ii) imagery from cameras (to monitor the number of dredges deployed).

Following the installation by the original 20 vessels the wider Scottish scallop dredge sector acknowledged the value of using REM in demonstrating responsible fishing practices, optimising co-existence with other marine users and improved spatial data of their fishing activities. Positive dialogue with the Scottish Government led to the majority of the active Scottish sector adopting fully funded³⁹ REM systems (including vessel positioning system (VPS), winch sensors and camera imagery) on a voluntary basis. This programme of work was initially hampered by the pandemic, with the majority of installations taking place 2021 - 2023.

The Scottish Government's Fisheries Management Strategy⁴⁰ 2020-2030 (FFM) sets out our policy initiatives to protect the environment, and support a strong, sustainable and resilient fishing industry. A key part of the Strategy is to improve accountability and confidence in seafood products and fishing operations, supported by a robust compliance regime, by using existing and emerging technology, including REM, to deliver compliance and improve our knowledge base, ensuring that our decisions are grounded in the best available scientific advice and that we fish within sustainable limits. As part of that commitment, legislation is being introduced that will mandate the use of REM on all scallop dredge vessels fishing for any species of scallop in Scottish waters (creating a level playing field) and for Scottish vessels within that category wherever they operate.

Scallop dredge vessels operational in the Scottish zone in 2022 comprised 68% Scottish registered vessels, 32% other UK registered vessels, and no vessels from beyond the UK. These proportions are fairly consistent from 2018-2022.

³⁸ [The Regulation of Scallop Fishing \(Scotland\) Order 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ssi/2017/127)

³⁹ European Maritime and Fisheries Fund (EMFF)

⁴⁰ [Future fisheries: management strategy - 2020 to 2030 - gov.scot \(www.gov.scot\)](https://www.gov.scot/future-fisheries-management-strategy-2020-to-2030)

The UK had 237 active scallop dredge vessels in 2021 with an average estimated operating profit as seen in the Seafish Economic data⁴¹ of approximately £41,700 per vessel in expected 2023 prices.⁴² The estimated operating profit for the fleet was therefore £9.9 million in 2021 in expected 2023 prices. Provisional data for 2022 suggests that the operating profit has fallen to £30,300 per vessel in expected 2023 prices with the fleet losing 8 vessels also. Profits for the UK Scallop dredge fleet have been flat or decreasing over the last decade as seen in the Seafish Economic data with costs rising faster than the value of catch. This has resulted in a long term decrease in the number of vessels in the sector.

Analysis of the scallop fleet's profitability using Seafish data⁴³ shows substantial variability in profitability each year. Taking a 5 year average of scallop profits from 2017-2021 (the last year of complete data) indicates an average net profit of £10,700 for the under 15 metre fleet and £33,900 for the over 15 metre fleet in expected 2023 prices.

Landings by Scottish registered vessels represented 59% of total UK scallop and queen scallop landings by weight and 58% by value in 2022.

Objective

To deliver confidence and accountability in the activities of fishing vessels at-sea, to ensure compliance with key legislation, such as that governing Marine Protected Areas (MPAs) and gear restrictions, and to enhance the reputation of Scottish fisheries and their management.

This could be achieved by introducing measures that prohibit any vessel undertaking scallop dredge operations in the Scottish zone unless a functional REM device is installed on-board and prohibiting Scottish scallop dredge vessels from undertaking scallop dredge operations without a functional REM system installed on board, regardless of fishing location. Following introduction of the policy, REM data – including positional data, winch sensor data, electronic monitoring images and video – will be provided to, and reviewed by, Scottish Ministers to ensure that gear restrictions and spatial management measures are respected.

High-quality monitoring across the scallop dredge fleet will provide high resolution spatial data and will strengthen accountability, producing the evidence base required to ensure dredging activity is compliant with legislative rules and regulations.

- 1) To deter non-compliance with fisheries and environmental protection legislation and enhance the Scottish Government's enforcement capabilities by increasing the data available to assess scallop dredge vessel compliance. The REM camera function in particular provides an effective enforcement solution by monitoring compliance with legislative rules and regulations when vessels are at sea, specifically:
 - to validate that the number of dredges deployed at sea do not exceed statutory limits; and,

⁴¹ Operating profit: the difference between total income and operating costs.

⁴² Economics of the UK Fishing Fleet by Seafish - [Fleet Enquiry Tool | Tableau Public | Seafish](#)

⁴³ Economics of the UK Fishing Fleet by Seafish - [Fleet Enquiry Tool | Tableau Public](#)

- to function as a corroborative tool to prove (or disprove) fishing activity on location, for example when in close proximity to a restricted area, ensuring compliance with marine protection legislation.
- 2) Widening the use of REM will support and enhance the reputation of Scottish seafood, by providing a demonstration of compliance by scallop dredge vessels and offering confidence and accountability to consumers and retailers that dredging is being undertaken in accordance with the rules set.
 - 3) Generate high resolution spatial data to provide a greater insight into where fishing operations take place and improve the evidence base on which decisions are taken by the Scottish Government and other relevant public authorities.

REM also supports the delivery of two of the National Performance outcomes contained within the Scottish Government's National Performance Framework. These are:

Economy – we have a globally competitive, entrepreneurial, inclusive and sustainable economy, and Environment – we value, enjoy, protect and enhance our environment.

It does this by ensuring the fishing industry remains competitive in an international context by enhancing the sustainability and transparency of fishing operations, by ensuring that legislation intended to protect the marine environment and fish stocks is complied with, and by enhancing the evidence base from which the Scottish Government makes decisions regarding the marine environment.

Rationale for Government intervention

The scallop dredge method of fishing for scallops can have a significant effect on the seabed if the method is not managed effectively, and large negative impacts on protected marine features if fishing is undertaken in certain areas. There are spatial management measures in place to restrict where scallop dredge activity can take place but there are challenges in enforcing those restrictions due to evidential gaps (ie. the requirement to prove that fishing activity has taken place). The Marine Directorate of the Scottish Government fully investigates all reports of suspected illegal scallop dredging, based on the extent that the evidence allows and appropriate action is taken where necessary. REM will improve the Scottish Government's control and enforcement tools, providing enforcement officers with the ability to independently monitor at sea operations, and with data to prove or disprove any allegations of illegal fishing.

The mere presence of a fishing vessel in a MPA does not, in and of itself, mean a law has been broken. Vessels may transit through and may fish these areas, providing they do not undertake activities, including certain fishing activities, which are prohibited within the MPA in question (by virtue of management measures contained in a Marine Conservation Order applying to that MPA), which can include certain fishing activities, and that they comply with any restrictions which apply within the MPA, for example, that gear of specified kinds is lashed and stowed.

Different activities are prohibited and regulated in different MPAs⁴⁴ and so activity which is illegal in one, on the basis that it is prohibited within an MPA, might be legal in another. Existing legislation (Marine Conservation Orders) prohibits the deployment or use of scallop dredge gear within specified locations, either for all or part of the year. Within certain MPAs there are limited exemptions to prohibitions on deploying fishing gear, for example, in certain MPAs, certain types of gear can be deployed for scientific research purposes where a permit has been issued by the Scottish Ministers. This section is not intended to provide a comprehensive account of the legal framework regulating sea fishing activity within MPAs. For more detailed information, see information on MPAs on gov.scot.⁴⁵ REM will deliver confidence that fishers are complying with the rules and regulations which are in place to govern scallop dredging activity, and to supplement existing enforcement tools. This has the further co-benefit of supporting the industry in proving it is complying with the law and operating a clean fishery, helping to counteract much of the negative press this sector has received.

The vast majority of the active Scottish scallop dredge fleet already carry REM systems. Most currently do so on a voluntary basis, although there is currently no requirement to have the system turned on where REM systems are being carried voluntarily. The REM legislation will mandate that active REM systems must be installed and operated on all scallop dredge vessels fishing for any species of scallop in the Scottish zone and on all such Scottish vessels wherever they operate.

UK vessels and vessels fishing in UK waters with a length of 12 meters or greater are required (subject to limited exemptions) to have a functioning satellite tracker (VMS) installed on-board⁴⁶ which transmits the boats' positional data to a satellite and then sends it to a national or international body that monitors vessels' position, course, speed and other parameters. In general VMS pings are received every 2 hours. The EU also operates a VMS regime in relation to EU vessels and for vessels fishing in EU waters. In comparison, REM systems can report vessel positions at 10 second intervals. The availability of REM data for all scallop dredge vessels in Scottish waters, and Scottish scallop dredge vessels wherever they fish, will therefore be an improvement on the 2 hourly VMS reports and provide spatially rich data of all fishing activity. Such data is valuable in a range of circumstances, in particular it will provide a more detailed profile of Scotland's scallop fishery, to aid and improve management measures, and improving the evidence base on which decisions are taken by the Scottish Government (for example the provision of scientific advice and in a marine planning context). In addition it will assist fishers in providing factual evidence of their activities during marine planning processes and has the potential to generate market benefits through the likes of accreditation schemes.

With the above objectives in mind, intervention through legislation is assessed to be the most effective method of effectively delivering mandatory REM requirements, and REM is assessed as being the most effective method of delivering the objectives identified.

⁴⁴ [Marine Protected Areas \(MPAs\) - Marine environment - gov.scot \(www.gov.scot\)](http://www.gov.scot/Topics/marine/protected-areas)

⁴⁵ [Marine Protected Areas \(MPAs\) - Marine environment - gov.scot \(www.gov.scot\)](http://www.gov.scot/Topics/marine/protected-areas)

⁴⁶ Article 9 of the assimilated Control Regulation 1224/2009 (EUR 2009/1224) and the Chapter IV (Articles 18 to 27) of the assimilated Commission Implementing Regulation 404/2011 (EUR 2011/404)

Consultation

Within Government

Consultation has been undertaken with officials within the Marine Directorate of the Scottish Government, including policy, compliance and science experts and marine analysts/economists.

Within the UK we have also engaged with DEFRA, the Marine Management Organisation (MMO), the Welsh Government and Northern Ireland Executive on overlapping areas of interest. In an international context we have engaged with the EU, Norway and other Coastal State partners on our REM policies.

Under the terms of the Trade and Cooperation Agreement between the UK and EU, a formal notification will be made to the Specialised Committee on Fisheries.

Public Consultation

A full public consultation⁴⁷ on the use of REM took place from 15 March to 7 June 2022. The consultation sought views on the implementation, impact and general principles of the use of REM in the pelagic sector.

Responses to the consultation were mixed between individuals and organisations, and between environmental / conservation groups and fisheries organisations and have proved helpful in providing stakeholder views on a number of key questions. In total the consultation received 48 valid responses.

We published our analysis report⁴⁸ of the responses to the REM consultation in August 2023.

Specific feedback received as part of the consultation has been used to shape the policy further, including (but not limited to) the following topics:

- **Consistent REM monitoring and enforcement**
Some respondents asked for consistency of REM monitoring and enforcement across fisheries administrations, with data sharing arrangements in place as necessary.

The Scottish Government officials have been considering relevant matters, including REM interoperability with officials from DEFRA, the Marine Management Organisation (MMO), the Welsh Government and the Northern Ireland Executive

⁴⁷ [Marine resources - ensuring long term sustainability: remote electronic monitoring \(REM\) consultation - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/)

⁴⁸ <https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/>

- **Number of cameras required**

A number of respondents suggested that the number of digital cameras required on a scallop dredge boat could usefully be increased to realise the full benefits of REM. For example additional cameras to monitor catch composition and discards. The Scottish Government response recognised this ambition but was clear that it had to be tempered with realistic expectations of what the technology can currently deliver, along with what and how data can be analysed considering different working environments onboard fishing vessels. The technical specifications which Scottish Ministers will publish under the REM legislation specify what needs to be captured in the field of view of the digital camera(s) forming part of an REM system and requires each vessel to carry a minimum of one digital camera. In practice and based on experience gained through the voluntary REM scheme, the vast majority of vessels will be required to carry two digital cameras in order to meet the field of view requirements of the scallops REM system technical specifications.

The Scottish Government published its response report⁴⁹ on the REM consultation in August 2023.

Business

Views on REM were sought as part of the National Discussion Paper on Future Fisheries Management (FFM)⁵⁰, which was published in March 2019. Businesses were also able to respond to the specific REM consultation held in 2022.

During the voluntary rollout of REM to the active Scottish scallop dredge fleet, the Scottish Scallop Sector Working Group (SSSWG) acted as a consultative forum to inform future policy development and discuss national issues facing the sector. The group represented scallop interests in Scotland. Membership (with dredge, dive and processing interests) included fishing association representatives, frontline fishers/businesses and Regional Inshore Fisheries Groups. SSSWG was disbanded in 2023 whilst the Fisheries Management and Conservation (FMAC) group was brought into a more strategic space to help delivery of the FFM Strategy and the key policies and actions within it. FMAC now operates as a 'hub and spoke' model, supplemented by a number of technical and issue specific subgroups, including a scallop sub group which has been engaged on REM developments.

We have engaged with developers of REM systems to ensure that current REM technology is capable of meeting the 'technical specification' minimum standards which the SSI will require REM systems installed on board scallop dredge boats to meet.

Options

Option 1: Do nothing

⁴⁹ [Supporting documents - SG Response to Consultation: Marine Resources – Ensuring Long Term Sustainability: Remote Electronic Monitoring \(REM\) - gov.scot \(www.gov.scot\)](#)

⁵⁰ [Future fisheries management - discussion paper: analysis - gov.scot \(www.gov.scot\)](#)

This would maintain the current monitoring arrangements for the Scottish scallop fishery. A number of vessels (group 1 below) fishing for king scallops in parts of the Scottish zone would be required to have an REM system (comprising fully functioning cameras, winch sensors and a VPS device onboard) in order to benefit from the dispensation provided in the 2017 Order (to use 10 dredges per side in the 6-12 nautical mile zone), however for the majority of vessels uptake would be voluntary.

Option 2: Introduction of legislative requirement for REM on relevant scallop boats

This option involves introducing legislation which requires REM systems to be installed and operated onboard all scallop dredge vessels fishing for any species of scallop within the Scottish zone and all Scottish fishing boats that deploy scallop dredges outwith the Scottish zone for this purpose. Affected vessels will be required to have a system comprising fully a functioning camera (or, depending on the vessel size and layout, cameras), winch sensors and a Vessel Positioning System (VPS) device onboard.

Sectors and groups affected

The following sectors have been identified as groups who will be affected by the proposal:

- Scottish scallop fishing industry - vessels that do not already have REM installed or are not mandated to operate it.
- Wider UK and International scallop fishing industry operating in Scottish waters.
- REM suppliers.
- Engineers (i.e. those that install and maintain REM systems).
- Internal Scottish Government, in particular Marine Directorate enforcement officers and spatial data analysts.
- Courts and the Crown Office and Procurator Fiscal Service – if criminal prosecutions are pursued.

Benefits

Option 1: Do nothing

Fishing vessels would be able to continue to dredge for scallops in the Scottish zone as per the existing Scottish sea fisheries legislation with no new restrictions.

Option 2: Introduction of legislative requirement for REM on all scallop dredge vessels fishing in Scottish waters and all Scottish scallop dredge vessels fishing outwith Scottish waters

At a basic level, the REM technology on scallop dredge vessels operating in the Scottish zone will:

- provide high spatial resolution positional data to identify where/when a vessel is fishing;
- provide video footage to verify the number of dredges deployed and to act as a corroborative tool in determining when fishing activity is being carried out; and
- provide the duration (time taken and distance covered) of tows.

Data that identifies where, when and for how long a vessel is fishing will provide a more detailed profile of Scotland's scallop fishery, to aid and improve management measures, to act as a tool to deter and detect any non-compliant activity, improve the evidence base on which decisions are taken by the Scottish Government and relevant public authorities (for example the provision of scientific advice and in a marine spatial planning context) and help sustain this important industry for coastal communities.

Scotland's marine environment is increasingly in demand, by a variety of sectors who want to utilise the resource. REM data will help address the challenges this poses by enhancing the fisheries evidence base and enabling improved interaction between the fishing industry and other marine users. The data can be used by fishers to effectively demonstrate their activities during marine planning processes or to derive market benefits through the likes of accreditation schemes, which could in turn improve the competitiveness of the product. This confidence in sustainability has also been noted in the significant price premium that MSC certification can convey (5-25% for different fish^{51,52,53}) with REM expected to help build the scallop fleet's credentials with a possible increase in value to fishers as a result. While these price changes are difficult to quantify, even a small consistent price increase could see a significant change. With every 1% increase in the price of scallops benefitting Scottish fishers to the tune of around £332,000 based on the total value of landings in 2022⁵⁴, similar to the higher expected costs of the REM system.

The risk based review of camera footage validates that a vessel is not exceeding prescribed dredge numbers in inshore waters and is also a corroborative tool to prove (or disprove) fishing activity on location, providing confidence and accountability in their operations. This could enhance the scallop industry's abilities to demonstrate accountability in our fishing practices, to deliver confidence that fishers are complying with the rules and regulations which are in place governing scallop dredging, and to supplement our existing enforcement tools used as part of our world-class compliance system. Over time, with further development of tools such as machine learning (ML), REM could be used in place of existing methods allowing efficiencies in fisheries compliance activities. These compliance benefits have not been monetised given the use of REM has, up until this point, not been widespread.

REM technology offers a range of scientific benefits such as providing enhanced spatial information and thus enabling an improved understanding of the interactions

⁵¹ [New survey sees seafood consumers placing sustainability before price and brand | SeafoodSource](#)

⁵² [Evidence of price premium for MSC-certified products at fishers' level: The case of the artisanal fleet of common octopus from Asturias \(Spain\) - ScienceDirect](#)

⁵³ [Price premiums for ecolabelled seafood: MSC certification in Germany - Asche - 2017 - Australian Journal of Agricultural and Resource Economics - Wiley Online Library](#)

⁵⁴ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](#)

between the scallop fishing industry and other marine users. If used on a large scale, and as more tools are developed and implemented such as ML, REM data streams can be integrated with existing data collection programmes to support stock assessments, with data derived for one purpose often having utility to support other scientific research interests. The benefit of this additional data and the resulting benefit of enhanced scientific research and advice has not been monetised due to the fact that, up until now, the use of REM has not been widespread and the fact that there is a lack of international examples to draw on.

Summary of Benefits

Non-Monetised – Option 1: Do nothing

1. No additional cost pressures for the fishing industry

Non-Monetised – Option 2: REM

1. Enhanced spatial data on the location of scallop fishing effort to inform the scientific evidence base for decision making, with possible future stock assessment improvements as technology advances.
2. Potential reduction in damage to protected areas due to increased compliance – leading to improved biodiversity.
3. Helping establish the tools and train AI through collected data to further improve the capabilities of REM.
4. Fishing accountability and increased consumer confidence improved reputation for Scottish catch, potential improvement in competitiveness of the product and improved access to markets. Monetised benefit is estimated to be £332,000 for every 1% increase in price.

Costs

Option 1: Do nothing

This option requires maintaining available compliance tools at existing levels and will, therefore, provide no additional means with which to address reports made to the Scottish Government of suspected illegal scallop dredging in MPAs or other closed areas.

In recent years markets and consumers have become increasingly focussed on sustainability, traceability and accountability. This confidence in sustainability has also been noted in the significant price premium that MSC certification can convey (5-25% for different fish^{55,56,57}). By maintaining the current monitoring arrangements, the product could potentially become less attractive to consumers and could potentially result in lower prices or, in the extreme, loss of markets if other scallop fleets adopt and demonstrate higher accreditation through REM. For every 1%

⁵⁵ [New survey sees seafood consumers placing sustainability before price and brand | SeafoodSource](#)

⁵⁶ [Evidence of price premium for MSC-certified products at fishers' level: The case of the artisanal fleet of common octopus from Asturias \(Spain\) - ScienceDirect](#)

⁵⁷ [Price premiums for ecolabelled seafood: MSC certification in Germany - Asche - 2017 - Australian Journal of Agricultural and Resource Economics - Wiley Online Library](#)

decrease in the price of scallops the cost to Scottish fishers is estimated to be around £332,000 based on the total value of landings in 2022⁵⁸. As Option 1 is the baseline case no cost has been monetised for this, instead these are identified as possible risks.

Option 2: Introduction of legislative requirement for REM on all scallop dredge vessels fishing in Scottish waters and all Scottish scallop dredge vessels fishing outwith Scottish waters

Voluntary REM installations on active Scottish registered scallop dredge vessels benefited from contributions from the European Maritime and Fisheries Fund, the installations were initially hampered by the pandemic, with the majority taking place 2021 - 2023. Those adopting REM on this basis also benefitted from contributions for maintenance and license fees for the first year after installation.

The purchase and installation of any new or replacement REM systems, as well as any other ongoing costs for Scottish vessels will be expected to be borne by the fishers.

Owners of non-Scottish vessels that wish to continue to operate in the Scottish zone will need to procure an REM system which meets the technical specifications which Scottish Ministers will publish under the REM legislation and will need to liaise with their fisheries administration about their eligibility for any funding opportunities available from their relevant authority.

Estimated costs of the REM system for a scallop vessel (2023 prices)

- Initial system cost: £2,380 - £6,180
- Initial installation: £520 - £1,650
- Annual software license: £310 - £420
- Sim card with annual data package: £50 - £90
- Annual maintenance: £0 - £310 (excluding labor)

Summary of costs

- Annual cost Year 1 and replacement years: £3,250 - £8,320
- Annual cost Year 2 onwards: £360 - £810

Notes: Figures were deflated to expected 2023 prices from 2022 prices using the Treasury's GDP deflator⁵⁹.

Cost figures were estimated from Scottish scallop vessels who have already adopted REM and estimates provided by businesses looking to enter the sector.

Figures may not correctly sum to total annual costs due to rounding.

Payment of these costs

⁵⁸ [Scottish Sea Fisheries Statistics 2022 - gov.scot \(www.gov.scot\)](http://gov.scot)

⁵⁹ [GDP deflators at market prices, and money GDP September 2023 \(Quarterly National Accounts\) - GOV.UK \(www.gov.uk\)](http://gov.uk)

Costs can be broadly split into three categories: 1) the initial upfront cost of hardware (system and installation), 2) the cost of data transfer and system software / licences, 3) the ongoing maintenance of hardware and replacement of kit. It should be noted that these are estimates only.

There were 76 Scottish registered vessels and 36 vessels registered in the rest of the UK active in the Scottish zone in 2022. These vessels are split into three main groups for the purposes of estimating the cost.

Group 1 are 16 vessels who are estimated to be currently active of the original 20 who installed the REM system to comply with the 2017 Order. These vessels are likely to maintain their existing onboard REM system due to the benefit of deploying extra dredges from their early adoption. As such, while they would be impacted by this regulation they are not likely to change their behaviour due to having a monetary benefit to continue. It is assumed that the REM present on these vessels is sufficient to meet the new legislation requirements with only minor costs and so no additional monetised cost is expected.

Group 2 are those vessels who have installed the REM system voluntarily but who may have chosen to stop running the system at a future point. This is expected to be over 90% of the Scottish dredge scallop fleet who have not installed REM following the 2017 Order coming into force, estimated to be 52 vessels in 2022. The cost to these vessels is expected to be the cost of maintaining the system and purchasing replacement systems as many of these vessels may not have run the system if it were not made mandatory. The total maintenance cost for this group in the first year is estimated to range between £18,720 - £42,120 for the 52 vessels, with the system renewal cost (comparable to the first year purchasing costs) estimated to range between £169,000 - £432,640 for the 52 vessels.

Group 3 are those vessels who have not yet installed REM at all but who, under this option, would be mandated to operate an REM system. This is expected to be under 10% of the Scottish dredge scallop fleet with this group also including other UK vessels which are assumed to have not purchased the system yet. This group is estimated to be 44 vessels in 2022. The cost to these vessels is expected to be the cost of first purchase, maintenance and subsequent system renewal. The purchase and future renewal costs for this group is estimated to range between £143,000 - £366,080 per annum, with the maintenance costs estimated to range between £15,840 - £35,640 per annum.

All of the system costs listed above are expected to be borne by the industry, however, non-Scottish vessels in the UK fleet will wish to liaise with their fisheries administration to confirm if any grant funding may be available.

Industry estimates of the lifespan of the system is estimated to be on average 5 years, although systems can last longer or shorter depending on the quality of maintenance. For the purposes of the analysis, a full system repurchase is expected every 5 years, with a renewal expected in year 5 and 10 of the scheme for group 2 and a renewal in year 6 for those who newly purchase a system in group 3.

Public sector costs: Enforcement costs

To supplement existing Marine Directorate enforcement activity, the REM system will be able to detect non-compliance (while its very presence may deter it in the first instance), and Marine Directorate will deal with any detected non-compliance appropriately and proportionately if it occurs.

While there are additional costs associated with expanding the team reviewing REM data these are to be balanced internally from the other compliance efforts so there will be no overall additional cost, this is achieved through taking a risk based approach on resourcing different compliance and detection activities. There may be some minimal costs associated with purchasing specialised software for analysis or server storage for downloaded data, these costs are expected to be absorbed through existing budgets and are estimated to range between £4,000 and £30,000 per annum.

Public sector costs: Science costs

Cost associated with scientific analysis of spatial data generated through this policy are expected to be balanced internally with current resources. There may be future costs associated with the storage and management of retained data which will be reviewed periodically.

Data Transfer costs

The technical specifications which Scottish Ministers will publish for REM systems for scallop dredge vessels will require REM systems to automatically transmit VPS and winch sensor data to a data storage system when the scallop dredge vessel is within range of, has access to or is connected to a means of transmission. In many cases this will be when the vessel is within range of the mobile phone network, however, some scallop dredge vessels have satellite packages and may opt to transmit the VPS and winch sensor data that way.

The transfer of camera data and the potential costs involved will depend on the REM system that a fishers has on their vessel. The technical specifications permit REM systems to be installed which:

- automatically transmit all the camera data to the data storage system. This could be via the mobile phone network, or, subject to the technology onboard the vessel, through onboard satellite packages; and
- store the camera footage on the control box or storage box. Analysts then remotely select recorded camera data on the control box which is automatically transmitted to the data storage system when the vessel is next within range of, has access to or is connected to a means of transmission. This transmission could be via the mobile phone network, or, subject to the technology onboard the vessel, through onboard satellite packages.

The cost to the vessels of transferring the data to the data storage system will range depending on the functionality of their REM device (in relation to transfer of camera data), access to Wi-Fi, the vessel's own data package, or if the vessel has to buy a new data package. Figures from vessels who have already implemented REM

suggest that the cost for this could range from £4-7 per month, with an annual cost of £50-£90 as outlined. The current sim only packages⁶⁰ are off the shelf therefore if fishers were to upgrade to unlimited packages in order to automatically upload camera data, the cost could range from £16-£44 per month, with an annual cost of £200-£530. However, as uploading camera data is expected to cost businesses more relative to storing data on the control box, it is not expected that businesses will choose this option unless it fits with their existing data package and business practices and it is anticipated that the cost differential between these two types of data transfer could lead to a preference for systems incurring data costs at the lower end of the estimated range.

Vessels that opt to transfer data via onboard satellite are not anticipated to incur additional costs due to the low amount of data being transmitted.

Summary of Costs

Non-Monetised – Option 1: Do nothing

1. No direct additional costs for the fishing industry or the public purse.
2. Indirect costs through continued non-compliant activities going undetected such as damaging marine protected areas.
3. Possible loss of competitive position and reduction in price received in future.

Non-Monetised – Option 2: REM

1. Nothing.

Monetised – Option 1: Do nothing

1. Nothing

Monetised – Option 2: REM

1. Cost of REM systems per vessel ranges between £3,250-£8,320 in the first year and sixth and between £360-£810 each other year.

Aggregate costs:

For those 52 vessels in group 2 who already have an REM system installed voluntarily, the total annual cost for this group is estimated to range between £18,720 - £42,120, with the system renewal cost estimated to range between £169,000 - £432,640 in years 5 and 10.

For those 44 vessels in group 3 who would have to purchase a new system, the total purchase and renewal costs for this group are estimated to range between £143,000 - £366,080 per annum, with the total maintenance costs estimated to range between £15,840 - £35,640 per annum.

2. Enforcement system costs ranging from £4,000-£30,000 in total per annum.

⁶⁰ Sim only data package costs are as publicly advertised in 2023

3. Data transfer costs are embedded into the annual maintenance costs and are not presented separately.

Regulatory and EU Alignment Impacts

Intra-UK trade

No impact. There is no expected impact on intra-UK trade as this will only impact the act of fishing in Scottish waters and not have any effect on downstream purchases or sales.

International Trade

No impact. There is no expected impact on international trade from this regulatory change. The regulation change would not proscribe any new requirements on the end product, in this case the landed scallops, and thus would have no impact on the ability to states and businesses to trade in this product on the Scottish market.

EU Alignment

The EU is taking steps to consider a role for REM in certain fisheries in the future as part of their wider review of the control and enforcement regulation⁶¹. The SSI will advance the standards shared with the EU, creating a temporary period of divergence while it progresses its own development of REM. We have undertaken engagement and consultation with the EU on this REM policy and development of the SSI and are also seeking to share learning from its development internationally including with the EU.

Scottish Firms Impact Test

The Scottish Scallop Sector Working Group (SSSWG), whose membership included fishing association representatives, frontline fishers/businesses and Regional Inshore Fisheries Groups, were fully consulted throughout the development of this policy (until the group was disbanded in 2023 and replaced with an FMAC scallop group) and their views which reflected dredge, dive and processing interests were vital in its co-development. A number of Scottish businesses have already chosen to have an REM system installed on their vessels.

Analysis of the scallop fleet's profitability using Seafish data⁶² shows substantial variability in profitability each year. Taking a 5 year average of scallop profits from 2017-2021 (the last year of complete data) indicates an average net profit of £10,700 for the under 15 metre fleet and £33,900 for the over 15 metre fleet in 2023 prices. The average annual cost over the first 5 years of REM for scallop vessels is estimated to be £940 for the under 15 metre vessels and £2,320 for the over 15 metre vessels when considering a single purchase year and 4 maintenance years.

⁶¹ "Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy (OJ L 343, 22.12.2009, p. 1–50)

⁶² Economics of the UK Fishing Fleet by Seafish - [Fleet Enquiry Tool | Tableau Public](#)

This would represent 9% of the profit from an under 15 metre vessel and 7% of the profit from an over 15 metre vessel.

However, there may be a significant variance in profits for these vessels, particularly given the variability in average profits year on year. As a result some businesses may be more impacted than the average in a particular year.

Finally, the average annual cost of the system is smaller than a 1% change in the price of scallops, REM is estimated to be up to £2,320 per vessel compared with an average of £3,240 change per vessel for a 1% price change in scallops in 2022. As such it is expected that these businesses would be able to absorb the annual cost.

Competition Assessment

Many vessels in the Scottish registered scallop fleet are nomadic in their fishing patterns, catching between 65-75% of its tonnage outside of Scottish waters in 2018-2022. As such the Scottish fleet may experience higher costs when operating outside of the Scottish zone compared with other vessels which would not be subject to REM requirements. However, as the costs are expected to be less than 1% of a vessels revenue and between 7-9% of a vessels profits it is not expected this would result in a loss of competitiveness for the Scottish registered scallop fleet. Additionally, nomadic scalloper vessels from the rest of the UK are expected to look to continue to access the Scottish zone and thus will experience the same fixed costs as the Scottish fleet when fishing in the Scottish zone. As the REM requirements under the REM legislation will apply to all fishing boats carrying out scallop dredge operations in the Scottish zone, they are not anticipated to have any major impact on the ability of operators to compete against each other.

With the reputation of Scottish scallops expected to increase as a result of demonstrating compliance with sea fisheries legislation such as marine protected areas (bringing these products more in line with public demand), this is anticipated to make the competitiveness of these products more favourable compared with substitute goods.

In recent years companies developing REM solutions to meet the challenges of monitoring diverse global fisheries have increased. In general, REM systems can be customizable and configurable to meet the diverse requirements of individual fisheries. The REM legislation (as with the 2017 Order) establishes the minimum standard which REM systems need to meet, enabling competitions between suppliers.

Consumer Assessment

The consumer in this is considered to be those who purchase the fish from the scallop dredge fleet. As noted in the Scottish Firms Impact Test the recurring costs of the system that fishers have to pay is less than a 1% price difference for scallops. As a result, it is not expected that there will be any noticeable extra cost borne by the consumers with the exception of where scallops are marketed under a special accreditation scheme. In this case it is expected that the additional price would be

available for those who wish to buy more sustainably caught scallops, while alternatives would still be available on the market.

Consumers could also be considered the scallop vessel owners – the impacts on this group of people are considered throughout this BRIA.

Competition Filter Questions

Will the proposal directly limit the number or range of suppliers? E.g. will it award exclusive rights to a supplier or create closed procurement or licensing programmes?

No. Any supplier with the capabilities to supply REM systems which meet the technical specifications for REM systems for scallop dredge vessels (which will be published by the Scottish Ministers) will be able to do so.

Will the proposal indirectly limit the number or range of suppliers? E.g. will it raise costs to smaller entrants relative to larger existing suppliers?

Limited / No Impact. The proposal is not anticipated to limit the ability of any supplier to provide REM systems, regardless of size or existing business provision.

Scale should not affect the competitiveness of larger suppliers over smaller. The only consideration will be whether an REM system meets the minimum standards set out in the technical specifications.

Will the proposal limit the ability of suppliers to compete? e.g. will it reduce the channels suppliers can use or geographic area they can operate in?

Limited / No Impact. Introduction of REM will not directly affect firms' routes to market or the geographical markets they can sell into.

Will the proposal reduce suppliers' incentives to compete vigorously? e.g. will it encourage or enable the exchange of information on prices, costs, sales or outputs between suppliers?

No. Introduction of REM is not expected to reduce suppliers' incentives to compete vigorously.

Test run of business forms

No business forms have yet been produced, however, we will undertake a test run to ensure ease of use once forms are ready.

Digital Impact Test

Digital Impact Test Filter Questions

Does the measure take account of changing digital technologies and markets?

Yes. This measure is working with industry to move to a new and increasingly mature digital technology through remote electronic monitoring with the possibility of increased use of artificial intelligence to review the footage. Drafting of the SSI and the accompanying technical specifications has taken account of the need to future proof the requirements to allow for future digital developments.

Will the measure be applicable in a digital/online context?

Yes. REM data will be uploaded, accessed, and processed digitally.

Is there a possibility the measures could be circumvented by digital / online transactions?

No. There are no transactions in this process.

Alternatively will the measure only be applicable in a digital context and therefore may have an adverse impact on traditional or offline businesses?

No. The REM process contains a mix of traditional offline processes e.g. the installation and operation of physical hardware and digital processes (the capture, transmission, storage and analysis of digital REM data).

If the measure can be applied in an offline and online environment will this in itself have any adverse impact on incumbent operators?

No. REM systems are likely to be supplied and operated by a mix of existing suppliers, and new suppliers, with no restrictions in place as long as the technical and operational requirements of the legislation are met.

Legal Aid Impact Test

Individual vessel masters could require access to legal aid if prosecuted for an offence under the REM SSI

Enforcement, sanctions and monitoring

This policy will provide a new, enhanced method of enforcing compliance with existing legislation regulating sea fishing activity. Penalties will be applied in instances of non-compliance in line with existing sea fisheries offences.

Where a breach of fisheries regulations has been detected, it will be reported as appropriate to the prosecuting authorities. This can result in either a Fixed Penalty Notice of up to £10,000, or a fine of up to £50,000 on summary conviction, or a fine on conviction on indictment.

The Scottish Government will review the data recorded by REM systems in order to check compliance with legislation regulating sea fishing activity. The frequency of review will be risk based.

The Scottish Government will remain the relevant competent authority with responsibility for scientific studies, compliance, monitoring and enforcement of the requirement to have a compliant REM system on board.

Implementation and delivery plan

The new scallop dredge vessel REM requirements will be introduced through secondary legislation.

The consultation on REM, ran between March 2022-June 2022.⁶³ The consultation analysis report and the Scottish Government response report was published on 14 August 2023.⁶⁴⁶⁵

Preparation of draft legislation

The REM legislation will be laid in draft before the Scottish Parliament on 22 March 2024.

The REM requirements for scallop dredge vessels will come in to force on 17 June 2024.

Post-implementation Review

The intention is to maintain regular scrutiny of the policy.

Summary and recommendation

The Scottish Government recommends Option 2. Introducing new measures that require any vessel deploying scallop dredge gear in the Scottish zone to fish for any species of scallop, and any Scottish vessels deploying scallop dredge gear for that purpose wherever they are fishing, to have a fully functional REM device installed on-board and operational.

Table 1 – Summary of costs and benefits

Option 1

Total benefit per annum - economic, environmental, social: Non-Monetised

- Fishing vessels would be able to continue dredge fishing for scallops in the Scottish zone as per the existing Scottish fisheries legislation.

⁶³ [Marine resources - ensuring long term sustainability: remote electronic monitoring \(REM\) consultation - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/)

⁶⁴ <https://www.gov.scot/publications/analysis-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/>

⁶⁵ [Supporting documents - SG Response to Consultation: Marine Resources – Ensuring Long Term Sustainability: Remote Electronic Monitoring \(REM\) - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/supporting-documents-sg-response-to-consultation-marine-resources-ensuring-long-term-sustainability-remote-electronic-monitoring-rem/pages/1/)

Total cost per annum - economic, environmental, social, policy and administrative:
Non-Monetised

- No direct additional costs for the fishing industry or public purse.
- In-direct costs through continued non-compliant activities going undetected such as damaging marine protected areas.
- Possible loss of competitive position and reduction in price received in future.

Option 2

Total benefit per annum - economic, environmental, social : Non-Monetised

- Scientific benefits including enhanced spatial data on the location of scallop fishing effort and enabling improved interaction between the fishing industry and other marine users.
- Potential reduction in damage to protected areas due to increased compliance. The use of REM is anticipated to deter and detect non compliant activity – leading to improved health of fish stocks, in turn improving catch yields and future economic gains. Helping establish the tools and train AI through collected data to further improve the capabilities of REM.
- Fishing accountability and increased consumer confidence Improved reputation for Scottish catch, potential improvement in competitiveness of the product and improved access to markets. Monetised benefit is estimated to be £332,000 for every 1% increase in price.

Total benefit per annum - economic, environmental, social: Monetised

- There is no figure for total monetised benefits for REM due to the uncertainty in this new scheme.

Total cost per annum - economic, environmental, social, policy and administrative:
Non-Monetised

- There are no major non-monetised costs presented.

Total cost per annum - economic, environmental, social, policy and administrative:
Monetised

- Cost of REM systems per vessel ranges between £3,250-£8,320 in the first and sixth year and between £360-£810 each other year.
- For those 52 vessels in group 2 who already have the system voluntarily installed, the total annual cost for this group is estimated to range between £18,720 - £42,120, with the total system renewal cost estimated to range between £169,000 - £432,640 in years 5 and 10.
- For those 44 vessels in group 3 who would have to purchase a new system, the total purchase and renewal costs for this group are estimated to range between £143,000 - £366,080 per annum, with the total maintenance costs estimated to range between £15,840 - £35,640 per annum.
- Enforcement system costs ranging from £4,000-£30,000 in total per annum.
- Data transfer costs are embedded into the annual maintenance costs and are not presented separately.

Summary of monetised costs of each option

Option 1

- Year 1: £0
- Year 2: £0
- Year 3: £0
- 10 Year total: £0

Option 2 – Minimum of range

- Year 1: £165,720
- Year 2: £37,256
- Year 3: £35,996
- 10 Year total: £921,487

Option 2 – Maximum of range

- Year 1: £438,200
- Year 2: £104,116
- Year 3: £100,595
- 10 Year total: £2,459,644

Note: Figures have had a 3.5% discount rate applied in line with the [Treasury Green Book](#).

Declaration and publication

I have read the Business and Regulatory Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs. I am satisfied that business impact has been assessed with the support of businesses in Scotland.

Signed: Mairi Gougeon

Cabinet Secretary for Rural Affairs, Land Reform and Islands

Date: 20.03.2024

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