

Scotland's Blue Economy: Review of Current Status

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Table of Contents

1	Introduction	1
1.1	Purpose.....	1
1.2	Approach.....	1
2	Status Review for Blue Economy Outcomes	3
2.1	Natural Capital	3
2.2	Climate Change	8
2.3	Economy and Trade.....	11
2.4	Food Security, Health, and Nutrition	15
2.5	Social Inclusion and Equalities.....	18
2.6	Ocean Literacy	21
3	Monitoring and Evaluation	24
4	Overview of Data Sources	25

1 Introduction

1.1 Purpose

The [Blue Economy Vision](#) was published by the Scottish Government in March 2022. The Vision defines our long-term ambition for shared stewardship of Scotland's marine and freshwater environment and wider blue economy. It sets out the need for transformative change to create fairer, more prosperous, nature-positive marine sectors and communities. By delivering the Blue Economy Vision, we will ensure that our marine assets support Scotland's wider goal to become a wellbeing economy and tackle the twin crises of biodiversity loss and climate change as set out in the [National Strategy for Economic Transformation](#).

In order to successfully implement our Blue Economy Vision, we need to understand the current status of our marine, coastal, and inter-linked freshwater environments, the businesses that operate in them, and the communities that they support. We also need to be able to measure our progress and evaluate the effectiveness of our approach.

The first phase of delivery of our Blue Economy Vision was the publication of [Delivering Scotland's Blue Economy Approach](#) in November 2022. As part of this first phase, we have undertaken a status review to provide a clear picture of where we are now in relation to the Blue Economy outcomes. A summary of this status review was included in the Delivering Scotland's Blue Economy Approach document.

This status review document expands on those summaries and describes our starting position in the transition to adopting a Blue Economy approach to marine sectors, communities, and the environment. It provides us with the foundation to consider how we can track our progress, determine if significant and lasting change is occurring, and whether the Blue Economy approach is working.

1.2 Approach

There is a wide range of existing data that provides information on the status of Scotland's Blue Economy. This includes data from one-off studies, as well as routinely collected survey data and annual statistics. Some relevant data, particularly related to environmental status, are collected via environmental assessments that are carried out as part of statutory frameworks (e.g. the [UK Marine Strategy](#)) or by international conventions for protecting the environment (e.g. [OSPAR](#)¹). Other datasets are collated at national scale or regional scale.

To assess the current status of Scotland's Blue Economy, each of the six outcomes was first broken down into a handful of key words or phrases – referred to as 'sub-outcomes'. These key phrases were based on the text description of the outcome and each captured a discrete part of the outcome.

¹ OSPAR is the mechanism by which 15 Governments and the EU cooperate to protect the marine environment of the North-East Atlantic, and is named after the original Oslo and Paris Conventions.

An initial list of data sources that provide relevant economic, social, and environmental information was compiled through desk-based research. This was then added to by internal engagement across the Scottish Government at workshops and via email. Feedback was also sought on these data sources from key stakeholders². The data sources were then mapped against the ‘sub-outcomes’. Some data sources, like the [Scottish Marine Assessment](#) (hereafter SMA 2020), were relevant in more than one outcome. These mapped data sources were used to write a narrative description of the current status for each of the six Blue Economy outcomes. Where relevant, the most up-to date, available figures were used. For some data sources, the most recent data points were several years old – e.g. 2018 or 2019 – and thus pre-Covid-19, pre-EU Exit, pre-avian influenza of 2022, and pre-publication of the Blue Economy Vision, providing a useful baseline review from which to measure change.

This document is arranged as follows:

- Chapter 2 breaks down the six Blue Economy outcomes in Sections 2.1 through 2.6 (where each of these sections is broken down into sub-sections in which evidence is reviewed),
- Chapter 3 sets out a good practice approach to Monitoring and Evaluation, and
- Chapter 4 provides a full list of the data sources used in this publication.

² The following stakeholders were approached for feedback on data sources: Crown Estate Scotland; Highland and Island Enterprise; Historic Environment Scotland; Food Standards Scotland; NatureScot; Seafish; South of Scotland Enterprise; Scottish Enterprise; Scottish Environment Protection Agency; Transport Scotland.

2 Status Review for Blue Economy Outcomes

2.1 Natural Capital

Scotland's marine ecosystems are healthy and functioning, with nature protected and activities managed using an ecosystem-based approach to ensure negative impacts on marine ecosystems are minimised and, where possible, reversed.

What is natural capital?

The [Natural Capital Committee's first 'State of Natural Capital' report](#) defines natural capital as the part of nature which directly or indirectly underpins value to people, including ecosystems, species, freshwater, soils, minerals, the air and oceans, as well as natural processes and functions. This value is dependent on the quality as well as the location and quantity of the natural asset. For example, water quality can impact on biodiversity, marine life health, and also drinking and bathing water quality.

Summary of current outcome status

Climate change is the most critical factor affecting Scotland's marine environment, with impacts seen across all marine ecosystems. Examples of these impacts include sea level rise around coasts, which poses risk to assets, and temperature increases that are affecting species' distributions. Ocean acidification and non-indigenous species are other increasing pressures that may significantly affect sectors and the communities that depend on them.

Bottom-contact and pelagic fishing are the most widespread direct pressures on Scotland's marine regions. [Scotland's Marine Assessment 2020](#) (SMA2020) and other assessments indicate that the rate of change due to human activities in marine systems is accelerating. The state of Scotland's seas is improving in some areas such as in relation to contaminants, but nine out of 21 regions have seafloor habitats which are predicted to be in poor condition across more than half of their area. In addition, the state of marine mammals, birds, fish, and marine litter remains mixed. Further detailed assessment of Scotland's marine environment is limited by insufficient data.

Management measures, such as fisheries management and Marine Protected Areas, are in place in response to recognised concerns relating to the status and trends of marine species and habitats, with other measures being implemented and developed to address current and future challenges.

2.1.1 Sub-outcome 1: Healthy marine and freshwater environment

A healthy marine and freshwater environment can be defined as being:

- i. productive, supporting a range of industries and ecosystem services;
- ii. biodiverse, represented by diverse assemblages of organisms ranging from plankton to fish, seabirds and mammals; and
- iii. resilient to change, including climate change and ocean acidification.

Scotland's marine ecosystem biodiversity and health was most recently evaluated using SMA 2020, which assessed the state of marine species (mammals, seabirds, fish, invertebrates, plankton and non-native species) and their benthic and pelagic habitats (intertidal and continental shelf, deep sea, and pelagic). The [ecological components assessed by SMA 2020](#) show a complex picture. Seabirds are routinely monitored using annual records for their breeding numbers and breeding success for selected species at sites across the UK, including three key sites in Scotland. The SMA 2020 indicates stable breeding success of Scotland's seabirds since 2011, but examining records from 1986 shows a 38% decline in the abundance of breeding seabirds. Since publication of the SMA 2020, there has been an incidence of Bird Flu (HPAI H5N1) circulating in wild birds. The impacts of this are not yet known.

Scotland's seas support two species of seal and a variety of cetaceans (whales, dolphins and porpoise). The grey seal population in Scotland has increased, over the six year period assessed (2008-2014). Grey seal pup production, assessed over 1985-2016, also shows increases, particularly in the east coast. The harbour seal populations, assessed from 1989-1996 (depending on management area) to 2016, are stable on the west coast, but populations in the Northern Isles, north and east coast are declining. For cetaceans in Scottish offshore waters, sufficient data exists to detect significant trends for three species, harbour porpoise, white-beaked dolphin and minke whale. Numbers for these species are stable. For the remaining species assessed (Atlantic white-sided dolphin, short-beaked common dolphin, striped dolphin, Risso's dolphin, long-finned pilot whale, sperm whale, beaked whales and fin whale), abundance estimates from 2005/7 and 2016 show recent estimates are either similar or larger than earlier estimates. The abundance of bottlenose dolphins on the east coast of Scotland has increased in the assessment period (2009-2015).

While top predators provide some indication of the health of the marine environment, the complexities of food-web interactions and marine ecosystems mean that no single component captures all aspects of ecosystem biodiversity or health. Other components assessed by the SMA 2020 show a more complex picture. For the wider fish community in shelf waters (assessed between two time periods, 1999-2008 and 2009-2017), species richness and diversity varied spatially, and for deep-sea fish communities (assessed between 1998-2018), there are no clear trends in diversity. A mixed picture is also seen in plankton communities, which were assessed with multiple datasets and over different time windows depending on the region. There are increasing trends in certain phytoplankton and zooplankton species but declining trends in others – changes like this are causing concern at the international OSPAR level. In terms of non-native species assessed in SMA 2020, there are more non-native species reported and over a wider geographic range, with West Highland, Argyll and Clyde Scottish Marine Regions³ having established non-native species (NNS) populations classified 'high-impact'. There is little evidence of how marine NNS affect Scottish biodiversity, but the presence of high-impact species is assumed in the SMA 2020 to have a detrimental effect on native biodiversity.

³ More information about Scottish Marine Regions can be found on the [Marine Scotland Information website](#).

Benthic habitats are an integral part of food webs, carbon storage and provisioning. Biogenic habitats are habitats formed by key animal or algal species, such as, blue mussel, horse mussel, flame shell, maerl and seagrass beds, and serpulid aggregations. These habitats are Priority Marine Features (PMFs) and there is growing awareness of the natural capital and ecosystem services they provide, e.g. climate change mitigation through capture and storage of blue carbon. [The SMA 2020 assessment of biogenic habitats](#) indicated some concerns for the five marine regions (Moray Firth, West Highlands, Outer Hebrides, Argyll and Clyde), where sufficient data (2011 to 2018) allowed an assessment. Similarly, the [SMA 2020 assessment of seafloor habitats](#) indicates many concerns for most marine regions. Nine out of 21 regions have seafloor habitats which are predicted to be in poor condition across more than half of their area.

In freshwater systems linked to the marine environment, an assessment of biodiversity will require further development. The SMA 2020 contains data at the national level on [estimated numbers of returning and spawning Atlantic salmon and catch numbers for salmon and sea trout](#) (it also contains data on size of salmon, and estimates of young salmon or smolt for the river North Esk). The estimated number of Atlantic salmon returning to Scottish coastal waters has been in general decline since at least the early 1970s. In 2018, the estimated number of salmon returning to Scottish coasts was 44% of 2011 levels. The salmon that do return have also declined in size since the late 1990s – this is mirrored internationally as well and thought to be linked to [changing climate conditions](#) in the North Atlantic feeding grounds.

Sub-outcome 2: Clean marine and freshwater environment

The Scottish Government's National Performance Framework's (NPF) [Clean Seas](#) indicator measures the levels of five contaminant groups in fish and shellfish and sediments from three biogeographic regions around Scotland. The proportion of contaminants assessed in Scottish marine waters showing concentrations that are unlikely to harm marine organisms was fairly stable between 2015 and 2020, with a [Clean Seas indicator of 93% for 2020](#)⁴. This is an improvement from 90% in 2015-16 and was primarily due to lead concentrations in sediment in the Minches and Western Scotland decreasing to acceptably low levels. However, as of 2019, the Irish Sea (Clyde and Solway) is still showing high levels of concentrations of both mercury and lead in sediment.

It is important to note that the cleanliness, health, and safety of Scotland's seas are affected by other influences beyond contaminants such as eutrophication, marine litter, microbiological contamination, or noise (all of which are covered in SMA 2020 as well). The majority of Scottish Marine Regions have no trend suggestive of eutrophication, as indicated by chlorophyll-a concentrations. However, there is an increasing trend in chlorophyll-a concentration in the Forth and the Tay. These

⁴ The 2021 indicator will be updated (and the indicator for previous years will be recalculated) to reflect developments in international contaminant assessments, such as the OSPAR assessment for the North Sea and north-east Atlantic.

influences, along with contaminants, have the potential to affect human activity and industry (e.g. aquaculture); likewise, human activity and industry can affect the environment. These effects may be magnified or altered by changing climate.

For Scotland's interlinked freshwaters, the Scottish Environment Protection Agency (SEPA) [River Basin Management Plan](#) (RBMP) provides an assessment of the condition of surface waters (see SEPA's [water classification hub](#)). SEPA monitors the environment to assess the condition of water quality, water resources, physical condition and fish migration. Taking these four themes together, alongside assessments of invasive non-native species, SEPA classifies each part of the water environment based on the worst condition of any category. The combined classification indicates that 66% of our water environment overall was assessed to be in good or better condition in 2020.

2.1.2 Sub-outcome 3: Safeguarded marine environment

Managing the range of pressures from human activities on Scotland's seas supports habitats and species to be healthy and able to continue to support economic activities and human wellbeing. Various marine protection mechanisms contribute to this management. [Marine Protected Areas](#) (MPAs) are clearly defined geographical spaces, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of specified species and habitats. There are legal duties on authorities to consider MPAs in their decision making processes and additionally, Marine Conservation Orders and fisheries orders in MPAs can deliver additional conservation benefits through control of specific activities. There are [231 MPAs covering Scotland's marine environment](#), comprising MPAs for nature conservation; Special Protection Areas; Sites of Special Scientific Interest; MPAs for other purposes; and Other Area-based Measures. [Highly Protected Marine Areas](#) (HPMAs) will provide additional protection over and above MPAs through establishment of sites that protect from all extractive, destructive or depositional activities. [PMFs](#) are habitats and species identified as being of conservation importance in Scotland and have legal protection under policies in the National Marine Plan.

2.1.3 Sub-outcome 4: Measuring marine natural capital

[UK marine natural capital accounts](#) published by the Office for National Statistics provide an assessment of a range of ecosystem services provided by the marine and coastal environment. The accounts include monetary valuations and quantitative assessments where possible but they contain only limited geographical breakdown across the UK. This means it is currently not possible to assess Scotland's marine natural capital from this source. For 2018, the UK marine natural capital assets were valued at £211 billion. This only includes those assets for which it was possible to estimate a value.

A [Natural Capital Asset index](#) (NCAi) has been developed for Scotland's terrestrial (land) environment. This asset index does not include monetary estimations but is instead a composite index showing changes from a set point in time tracking the benefits to people from the natural environment. The index shows improvement from

2012 to 2020, and is at its highest level since before 2000. A marine natural capital asset index for Scotland does not yet exist though [a feasibility study](#) was carried out by NatureScot in 2019. This study found that it may be possible to develop a marine index but data and indicators are not currently sufficient. A coastal and intertidal index could be a more feasible intermediate step.

2.2 Climate Change

Scotland's Blue Economy is resilient to climate change, contributing to climate mitigation and adaptation, with marine sectors decarbonised, resource efficient and supporting Scotland's Net Zero and Nature Positive commitments.

Summary of current outcome status

The impacts of climate change and ocean acidification are already apparent in Scotland's marine and interlinked freshwater environments. The expansion of Scotland's offshore wind sector has made a significant contribution to delivering a low carbon energy system. Data on the emissions associated with individual marine sectors is currently lacking, but there has been progress in reducing overall marine vessel emissions. Reductions in vessel emissions have mainly been due to reductions in those from coastal shipping. Small reductions in the emissions from fishing activity are mostly due to changes in the fleet composition and their combined fishing effort. Currently, we do not have an effective measure for the extent to which the Blue Economy is adapted for climate change. However, the next Scottish Climate Change Adaptation Programme (due for publication in 2024) is set to strengthen adaptation monitoring and evaluation.

2.2.1 Sub-outcome 1: Decarbonisation

[Scottish Greenhouse Gas Statistics](#) show that Scotland's total emissions were 40.0 million tonnes of carbon dioxide equivalent (MtCO₂e) in 2020. We do not currently have an aggregated figure for the contribution of Blue Economy sectors and activities to that total emission figure. However, our understanding of some sectors' greenhouse gas emissions within the Blue Economy is more developed. Fuel use by marine traffic is readily captured and provides a comprehensive understanding of emissions associated with vessel use. In 2020, marine and inland vessels emitted 2.1 MtCO₂e. The majority of this came from coastal shipping (1.4 MtCO₂e), with the remaining emissions being primarily from international shipping (0.3 MtCO₂e) and fishing vessels (0.3 MtCO₂e). Other vessels, such as motorboats, workboats, personal watercraft and sailing boats with auxiliary engines, accounted for less than 0.1 MtCO₂e. Fishing vessel emissions in 2020 were 32% lower than in 2007, partly due to reductions in total engine power of the Scottish fleet. [Scottish Sea Fisheries Statistics](#) show that in 2007, total engine power was 401 MW (megawatts), while in 2020 this was 376 MW, a 6% reduction that was due in part by a reduction of the number of active vessels and a shift to smaller vessels. Despite this, the volume of landings has increased by 8%, likely because of improved stock management and improved efficiency due to technological and gear advances.

2.2.2 Sub-outcome 2: Marine renewable energy

The [Climate Change Committee's 2021 report to Scottish parliament](#) shows that progress in decarbonising the energy supply has significantly contributed to the overall reductions in Scotland's greenhouse gas emissions. This has been driven in a large part by increases in energy generation from renewable sources such as on-

and offshore wind, solar and bioenergy. [Scottish Energy Statistics](#) show that in 2021, 41.2% of all electricity generated in Scotland was from wind (35.5% from onshore wind and 5.7% from offshore wind). Wave and tidal energy generation are still in their early development stages, and their contribution to Scotland's energy generation remains small (<1% of total renewable energy generation in 2021).

2.2.3 Sub-outcome 3: Climate change adaptation

Climate change and ocean acidification are already having an impact on Scotland's marine and freshwater ecosystems. Globally, the ocean is critical in climate regulation: it has absorbed 89% of the excess heat, and every year absorbs at least a quarter of the carbon dioxide (CO₂) released to the atmosphere. Through SMA 2020, and sustained environmental monitoring in our seas, coastal areas and rivers, we are monitoring the impacts of climate change on the aquatic environment. Global warming has meant Scotland's seas have warmed at a rate between 0.05 and 0.07 °C per decade in the period 1870-2016, but warming at much higher rates has been seen in the past 30 years. Mean sea level is also increasing in all coastal regions. The subsequent increased risks of coastal erosion and coastal flooding will pose significant challenges for the maintenance of existing defences and further adaptation planning to address these risks. Rivers have also warmed, with salmon in particular experiencing thermal stress due to summer temperatures. There is currently no dataset of ocean carbon measurements in Scottish waters that allows the detection of long-term changes in ocean acidification, although data is now being collected as part of the [Scottish Coastal Observatory](#). Impacts on marine life include declines of certain species (Atlantic salmon, Atlantic cod), and changes to the timing of key life stages.

[Scotland's Climate Change Adaptation Programme](#) (and associated monitoring and evaluation framework) documents the interventions to adapt to these impacts, and where possible, increase resilience of people and nature to the changing climate. We currently cannot quantify whether resilience and adaptation to climate change are increasing across blue economy sectors. Based on a suite of indicators that were included as part of Scotland's Climate Change Adaptation Programme, some progress has been made to reduce pressures on marine and freshwater species and habitats to improve their resilience to climate change (for example, the increasing percentage of stocks fished at sustainable levels and reducing contaminant concentrations).

In June 2021, the Climate Change Committee published its [Independent Assessment of UK Climate Risk: Advice to Government for the UK's Third Climate Change Risk Assessment](#) and [associated website](#). This will inform the next Climate Change Adaptation Programme in Scotland, due for publication in autumn 2024.

2.2.4 Sub-outcome 4: Circular economy

As part of this Blue Economy Vision outcome, marine sectors and their supply chains may also need to further improve efficiency in resource use and minimise waste. Currently, no data sources were identified which suitably provide an overview of progress by the blue economy sectors to achieving this. Although data exist for litter

in the marine environment (see e.g. [SMA 2020](#)), these were not considered suitable to capture progress on resource use and the circular economy within marine sectors.

2.3 Economy and Trade

Established and emerging marine sectors are innovative, entrepreneurial, productive and internationally competitive.

Summary of current outcome status

The contribution to Scotland's economy by established marine sectors has decreased over the last ten years, primarily due to reductions in the oil and gas support sectors. Offshore wind, a growing and important sector, has the potential to contribute significantly to the value of Scotland's marine sectors and Scotland's economy. The average spend on research and development (R&D) by businesses in marine sectors is below Scotland's average – and Scotland's proportional R&D spend is below both the UK and EU-27 average. However, Scottish seafood exports has seen major successes in the last decade, with over £1 billion exported in 2021.

2.3.1 Sub-outcome 1: Productive marine sectors

[Scotland's Marine Economic Statistics](#) show that Scottish marine sectors (excluding offshore renewables, oil and gas) generated £5 billion in GVA⁵ in 2019, accounting for 3.4% of the Scottish economy. GVA by sector between 2010 and 2019 is generally volatile: many sectors have seen success, like fishing and aquaculture, while others have seen a general decline in GVA. For example, the 'support for oil and gas' sector's GVA decreased by 37% since 2010 – this was the primary factor behind the total marine GVA reduction of 7% between 2010 and 2019. All marine sectors saw decreases in their GVA from 2019 to 2020, largely as a result of the Covid-19 pandemic. The 'support for oil and gas' sector had the largest decrease in monetary terms, continuing the downward trend from previous years.

Data for the wider oil and gas sector (excluding support services) is not included in the GVA figures above primarily to remain consistent with National Accounts and Annual Business Survey data, which both allocate oil and gas extraction to a separate offshore region, rather than any particular country or region in the UK.

Data for the offshore wind sector, a relatively young but important and growing sector within the marine economy, is of interest but has not been included in the GVA above due to limited data availability. [Survey data from Office for National Statistics](#) is available for some years but is not directly comparable to the pre-existing data. This survey data shows that turnover of the offshore wind sector was c.a. £620 million in 2020, up from £280 million in 2018 (in 2020 prices). Additionally,

⁵ Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector. It is the value of the amount of goods and services that have been produced, less the cost of all raw materials and energy that are used up in the production process. GVA is closely linked to the GDP, which is often a measure of the entire economy's production value. The cost of labour is not deducted as this is a value added from the economic activity, which is not captured in GVA elsewhere in the economy (unlike packaging, ingredients or energy).

global spending on research and development of offshore renewable energies reached record highs in 2019 (see e.g. [OECD's Blueprint for Improved Measurement of the International Ocean Economy report](#)).

In 2020, the Covid-19 pandemic necessitated the shutdown of economic activity in many parts of the Scottish economy, which led to the single biggest annual fall in Scottish GDP⁶ since the earliest estimates in 1963.

The latest [Scottish quarterly GDP estimates](#) indicate that Scotland's GDP in Q1-Q3 2022 is still 0.9% below the pre-pandemic and pre-EU Exit levels seen in Q1-Q3 2019. However, Scotland's GDP has recovered to 2018 levels.⁷

The same Scottish GDP data also shows that output in the combined 'agriculture, forestry, and fishing' sector in Scotland outperformed 2018 levels throughout the pandemic, and did not face the same levels of decline as overall Scottish GDP. However, output in this sector has similarly not recovered to 2019 levels, with output in Q1-Q3 2022 still being 2% below Q1-Q3 2019 levels.

It is difficult to attribute changes in output from 2021 onwards to either EU Exit or the Covid-19 pandemic. For comparison, the Office of Budget Responsibility (OBR) forecasts that UK GDP will reduce by 4% as a result of EU Exit in the long run ([OBR March 2022 forecast](#)).

[Scotland's Marine Economic Statistics 2020](#) indicate that GVA for all marine sectors decreased when compared to 2019 – with the largest relative decreases seen in the freight water transport (-60%), passenger water transport (-47%), and the marine tourism (-44%) sectors.

2.3.2 Sub-outcome 2: Innovative and entrepreneurial marine sectors

Most available data sources on innovation do not break down by industry sector, which means innovation or entrepreneurship in the blue economy cannot be easily identified. Context on innovation and growth across Scotland as a whole is provided in this section, along with a custom extract of the [Inter-Departmental Business Register](#) (IDBR) dataset showing investment into research and development across marine sectors.

The proportion of 'high-growth' businesses⁸ across all Scottish sectors are tracked as part of the [NPF](#)⁹. In 2021, 1.1% of all registered businesses in Scotland were classed as 'high growth'. This proportion was highest in Aberdeen City (2.7%) and

⁶ Gross Domestic Product (GDP): in short, the total value of goods produced and services provided. This is often used as a broad measure of a country's overall economic performance (particularly when adjusted for inflation, 'real' GDP).

⁷ Note that during 2020-22, these figures are subject to [more uncertainty](#) because of the coronavirus pandemic.

⁸ Defined as having on average a 20% annual increase in turnover.

⁹ This uses data for VAT-registered businesses from the IDBR to track annual turnover. Note that many smaller enterprises won't be represented (since they don't have to register for VAT), and that there may be a lag in VAT returns.

lowest in Na h-Eileanan Siar (0.8%). By sector, the combined ‘agriculture, forestry, and fishing’ sector had the lowest proportion of high-growth businesses (0.3%).

The latest [UK Innovation Survey](#) shows that Scottish businesses are slightly less ‘innovation active’ than businesses in the UK overall (39.0% of businesses in Scotland were innovation active in 2018-20, compared to 44.9% for the UK as a whole). Although this is an improvement on last year, it is worth noting that last year was a historic low and that further improvements are required to return to 2014-16 levels.

[Gross expenditure on research and development in Scotland](#) totalled £2.8 billion in 2019, representing 1.66% of Scottish GDP – placing it below the total UK spend of 1.74% of GDP.¹⁰ Both Scotland and the UK as a whole spend less on R&D than the EU27 average (2.1%) and the Organisation for Economic Cooperation and Development average (2.5%).

A custom extract from the IDBR dataset (using data from the Office for National Statistics and Scottish Government) shows that private investment into research and development by businesses in marine sectors is volatile from year to year. Business R&D spending in these sectors totalled £42 million in 2019, up from £38 million in 2018. In 2019, the total spend as a proportion of GVA was 0.82%, less than Scotland’s business R&D spending as a proportion of total GVA (0.98%). The majority of this spending was in oil and gas services (63%), with aquaculture (19%), seafood processing (7%), and marine tourism (2%) accounting for a large proportion of the remaining spending.

2.3.3 Sub-outcome 3: Internationally competitive marine sectors

[Export Statistics Scotland](#) shows that in 2019, the total value of Scotland’s international and rest-of-UK exports (excluding oil and gas) stood at £87.1 billion, accounting for roughly 52% of [on-shore GDP](#) (£166.7 billion). For comparison, Denmark has a similar export-to-GDP ratio of 58%, according to the [World Bank](#).

Scotland’s total international exports increased in almost every year between 2010 and 2019 (with 2014 being the exception) and in 2019, were 43.0% higher than in 2010 – an average increase of 2% per year after adjusting for inflation.¹¹ For the combined marine sectors (excluding marine tourism), the average increase in international exports between 2010 and 2019 was 1.4% (again, when adjusting for inflation), with a nominal value of £2.3 billion in 2010 vs. £3.1 billion in 2019.

Scotland exported £1,019 million worth of fish and seafood in 2021, an increase of 16.2% on 2020 and a decrease of 5.1% on 2019 (when adjusting [HMRC regional trade figures](#) for inflation). The volume (net weight) of Scottish exports increased: in 2021, Scotland exported 205 thousand tonnes of seafood overseas, an increase on both 2020 and 2019 volumes. This is in contrast to the overseas seafood export

¹⁰ This is referring to Gross Expenditure on Research and Development and includes spending by businesses, higher education, government, and private non-profits.

¹¹ Adjusted for inflation using the [GDP deflators at market prices](#) published by HM Treasury on March 2022.

values and volumes from the rest of the UK, which have steadily decreased since 2018/19.

2.3.4 Sub-outcome 4: Scottish ports as facilitators of trade and production

Scottish ports are a vital part of the Scottish economy, providing employment to many coastal communities. They are also a key facilitator of trade and the seafood, offshore energy, and tourism sectors – as well as providing lifeline connectivity for Scotland’s island communities.

In 2020-21, [Transport Scotland's grant contributions](#) to ‘pier and harbour projects’ amounted to £14.2 million, with a further £12.9 million in funding provided to ports and harbours by Marine Scotland through the [European Maritime and Fisheries Fund](#) between 2014-21, and an additional £1.8 million through [emergency support in response to Covid-19](#) during 2021-22. Funding programmes like these, combined with private sources of investment, are key to the continued maintenance and modernisation of Scotland’s ports and harbours. However, investments are not the only potential metric of interest – the general efficiency and throughput of existing ports and harbours, and their management, are key to continued trade and competitiveness.

[The Transporting Scotland’s Trade 2020 publication](#) shows that in 2019, seaport freight accounted for a third of all domestic and international freight carried in Scotland. Scotland’s eleven major ports facilitate trade with over 100 destinations worldwide – most of this trade is outbound. However, the volume of port freight has followed a downward trend over the previous two decades. Since its peak around 2000, Scottish port freight volumes have nearly halved (by comparison, UK port freight decreased by 15% on 2000). This decrease was largely driven by decreases in oil exports (see the [Department for Transport’s Maritime Statistics](#) for more detail).

2.4 Food Security, Health, and Nutrition

Scotland is a global leader in healthy, quality, sustainably harvested and farmed Blue Foods, for our own population and beyond.

Summary of current outcome status

Scotland accounts for the majority of the UK's seafood production, and for 0.3% of global seafood production. Fish stock sustainability has improved in Scotland's fisheries over the last decade, but work remains to be done. Sustainability in other food sectors such as aquaculture and processing is equally important, but harder to measure. Despite Scotland being a major seafood producer, the people of Scotland do not consume the recommended amount of oily fish.

2.4.1 Sub-outcome 1: Scottish seafood on the global stage

Scotland is a major producer of fish and seafood: Scottish vessels landed 393,000 tonnes of fish and seafood into ports in 2019, worth nearly £600 million at first sale. Landings by Scottish vessels accounted for more than 60% of all landings by the UK fleet.¹² Similarly, Scotland's aquaculture production accounted for roughly 90% of total aquaculture production by volume in the UK in 2019.¹³

The UK as a whole ranked 30th in the world in terms of fish and seafood production volume, while Scotland on its own ranked 38th, accounting for 0.3% of global production.^{13,14} Most of the UK's production is from Scottish wild capture production. Scottish landings of *Nephrops*, for example, accounted for roughly two-thirds of global *Nephrops* production, with other species like Atlantic mackerel and Great Atlantic scallops accounting for 17% and 32% of global capture production, respectively.¹³ Similarly, Scotland's aquaculture production of Atlantic salmon in 2019 accounted for 8% of global production. Measuring success in this outcome should also take account of sustainability.

2.4.2 Sub-outcome 2: Sustainable Scottish seafood production

Sustainability is a key consideration in resilient production systems and food security in Scotland: all aspects of the fish and seafood supply chain, including commercial fishing, aquaculture, processing, transport, and retail have roles to play in a

¹² Note that 2020 and 2021 fisheries data for Scotland was also available at the time of writing (see [Scottish Sea Fisheries Statistics](#)), but that at this time only data up to 2020 was available for global seafood production (via [FAO](#)); 2019 was chosen here as a pre-Covid base year.

¹³ Analysis of the [Scottish Fish Farm Production Survey](#), [Scottish Shellfish Farm Production Survey](#), and [Scottish Sea Fisheries Statistics](#); and [global seafood production data](#) obtained from FAO.

¹⁴ Excluding production of crocodiles, alligators, whales, seals, and walruses; and splitting the UK into 'Scotland' and 'the rest of the UK'.

sustainable food supply. This extends more widely to other activities and sectors in the Blue Economy as we continue to use, and benefit from, marine resources.

The [Sustainability of Fish Stocks NPF indicator](#) tracks the status of commercial fish stocks of importance to Scotland. In 2020, an estimated 69% of commercial fish stocks of importance to Scotland were fished at sustainable levels. This is a 35 percentage point increase on 2000, demonstrating the ongoing overall recovery of commercial fish stocks.

Sustainable aquaculture is also key to a sustainable global food supply, since it is a major source of both Scottish and global seafood production. The Food and Agriculture Organization of the United Nation's (FAO) [State of World Fisheries and Aquaculture 2022 publication](#) highlights that since the 1990s, global production of seafood for food purposes from aquaculture has substantially increased, as has consumption. In 2020, aquaculture production accounted for 49% of total global seafood production – most of this was from inland aquaculture production. Scotland produced just over 200,000 tonnes of Atlantic salmon in 2019 (Scotland's primary aquaculture product and largest food export), accounting for roughly a third of total Scottish seafood production in 2019.^{13,15}

Data on sustainability in the aquaculture sector (covering environmental, economic and social sustainability) is complex and often not adequately transparent, and so the current status or trend in sustainability is difficult to assess. For recent environmental sustainability data in aquaculture, see, for example, the publication of [environmental data on Scotland's Aquaculture website](#) and reporting of [environmental performance by SEPA](#). The forthcoming Vision for Sustainable Aquaculture will seek to support greater collaboration and information-sharing across the whole supply chain in order to develop productivity and reduce adverse impacts. Certification programmes and labels, like those run by the [Aquaculture Stewardship Council](#), are a useful signal for buyers and consumers concerned about the seafood they consume.

2.4.3 Sub-outcome 3: Dietary benefits of seafood

Fish is a great source of protein, vitamins and minerals, and oily fish also contains omega-3 fatty acids which are believed to help reduce the risk of heart disease (see e.g. the [British Medical Journal, 2020](#)). [Food Standards Scotland](#) recommends (based on [advice from the Scientific Advisory Committee on Nutrition](#)) that adults should aim for two portions (2 x 140g) of fish a week, including a portion of oily fish. Population level intakes in Scotland do not meet this recommendation.

[Published data from the Living Costs and Food Survey](#) (LCFS) shows that Scottish consumers purchased on average 157 g (£1.36) of fish and seafood per week in 2018/19, the majority of which was for in-home consumption – this was about 3% less than the UK average (by volume) and falls well short of the recommended 280 g. The largest category of fish consumed in-home in 2018/19 was fish as part of

¹⁵ Note that 2019 is used as a base year here again to remain consistent with other quoted global production figures.

ready meals (42% of in-home purchase volume), while fried white fish dominated the eating-out market (70% of eating-out purchase volume). [Food Standards Scotland's monitoring of the LCFS data](#) shows that between 2016 and 2018, oil-rich fish consumption was 33 g per person per week.

[Research published in 2021](#) shows that regular access to seafood among young people (age 11-16) is limited: only 37% of young people had consumed seafood 'in the last week', with 9% having never tried any type of seafood. Whitefish was the most commonly consumed species, followed closely by salmon. In addition, young people from more deprived areas were less likely to consume a range of seafood compared to those from less deprived areas.

2.5 Social Inclusion and Equalities

Thriving, resilient, regenerated, healthy communities have more equal access to the benefits that ocean resources provide.

Summary of current outcome status

Two-thirds of people in Scotland live within a five-minute walk from their nearest green or blue space, with more than half of people visiting the outdoors at least once a week. The 2022 [Ocean Literacy in Scotland](#) report shows that respondents in Scotland value the marine environment and recognise the benefits that it brings to their physical and mental health. Data on fair work and diversity within marine sectors is currently limited. Employment within marine sectors (excluding tourism) remains male-dominated, and there remains work to be done to ensure marine sectors – a key source of employment for people living in coastal communities – are inclusive and equitable.

2.5.1 Sub-outcome 1: Access to marine environments

Scotland's people have a varied and rich relationship with the coast and sea. For many, it is a great place for leisure activities, like hiking, wildlife watching, sailing, or swimming. For others, it is front and centre in their day-to-day lives. This may be through fishing, transport, offshore energy, research, or volunteering to clean up beaches.

The 2020 [Attitudes in Scotland on the Marine Environment and Marine Issues](#) survey showed that those who live near the coast realise they are 'fortunate' to have easy access to the marine environment for leisure. Easy access to the coast is viewed as a valuable and low-cost activity, especially useful for spending time outdoors, keeping active, improving mental wellbeing, and entertaining younger people and children. However, improvements in facilities (such as a lack of clean and/or working toilet facilities, availability of drinking water, and walkway maintenance/accessibility) were commonly sought after by users of these spaces. The cost of parking was also highlighted as a deciding factor in people's ability and desire to visit coastal areas.

Data from the [Scottish Household Survey](#) (SHS) showed that in 2019, 66% of adults in Scotland lived within a 5-minute walk from their nearest green or blue space. These adults were also more likely to use their nearest blue or green space more often: 44% of those who lived within a 5-minute walk used it every day or several times per week (compared to 20% of those who live more than a 5-minute walk away). Across Scotland, people living in the most deprived areas, people in the 75+ age group, and people from ethnic minorities were least likely to live within a 5-minute walk of a green or blue space.

Furthermore, using the same SHS datasets for 2019, 57% of Scotland's residents rated their neighbourhood as 'a very good place to live' – this has remained fairly stable since 2011. A custom extract of the 2019 SHS dataset shows that residents in

coastal communities¹⁶ were slightly less likely to rate it as high, with 54% rating it as a 'very good place to live'. Generally, neighbourhood perceptions increase with age: just over two-thirds of adults aged 75 and over in both Scotland and Scottish coastal communities rated their neighbourhood as a 'very good place to live' in 2019. Additionally, adults from a white ethnic background, adults with no disability, and adults living in less deprived areas all rated their neighbourhood more favourably – in both Scotland as a whole and in coastal communities. Residents in 'remote rural' coastal communities generally rated their neighbourhoods more highly (75% rated it 'very good') than those living in large urban coastal communities (50%).

SHS data for 2019 also shows that 56% of adults in Scotland are estimated to have visited the outdoors at least once a week. Adults who self-report as 'healthy' or 'very healthy', younger adults, and adults living in less deprived areas were all more likely to visit the outdoors weekly than other groups. Men were also somewhat more likely to visit outdoor spaces than women, although this varies by year. Similarly, the custom extract obtained for SHS shows that 57% of adults in coastal communities visit green or blue spaces at least once a week on average.

The 2022 [Ocean Literacy Survey](#) shows that residents in Scotland appreciate the physical and mental health benefits that the marine environment gives them. A total of 83% report that visits to the marine environment are good for their mental health and 80% report that visits are good for their physical health.¹⁷

Much of the 'blue space' being enjoyed for leisure activities is coastal bathing water, the quality of which has seen improvement since 2015 (as reported by [SMA 2020](#)). This reflects SEPA's aim to bring all bathing waters to 'sufficient' or better quality. As of November 2022, [SEPA data shows that only two sites did not meet this standard](#) (Kinghorn Harbour Beach and Lower Largo), with roughly 84% of sites classed as either 'excellent' (38 sites) or 'good' (35 sites).

2.5.2 Sub-outcome 2: Employment, diversity and inclusion in marine sectors

Scottish [marine sectors employed 75,500 people in 2019](#), comprising 2.8% of the [total Scottish employment](#). Combined marine sectors had a gross value-added per head of £66,800 in 2019, roughly 25% higher than the Scottish average of £53,524.¹⁸ Employment in Scotland's marine sectors decreased in 2020 to 68,600 (-9%), mainly due to the 21% decrease in the marine tourism sector.

¹⁶ Coastal communities refer to settlements – as per the [National Records of Scotland's definition of settlements](#) – containing at least one data zone bordering the coast (mean high water spring).

¹⁷ See the Ocean Literacy outcome's status review in this document for more information on the Ocean Literacy Survey.

¹⁸ Note that 2020 data for employment in marine sectors was also available at the time of writing (see [Scotland's Marine Economic Statistics 2020](#)), but that both employment and GVA were impacted by the onset of the Covid-19 pandemic and likely not reflective of the 'status quo'.

Similar to Scotland's Marine Economic Statistics' GVA figures, the employment figure excludes employment in the offshore wind sector because of data limitations. [ONS survey data](#) shows that direct employment in the offshore wind sector was estimated at 1,600 full time equivalent (FTE) employees in 2019, and 2,200 in 2020. This figure is not directly comparable to the number of employees referenced for the Scottish marine economy above as it is based on FTE rather than headcount.

Inclusion in businesses and organisations operating in coastal communities or in Scotland's seas is key to building and maintaining resilient and thriving coastal communities. A lack of employment or advancement opportunities may be a barrier for someone living in a coastal community. The latest Scottish [Annual Population Survey \(APS\)](#) for 2021 shows that employees in the combined 'agriculture, forestry, and fishing' sector were more likely to have a permanent contract or earn a real living wage (in 2020) compared to employees in Scotland as a whole. However, employees in this sector were less likely to be a woman, minority ethnic, or disabled. Note that this combined 'agriculture, forestry, and fishing' sector does not include any other marine sector.

A custom (unpublished) extract of the APS dataset shows that for marine sectors (excluding tourism), employees were also more likely to be male, with 79.6% of those employed aged 16+ or over being male. This gender disparity is particularly prevalent in fisheries: data from [the 2021 'Employment in the UK Fishing Fleet' survey by Seafish](#) suggests that only 0.3% of Scottish fishers are female, with 1% of fishers sampled in the UK being female.

Fisheries (including fishing communities) is one of the few Blue Economy sectors where a [detailed review of gender representation and attitudes \(Scottish Government, 2022\)](#) has been undertaken. From this study, we know that women in Scottish fisheries make significant contributions to coastal communities and the fishing industry. Women are currently mostly employed in onshore roles, such as administration and seafood processing, and are often also responsible for (unpaid) domestic work and childcare. They are also under-represented in offshore and senior leadership positions in fisheries. The study concludes that fisheries' reputation as being a male-dominated sector, along with reports of sexist attitudes, behaviour, and language, can discourage women from entry. At present, the lack of equivalent studies in other Blue Economy sectors means that it is not possible to assess the extent to which issues relating to representation and attitudes also occur.

2.6 Ocean Literacy

Scotland is an ocean literate and aware nation.

Summary of current outcome status

The 2022 [Ocean Literacy in Scotland](#) report shows Scottish residents' current understanding and knowledge of the marine environment and attitudes towards protecting it. A majority of Scottish residents know of, have heard of, or have some understanding of key Blue Economy terms including climate change, sustainable fishing, Marine Protected Areas, and biodiversity. 85% of residents stated that protecting the marine environment is important (or very important) to them personally. 79% of residents have already made, or likely plan to make, lifestyle changes to protect the marine environment. Besides making lifestyle changes, other common actions taken included signing petitions, voting for parties with strong marine environmental protection policies, and persuading others to do more.

2.6.1 Sub-outcome 1: Awareness and knowledge

[Marine Scotland commissioned a survey in 2019](#) on the attitudes and behaviours of Scottish residents towards the marine environment. It showed that generally, knowledge about various marine sectors amongst respondents was low. Scottish respondents were most knowledgeable about renewable and non-renewable energy, coastal tourism, recreation, and cruises. Nearly half of Scottish respondents said they have learned about the Scottish marine environment through films or documentaries – but there remained a strong appetite to learn more.

The topic of 'ocean literacy' was further explored through the [Scottish Government Survey on Ocean Literacy](#), commissioned in partnership with the [Department for Environment Food & Rural Affairs](#), [Natural Resources Wales](#) and the [Ocean Conservation Trust](#). This survey was published in November 2022 as part of the 'Understanding Ocean Literacy and Ocean Climate-related Behaviour Change in the UK' project, to better understand public awareness and attitudes towards the marine and coastal environment.

This survey shows that a majority of respondents in Scotland knew of, had heard of, or had some understanding of key Blue Economy terms including climate change, sustainable fishing, Marine Protected Areas, and biodiversity. However, more than half of respondents have never heard of key terms describing the state of our ocean, how we impact it and how it impacts us, such as blue carbon, natural capital, and eutrophication.

Similarly to the 2019 survey outlined above, the Ocean Literacy Survey showed that people mostly get their information about the marine environment from the news (45%) and television or radio (44%).

Public awareness of the importance of energy from renewable sources, and climate change in general, has increased over the last decade. The [SHS](#) shows that in 2019, 68% of adults view climate change as an 'immediate and urgent problem', up from 46% in 2013. In general, awareness is high. However, this view is most common in

adults that are in the 35-44 and 45-59 age groups, professional or degree-educated, and/or living in the 20% least deprived areas. In the Ocean Literacy Survey, nearly all respondents (90%) agreed that human activity contributes to climate change – either as the sole driver (50%) or in combination with other natural processes (40%).

2.6.2 Sub-outcome 2: Attitudes and actions

Scotland has a longstanding and rich coastal cultural heritage. This cultural heritage includes remains of pre-historic coastal settlements, built structures such as harbours, lighthouses and shipbuilding yards, ecclesiastical buildings, castles, wartime defences and wrecks of ships and aircraft offshore. These help create a sense of place, wellbeing and identity, enhancing the distinctiveness of the coast, attracting visitors to Scotland and contributing to the economy. For context, [Scotland's Marine Recreation and Tourism Survey](#) (SMRTS) surveyed activities that are marine related, many of which, though not all, are based around the historic environment or cultural heritage. The SMRTS findings indicated that activities such as scenic drives, bus tours, and visits to historic sites, museums and other visitor attractions around the coast account for around £230 million of annual expenditure in 2015, just over 6% of total expenditure on marine recreation and tourism activities the same year.

The [Ocean Literacy](#) report for Scotland shows that respondents in Scotland value the marine environment, with 85% feeling that it is important to protect it, and just over half of respondents stated that their overriding emotional response to the marine environment is that of 'concern'. Mental and physical health were given as the top reasons for visiting the marine environment, and a quarter of respondents said they felt 'calm' or 'relaxed' while there.

Nearly eight in 10 respondents (79%) are willing to make lifestyle changes and take individual action to protect the marine environment. The main reasons given for these changes were concerns about the climate (67%) or a wish to be 'greener' (63%).

The survey reveals positive environmental behaviour from people in Scotland through individual actions, with the top three being recycling, reducing use of single-use-plastic and reusing plastic. Other pro-environmental behaviours included switching off lights, heating and appliances to save energy, reducing water usage, and walking, cycling or using public transport instead of driving short distances. Individuals' decisions about purchasing seafood were influenced by whether or not the fish was endangered or over fished, if the product was environmentally friendly, and if it was locally caught.

2.6.3 Sub-outcome 3: Community involvement and decision-making

Data on community involvement and decision-making is not readily available (and hard to measure). Proxies that could tell us something about community cohesion include questions on neighbourhood involvement from the SHS, or the land or assets under community ownership in coastal communities.

Data from the [2019 SHS publication](#) shows that the percentage of people agreeing with statements about their involvement with other people in the neighbourhood generally increases when moving from urban to rural areas. For example, 93% of people living in remote rural areas felt that they could rely on someone in their neighbourhood to help them, compared to 85% of people on average in Scotland, and 82% of people living in large urban areas. Additionally, people living in rural areas also generally participate in volunteering more – this is true for both formal and informal volunteering. For example, 33% of adults living in remote rural areas provided unpaid help to organisations or groups, compared to 26% of adults in Scotland as a whole and 24% in large urban areas.

The NPF has included an indicator for [Community Ownership](#) since 2019 which shows that the number of community-owned assets has steadily increased since 2000, with 711 assets in community ownership in 2021. Just under 98% of community-owned land is in remote rural areas (60% by number of assets), and 72% of all community-owned land is on Na h-Eileanan Siar alone. In 2021, there were seven community-owned marine assets: two piers, two slipways, a ferry, a boat, and salmon fishing rights for a river. A custom extract of this data shows that there were a further 188 assets (e.g. land and/or buildings) that were community-owned in coastal communities¹⁹, representing just over 26% of total community-owned assets in Scotland.

¹⁹ Using the same definition for ‘coastal communities’ as in footnote 16.

3 Monitoring and Evaluation

Monitoring progress and evaluating whether actions are delivering the Blue Economy Vision is vital to ensure effective delivery. This will require identifying a suite of metrics and indicators across the six Blue Economy outcomes that can be used to measure progress, alongside studying the impacts of our specific actions to evaluate and improve.

As part of the status assessment in this document, we have reviewed existing data sources and routine reporting to understand the extent to which this data could be used to monitor progress towards the Blue Economy outcomes.

Data monitoring (over long, medium and short term) is an important basis for evaluation. The existing data sources set out below, along with potential new data collections and research (like the recently published [Ocean Literacy Survey](#)), can be used to establish the progress that has been made towards achieving the Blue Economy outcomes, and to help us improve policies and inform decisions.

The UK Government's [Magenta Book \(2020\)](#) outlines key principles of effective monitoring and evaluation – namely that evaluations should be useful, credible, robust, and proportionate. We will use this status review as a basis to develop a 'monitoring and evaluation framework' suitable for the Blue Economy vision.

Box 1. Monitoring and evaluation framework

'Monitoring' is an ongoing and regular assessment of progression towards a set of objectives. Generally this requires data – either existing data, like the data outlined in this status review, or new data collection.

'Evaluation' typically refers to a rigorous and impartial assessment of the impacts, including any unintended impacts of a particular intervention, which can promote accountability, learning, and provide recommendations for future interventions.

A **'monitoring and evaluation framework'** provides a plan and method for the delivery of these two processes. It maps indicators to outcomes, sets out what data to collect, and the methods to be used to collect that data, along with the sequence and timing of activities involved.

4 Overview of Data Sources

This section shows, for each of the six outcomes, a selection of data sources used in the current status review. This is not an exhaustive list of all potential data sources relevant to a particular Blue Economy Outcome. In many cases, more comprehensive overviews are available through assessments like the [UK Marine Assessment](#) or [Scotland's Marine Assessment](#).

Natural Capital

Sub-outcome	Description	Source	Frequency	NPF indicator	National Statistics	Data availability	Coverage
Healthy marine environment & Clean marine environment	OSPAR Quality Status Report, assessment of the environmental status of the North East Atlantic.	Quality Status Reports - OSPAR-OAP (Prod)	Most recent reports are 2010 and 2023 (with an intermediate assessment for 2017 available as well)	No	No	Depends on the assessment, most contain data up until 2022	The North East Atlantic (subregions of relevance to Scotland are Arctic Waters, Greater North Sea, Celtic Seas, and the Wider Atlantic)
Healthy marine environment & Clean marine environment	Assessment of both the state of Scotland's seas and of the main activities and pressures in the various UK Marine Regions and Offshore Marine Regions	UK Marine Assessment	Every 6 years (most recent report is 2018)	No	No	-	UK
Healthy marine environment & Clean marine environment	Assessment of both the state of the UK's seas and of the main	Scotland's Marine Assessment (SMA)	-	No	No	-	Scotland

environment	activities and pressures in the various Scottish Marine Regions and Offshore Marine Regions						
Healthy marine environment	Marine and terrestrial species indicators	NatureScot	-	No	No (Experimental)	1994-2016	Scotland
Healthy marine environment	The Seabird index (abundance of breeding seabirds) is used in the NPF as an index for the abundance of marine species. However, the SMA shows a complex picture when multiple food-web components are assessed.	NPF Biodiversity Indicator and/or SMA NatureScot information on Marine Abundance Indicator	Annual	Marine abundance part of NPF biodiversity indicator	No	2013-18	Scotland
Healthy freshwater environment	Estimated numbers of returning Atlantic salmon, size of salmon, catch numbers for salmon and trout, and estimates of young salmon (smolt)	Salmon and sea trout (SMA)	Annual	No	Yes	1971-2018	Scotland

Healthy freshwater environment	River gradings	Salmon fishing: proposed river gradings for 2023 season		No	No	-	Scotland
Clean marine environment	Clean seas: contaminant assessments in Scottish marine waters showing concentrations that are unlikely to harm marine organisms.	NPF Clean Seas Indicator and/or SMA	Annual	Yes	No	2015-19	Scotland
Clean marine environment	Eutrophication, marine litter, microbiological contamination, noise	SMA	Annual	No	No	-	Scotland
Clean freshwater environment	Percentage of freshwater surface bodies rated good or better.	River basin management planning (SEPA)	-	No	No	-	Scotland
Safeguarded marine environment	No data identified yet	-	-	-	-	-	-
Natural capital	No data identified yet (existing sources focus on UK Marine or Scotland as a whole, but not Scottish marine)	-	-	-	-	-	-

Climate Change

Sub-outcome	Description	Source	Frequency	NPF indicator	National Statistics	Data availability	Coverage
Decarbonisation	Marine vessel emissions (excl. naval) part of Scottish Greenhouse Gas Statistics	Scottish GHG Statistics	Annual	Shipping and fishing are included as part of NPF greenhouse gas emissions	No	1998-2020	Scotland
Decarbonisation	Scottish fishing fleet's engine power	Scottish Sea Fisheries Statistics 2021	Annual	No	Yes	1922-2021	Scotland
Marine renewable energy	Energy generation by offshore wind from Scottish Energy Statistics Hub, expressed as total of energy generation	Scottish Energy Statistics Hub	Annual	Offshore wind energy generation is part of NPF renewable energy indicator	Yes	2007-2021	Scotland
Marine climate change adaptation	No data identified yet	-	-	-	-	-	-
Circular economy	No data identified yet	-	-	-	-	-	-

Economy and Trade

Sub-outcome	Description	Source	Frequency	NPF indicator	National Statistics	Data availability	Coverage
-	Scottish Quarterly GDP	Gross Domestic Product: Quarterly	Quarterly	Yes	Yes	1998 Q1 – 2022 Q3	Scotland

		Output by Industry					
Productive marine sectors	Measure of the economic value of the Scottish Marine Economy (excl. offshore wind)	Scotland Marine Economic Statistics (SG)	Annual	No	No (Experimentally)	2016-20	Scotland
Productive marine sectors	Measure of the economic value of the Scottish offshore wind sector	Low carbon and renewable energy economy estimates (ONS)	Annual / tba	No	No (Experimentally)	2014-20	Scotland
-	Global investment into offshore renewable energies	Blueprint for improved measurement of the international ocean economy : An exploration of satellite accounting for ocean economic activity (OECD) using IEA data	..	No	No	2019	World
Innovative and entrepreneurial marine sectors	High-growth businesses across Scottish industry sectors (not Blue Economy specific)	High Growth Businesses (NPF)	Annual	Yes (High Growth Businesses)	Yes	2010-21	Scotland

Innovative and entrepreneurial marine sectors	Innovation active businesses in Scotland (not Blue Economy specific)	UK innovation survey 2021: results for Scotland	Bi-annual	Yes (Innovative Businesses)	No	2010-21	Scotland
Innovative and entrepreneurial marine sectors	Expenditure on R&D in Scotland (not Blue Economy specific)	Gross expenditure on research and development Scotland 2019 incl. custom extract	Annual	Yes (Spend on Research and Development)	Yes	2001-19 (custom extract for 2019)	Scotland
Internationally competitive marine sectors	Scottish international and rest-of-UK exports (not Blue Economy specific)	Export Statistics Scotland 2019	Annual	Yes (International Exporting)	Yes	2002-19	Scotland
-	Scottish GDP	GDP Quarterly National Accounts: 2021 Quarter 4	Quarterly / Annual	Yes (Economic Growth)	Yes		Scotland
-	Exports to GDP ratios of other countries, e.g. Denmark	Denmark Trade Statistics (WITS, World Bank)	Annual	-	-	2004-20	World
Productive marine sectors	Value in £ of Scottish seafood exports (adjusted for inflation)	HMRC RTS (with GDP deflators applied)	Quarterly	No	Yes	2013-21	Scotland
Productive marine sectors	A combination of Marine Fund Scotland	Transport Scotland contributions and	Quarterly	No	No	2020/21 and 2021/22	Scotland

	and Transport Scotland payments (reliable sources for private investment were investigated but are currently not included in status review)	Marine Fund Scotland 2021-2022					
Productive marine sectors	Seaport freight in and out of Scotland	Transporting Scotland's Trade - 2020 edition (Transport Scotland)	-	No	No	2018-20	Scotland

Food Security, Health, and Nutrition

Sub-outcome	Description	Source	Frequency	NPF indicator	National Statistics	Data availability	Coverage
Sustainable Scottish seafood production	Sustainability of commercial fish stocks	Sustainability of Fish Stocks (NPF) and/or SMA	Annual	Yes (Sustainability of Fish Stocks)	No	1991-2020	-
-	Global production of fish and seafood	The State of World Fisheries and Aquaculture 2022 (FAO)	Annual / bi-annual	-	-	1994-2022	World
	FSS monitoring of food consumption data	Estimation of food and nutrient intakes from food purchase data in Scotland	-	No	No	2001-2018	Scotland

		between 2001 and 2018 (FSS)					
Dietary benefits of seafood	Quantity of seafood purchased per consumer per week in Scotland	Family Food Datasets (Defra) using data from the LCFS	Annual	No	Yes	2001-2021	Scotland
Dietary benefits of seafood	Types of seafood consumed by young people	E. Jones, C. Chikwama (2021). Access to marine ecosystems services: Inequalities in Scotland's young people. Ecological Economics, Volume 188. ISSN 0921-8009.	-	No	No	2016 (using results from the Young People in Scotland survey)	Scotland
Scottish seafood on the global stage	Scottish fish and seafood production: fisheries	Scottish Sea Fisheries Statistics 2021	Annual	No	Yes	1922-2021	Scotland
Scottish seafood on the global stage	Scottish fish and seafood production: farmed fish	Scottish Fish Farm Production Survey Data	Annual	No	No	1979-2020	Scotland
Scottish seafood on the global stage	Scottish fish and seafood production: farmed shellfish	Scottish Shellfish Farm Production Survey Data	Annual	No	No	1986-2021	Scotland
Scottish seafood on the global stage	Global fish and seafood production	Global fisheries and aquaculture production by source (FAO)	Annual	-	-	2015-19	World

Social Inclusion and Equalities

Sub-outcome	Description	Source	Frequen-cy	NPF indicator	National Statistics	Data availability	Coverage
Access to marine environments	Attitudes to access to marine environments	Marine social attitudes: survey	-	-	-	2019	Scotland
Access to marine environments	Walking distance to nearest blue or green space	Scottish Household Survey (incl. custom extract for coastal communities)	Annual	Yes (part of Access to Green and Blue Space)	Yes	2013-19 (custom extract for 2019)	Scotland
Access to marine environments	Neighbourhood perceptions	Scottish Household Survey (incl. custom extract for coastal communities)	Annual	Yes (part of Social Capital)	Yes	1999-2020 (custom extract for 2019)	Scotland
Access to marine environments	Visits to the outdoors	Scottish Household Survey (incl. custom extract for coastal communities)	Annual	Yes (part of Access to Green and Blue Space)	Yes	2012-19 (custom extract for 2019)	Scotland
Access to marine environments	Quality of marine environment (coastal bathing water)	Bathing Waters (SEPA)	Annual / more frequently	No	No	2005-22	Scotland
Perceived health benefits from visiting marine environment	Percentage of respondents in Scotland saying that visits to the marine environment are good for their health	Scottish Ocean Literacy Survey	Annual	No	No	2022	Scotland

-	Employment within the Scottish Marine Economy (excl. offshore wind)	Scotland Marine Economic Statistics (SG)	Annual	No	No	2016-19	Scotland
-	Employment within the Scottish offshore wind sector	Low carbon and renewable energy economy estimates (ONS)	Annual / tba	No	No	2014-20	Scotland
Diversity and inclusion in marine sectors	Diversity in combined agriculture, forestry, and fishing sector	Labour market statistics (incl. custom extract for some marine sectors)	Annual	No	Yes	2016-21 (custom extract for 2021)	Scotland
Diversity and inclusion in marine sectors	Diversity in fishing sector	2021 Employment in the UK Fishing Fleet (Seafish)	Annual	No	No	2021	UK and/or Scotland
Diversity and inclusion in marine sectors	Gender balance in fishing sectors, unpaid labour, and barriers from entry	Women in Scottish fisheries: literature review	-	No	No	-	Scotland
Community involvement and decision-making	Percentage of people agreeing with statements about their involvement with other people in the neighbourhood	Scottish Household Survey	Annual	Yes (part of Social Capital)	Yes	2012-19	Scotland
Community involvement and	Percentage of people	Scottish Household Survey	Annual	Yes (part of Social Capital)	Yes	2013-19 (formal) and	Scotland

decision-making	participating in volunteering					2018 (informal)	
Community involvement and decision-making	Community ownership	Community Ownership in Scotland (incl. custom extract for coastal communities or marine assets)	Annual	Yes (Community Ownership)	Yes	2017-21 (custom extract for 2021)	Scotland

Ocean Literacy

Sub-outcome	Description	Source	Frequency	NPF indicator	National Statistics	Data availability	Coverage
Awareness and knowledge	Knowledge about marine environments, sectors, etc.	Marine social attitudes: survey	-	-	-	2019	Scotland
Awareness and knowledge	Percentage of respondents in Scotland that know of, have heard of or have some understanding of key Blue Economy terms	Scottish Ocean Literacy Survey	Annual	No	No	2022	Scotland
Awareness and knowledge	Public awareness and concern about climate change	Scottish Household Survey	Annual	No	Yes	2013-2019, now discontinued	Scotland
Attitudes and actions	Economic contribution of Scotland's marine historic environment (tourism activities)	Scotland's Marine Recreation and Tourism Survey	One-off	No	No	2015	Scotland
Attitudes and actions	Percentage of respondents who say that protecting the marine	Scottish Ocean Literacy Survey	Annual	No	No	2022	Scotland

	environment is important						
Attitudes and actions	Percentage of respondents who say they have made or plan to make lifestyle changes to protect the marine environment	Scottish Ocean Literacy Survey	Annual	No	No	2022	Scotland
Attitudes and actions	Percentage of respondents who have already taken action to protect the marine environment	Scottish Ocean Literacy Survey	Annual	No	No	2022	Scotland



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