

# **How much do people in Scotland value characteristics of marine and coastal areas**

**Final Report**

**October 2023**

## Contents

1. Introduction .....	6
2. Literature Review .....	7
2.1 Economic Valuation of the Environment.....	7
2.2 Non-market Economic Valuation Methods .....	7
2.3 Choice Experiments in a Scottish Marine Context .....	8
3. Methodology.....	10
3.1 Rationale for Choice Experiment Research Approach .....	10
3.2 Pilot Questionnaire Development .....	11
3.3 Pilot Testing .....	13
3.4 Final Choice Experiment Design .....	15
3.4.1 Attribute 1: Size of area where change occurs .....	16
3.4.2 Attribute 2: Distance to coast.....	17
3.4.3 Attribute 3: Type of restrictions .....	17
3.4.4 Attribute 4: Wildlife and habitats .....	18
3.4.5 Attribute 5: Educational boards.....	19
3.4.6 Payment vehicle .....	20
3.5 Structure of Final Survey Questionnaire.....	20
3.6 Question for Identifying Protestors .....	21
3.7 Sampling Approach.....	21
4. Results .....	23
4.1 Survey Sample Characteristics .....	23
4.2 Perceptions about Marine and Coastal Areas in Scotland .....	25
4.3 Leisure Visits to Marine and Coastal Areas.....	30
4.4 Choice Experiment Analysis.....	32
4.4.1 Approach .....	32
4.4.2 Preferences for Attributes of Marine and Coastal Areas.....	32
4.4.3 Determinants of Preferences .....	35
4.4.4 Aggregation of WTP Estimates .....	37
5. Validity of Results.....	39
5.1.1 Construct Validity.....	39
5.1.2 Content Validity .....	39
6. Conclusion .....	42
7. References.....	44
8. Annex.....	46
8.1 Annex 1: Statement from CSERGE at the University of East Anglia.....	46

8.2	Annex 2: Acronyms .....	47
8.3	Annex 3. Survey Questionnaire.....	47
8.4	Annex 4: Model Outputs.....	72
8.5	Annex 5: Aggregate WTP Estimates .....	75

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### **Statement from Centre for Social and Economic Research on the Global Environment (CSERGE) at the University of East Anglia:**

“The Centre for Social and Economic Research on the Global Environment (CSERGE) at the University of East Anglia provided support and capacity building in designing and administering the Choice Experiment (CE) study in this project which is aimed at eliciting the value of the Scottish marine environment.

The CE has been developed following the best practices in environmental valuation and stated preferences, therefore we are confident that results can be robustly used to inform Scottish policies on marine management, including impact assessments and cost-benefit analyses. A balanced trade-off between the detailed, science-informed definition of attributes and levels (e.g., biodiversity changes) and the need to simplify complex issues to facilitate respondent’s understanding was required. This resulted in an inevitable generalisation of some aspects of the CE. Nonetheless, the flexibility attained reflects the main characteristics of possible marine management policies (e.g., restrictions). Therefore, the use of results should focus on matching CE outcomes (in particular willingness-to-pay values) with characteristics of potential policy implementation scenarios and keep in mind the resulting uncertainty.”

## Executive Summary

This study was carried out to improve understanding of the economic value people place on key environmental and management characteristics of marine and coastal areas in Scotland. A stated-preferences choice experiment was designed to quantify this value.

An online survey questionnaire was designed in-line with best-practise guidance documents and expert support provided by the Centre for Social and Economic Research on the Global Environment (CSERGE) at the University of East Anglia. Feedback and advice was also received by a Project Steering Group, comprised of scientists, economists and policy officials.

An initial survey design was pilot tested on a sample of 222 people, which provided useful insights to inform the final design. The final questionnaire had a conventional structure and included a choice experiment as well as additional questions on perceptions about marine and coastal areas, leisure visits and respondent's socio-demographics.

In the choice experiment, respondents were asked to select their preferred option for alternative management policies, which were described in terms of 6 attributes:

- Size of area where change occurs
- Distance to coast
- Wildlife and habitats
- Type of restrictions
- Educational public display boards
- Annual household water charge increase

The choice experiment included a total of 36 choice cards which were used to describe alternative management options. In each choice card, two of the options included alternative management options and the other always involved no change at no additional cost. An example choice card is presented in Figure 1 and further details about the definitions used for each attribute and their levels are provided in Section 3 of this report.

Figure 1: Example Choice Card

	Option A	Option B	Option C
<b>Size of area where change occurs</b>	5% of total sea area	7.5% of total sea area	No Change
<b>Distance to coast</b>	Inshore	Inshore	
<b>Wildlife and habitats</b>	Medium increase	Small increase	
<b>Type of restrictions</b>	Moderate	Low	

<b>Educational boards</b>	No	No	
<b>Annual household water charge increase</b>	£50	£50	

A total of 986 complete responses were recorded. On average, respondents took 19 minutes to complete the survey. The survey sample was broadly representative of the Scottish population across age, sex and geographical area they live in (at the local authority level).

Respondents were asked a series of questions about their perceptions of the environmental condition and impact of human activities on marine and coastal areas in Scotland. When asked about the importance of marine industries to Scotland's future, respondents felt that marine renewable energy was the most important. The oil & gas industry was considered by respondents to have the largest environmental impact.

Most respondents reported to have had positive personal experiences of Scotland's marine wildlife and habitats, with 61% rating their experiences 'very good' or 'good'. 19% of respondents thought that the environmental condition of marine and coastal areas in Scotland had improved in the past 5 years, while 36% thought it had stayed the same, 33% thought it had worsened and 11% said they did not know.

The majority of respondents (76%) had visited a marine or coastal area in Scotland in the last 12 months. 20% stated that although they had not visited in the last 12 months they had before and only 4% of respondents had never visited. 'Enjoying the natural environment', 'Walking opportunities' and 'Being able to see wildlife in the area' were the top 3 factors respondents considered when deciding which area to visit.

Overall, results from the choice experiment section of the survey suggest that people in Scotland are supportive of management policies in marine and coastal areas over doing nothing. Results indicate that people in Scotland hold significant values for management policies that result in larger areas changed, larger increases in the number and variety of wildlife and habitats, 'low' and 'moderate' levels of restrictions, and additional educational content. People who have visited a marine and coastal area in the last 12 months, do regular recreational activities, are younger or have a marine industrial connection tend to have stronger preferences for alternative management options over the status quo.

Econometric modelling of the choice experiment results has allowed for the estimation of household willingness to pay (WTP) for marginal changes in the attributes used to describe alternative management policies. WTP has only been reported for attributes that had a statistically significant influence on respondent's choices. WTP estimates have been aggregated to give indicative total WTP values for the Scottish population (see Section 4 for more details):

- Households in Scotland are estimated to hold a total WTP of between £90m-£132m per year (£35-£52 per household) for management policies that result

in a 'large increase' in wildlife and habitats, decreasing to £40m-£80m per year (£16-£32 per household) for a 'medium' increase.

- For management policies that introduce 'low' and 'moderate' restrictions on damaging human activities, households in Scotland are estimated to hold a total WTP of between £28m-£76m (£11-£30 per household) and £40m-£86m (£16-£34 per household) per year respectively.
- Households in Scotland are estimated to hold a total WTP around £20m-£49m per year (£8-£19 per household) to update existing and install additional education boards about wildlife and habitats around marine and coastal areas in Scotland.
- For every additional 1% of total sea area changed by management policies, households are estimated to hold a total WTP of between £2m-£8m per year (£1-£3 per household)<sup>1</sup>.

Expert support and advice to design and carry out this choice experiment has been received by CSERGE at the University of East Anglia. Further guidance has been provided through extensive discussions and feedback from the Project Steering Group. This has helped to produce robust results about how much people in Scotland value characteristics of marine and coastal areas.

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<sup>1</sup> Within the 2.5% and 10% range of total sea area tested in this choice experiment

## 1. Introduction

This report summarises the results of a choice experiment survey that was designed to capture the preferences of Scottish people towards the management of marine and coastal areas in Scotland.

The objective of this study was to improve understanding of the economic value people place on key environmental and management characteristics of marine and coastal areas in Scotland.

The specific research aims were:

- Assess how people in Scotland perceive and interact with marine and coastal areas in Scotland
- Estimate the willingness to pay that people in Scotland have for changes in the characteristics of marine and coastal areas in Scotland
- Examine whether different groups of people in Scotland hold different values for changes in the characteristics of marine and coastal areas in Scotland

This research has been undertaken by the Marine Directorate of the Scottish Government, with technical advice and support provided by the Centre for Social and Economic Research on the Global Environment (CSERGE) at the University of East Anglia. The project has also been supported by a Project Steering Group, who actively participated in steering group meetings and provided extensive advice and feedback throughout the project.

This report is structured as follows:

- Section 2 contains a literature review
- Section 3 describes the research methodology
- Section 4 summarises the results from the choice experiment and other elements of the survey questionnaire
- Section 5 explains how the validity of results has been assessed
- Section 6 concludes

## 2. Literature Review

### 2.1 Economic Valuation of the Environment

Economic valuation is used as a way to measure how much something is worth to people or society as a whole. This can help to inform decision making by improving understanding of the potential welfare costs, benefits and trade-offs associated with allocating resources in different ways (HM Treasury, 2022).

The total economic value associated with environmental goods and services is often split into two broad categories – ‘use value’ and ‘non-use value’.

‘Use value’ relates to the value people place on the environment from directly using it. For example, people may benefit from the environment through the direct use of natural resources (e.g. eating fish) or indirect use such as recreation. Even if they don’t hold a use value, people may also value knowing that the environment exists, is preserved and/or is available for future generations to experience – this is known as ‘non-use value’.

When feasible, the economic value of a good or service is usually inferred from market prices. However, it is often difficult to apply this approach to capture the value of many characteristics of the environment that do not tend to be traded in markets. In cases where the good or service is not typically traded in a market, other valuation methods are usually required (HM Treasury, 2022).

It is important to recognise that economic value is only one way of estimating how much something is worth to people or society. People may hold other important values that cannot be measured in monetary term (e.g. spiritual value) and a discussion on this topic can be found in Dasgupta (2021).

### 2.2 Non-market Economic Valuation Methods

In the absence of market prices, two of the most commonly applied broad categories of valuation methods are ‘revealed preferences’ and ‘stated preferences’.

For some goods and services that are not directly traded in markets, revealed preferences methods can be used to estimate their economic value. This is done by observing people’s behaviour in related markets. Revealed preferences methods capture ‘use value’ but they tend to be unsuitable for estimating ‘non-use value’. As they require observing people’s actual behaviour in markets, they rely on this market data being available. This often limits their applicability, particularly in the case of economic values relating to key characteristics of the marine environment for which there is often limited or no market data available.

Stated preferences methods are an alternative valuation method which involve using carefully designed survey questionnaires to elicit respondent’s willingness to pay or willingness to accept a specified outcome (Bateman et al., 2002). The use of stated preferences methods is recommended in HM Treasury’s Green Book appraisal guidance when robust revealed preferences methods are not available (HM Treasury, 2022). These methods tend to be more flexible than revealed preferences



and they can be applied to a wider range of contexts (Bateman et al., 2002). They are also the only established method to measure both 'use value' and 'non-use value' (Johnston et al., 2017).

The two most established and widely applied stated preferences methods are contingent valuation and choice experiments. Contingent valuation is a survey-based method which involves a single attribute (i.e. price) scenario, where people are asked directly what they are willing to pay for a particular good or service. In contrast, a choice experiment is a multi-attribute valuation approach where the scenario includes a set of goods or services described by its attributes. Respondents report their preference from a combination of several options. A cost or price attribute is usually included to allow for the estimation of willingness to pay for marginal changes in the other attributes.

A key decision to make in the development of a stated preferences valuation study is whether a contingent valuation or choice experiment approach is more appropriate. Contingent valuation tends to be recommended when the researcher is interested in the value of a good or service as a whole (Bateman et al., 2002; Johnston et al., 2017). In contrast, choice experiments are usually more appropriate when investigating the willingness to pay for changes in the individual attributes of a good or service (Bateman et al., 2002; Johnston et al., 2017).

As a choice experiment was deemed to be more suitable to fulfil the research aims of this project, the rest of this section focuses on literature relating to choice experiments (see Section 3.1 for more details on the rationale for adopting this approach).

Every non-market valuation approach offers pros and cons. Stated preferences valuation techniques present their specific limitations. One of these limits is design issues that can impact the validity of choice experiment results. Respondents are assumed to answer truthfully and report values that they are actually willing to pay. However, due to the hypothetical nature of a survey, various biases may impact results and it is important that this is considered during the survey design process (Johnson et al., 2017). Problems can arise if respondents find the survey difficult to understand or do not believe the choice experiment to be realistic or plausible. The reliability and validity of results is often monitored by pre-testing the survey and using follow-up questions to check respondent's understanding (Johnston et al., 2017).

### 2.3 Choice Experiments in a Scottish Marine Context

Choice experiments have been widely applied in areas such as environmental, transport and health economics since the 1970s. They are underpinned by consumer theory presented in Lancaster (1966) combined with random utility theory (Thurstone, 1927; McFadden, 1974). Their use as a non-market valuation method has accelerated since the beginning of the 21<sup>st</sup> century ((Haghani, Bliemer and Hensher, 2021). They are often used to study people's preferences for attributes related to a wide range of topics including recreational choices, biodiversity conservation and ecosystem restoration.

Although choice experiments have been widely applied to value different aspects of the environment, there are a limited number of studies that have focused specifically on marine and coastal areas in Scotland.

Philips et al. 2018 investigated the value of bathing waters and the influence of bathing water quality to people in Scotland. The study involved a mixed methods approach which included stated preferences (an online choice experiment), revealed preferences (travel cost method from an onsite survey) and qualitative research from focus groups. The choice experiment focused on four attributes: bathing water quality, amount of litter at beach most visited by respondents, number of beaches failing to meet water quality standards and the annual water charge for households in Scotland. Results from this study indicate that households in Scotland hold positive preferences for improving bathing water quality, reducing litter on beaches and reducing the number of beaches failing to meet water quality standards.

Kenter et al. 2013 used a combined choice experiment and contingent valuation approach to estimate the value of potential marine protected areas to divers and sea anglers in the UK. Results from Kenter et al. 2013 suggests that divers and anglers hold significant values associated with attributes related to the protection of the marine environment in Scotland. The study assessed preferences for policy proposals that were being discussed at the time, however these have since been superseded<sup>2</sup>.

Jobstvogt et al. 2014 conducted a choice experiment on Scottish households to assess their willingness to pay for additional marine protected areas in Scotland's 'deep-sea' region. The study aimed to estimate the existence value for deep-sea species and the option value of deep-sea organisms as a source for future medicinal products. The attributes chosen to represent these values were the number of protected species and the potential for the discovery of new medicinal products from deep-sea organisms. Overall, results suggested that respondents had positive and significant willingness to pay for both attributes.

There are a number of other relevant studies that have estimated values for attributes of marine and coastal areas in places outside of Scotland (e.g. Börger et al. 2014; Grilli et al., 2022; Paltriguera et al. 2018; McVittie and Moran, 2010). A wide range of attributes have featured in previous studies including (but not limited to): biodiversity levels, protection of specific species or groups of species, marine litter, access restrictions, educational content and water quality. While these studies help to understand the scale of monetary values for different aspects of marine and coastal areas, it is very difficult to directly apply these values to a Scotland specific context.

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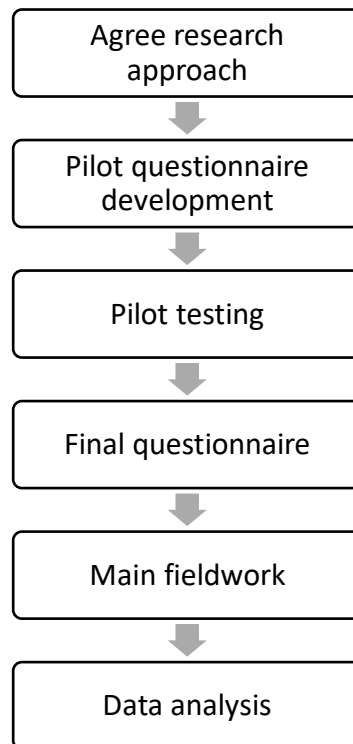
<sup>2</sup> This study assessed values for proposals that included 25 Scottish potential Marine Protected Areas that were being discussed at the time of study.

### 3. Methodology

This section describes the methodological approach for this research. A number of best-practise guidance documents were consulted on to aid the survey design process (Bateman et al., 2002; Johnston et al., 2017; Mariel et al., 2021).

The development of this choice experiment included a number of key steps, as outlined in Figure 2. After agreeing the research approach, an initial online survey questionnaire was designed and tested on a pilot sample. Results from the pilot were discussed with the project steering group and expert input led to questionnaire refinement. A final online questionnaire was designed and the main fieldwork was then undertaken. Results were analysed using a range of choice modelling techniques. Further information about the approach taken at key steps in the design process is detailed below.

Figure 2: Methodology Key Steps



#### 3.1 Rationale for Choice Experiment Research Approach

As the objective of this research was to improve understanding of the value people place on characteristics of marine and coastal areas in Scotland, the first step was to determine whether a revealed preferences or stated preferences valuation method was more appropriate.

A review of previous literature suggested that 'non-use value' was likely to be a considerable component of the total economic value people place on characteristics of marine and coastal areas (Börger et al. 2014; Kenter et al. 2013). Further scoping made it clear that a revealed preferences approach was not going to be an

appropriate way of assessing the economic value of key environmental and management characteristics of marine and coastal areas, due to lack of available market data to infer value from. As it is not possible to estimate 'non-use value' using revealed preferences, a stated preferences method was deemed to be more suitable

The next step was to consider whether a choice experiment or contingent valuation approach would be more appropriate. As discussed in the previous section, choice experiments allow for more information to be gathered about the value people place on specific characteristics of a good or service as opposed to the value of it as a whole. In a marine management policy context, this type of information is likely to be more useful when considering trade-offs between alternative management options of marine and coastal areas.

It was also important to select a method consistent with the underlying theory of welfare economics, of which a choice experiment is (Bateman et al. 2002). This increases the applicability of results to future-cost benefit analysis in the appropriate circumstances.

### 3.2 Pilot Questionnaire Development

The structure of the pilot questionnaire followed a typical choice experiment survey. It included an introduction, initial questions about perceptions of marine and coastal areas, a choice experiment, follow-up questions and additional questions about respondent's behaviours and socio-demographics.

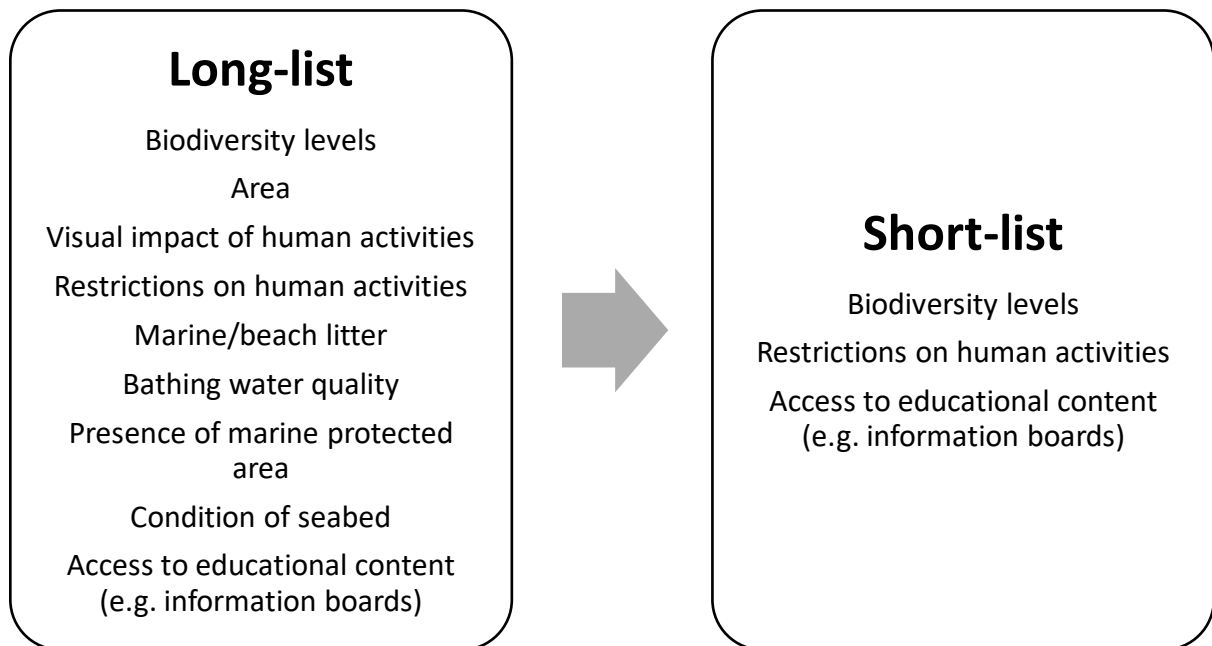
In a choice experiment, it is crucial to develop a credible overarching choice context and present respondents with a realistic mechanism for change (Bateman et al., 2002; Johnston et al., 2017)<sup>3</sup>. The context developed for the pilot was based on plausible alternative management options for marine and coastal areas in Scotland.

This overarching choice context provided a foundation to develop an initial long-list of relevant attribute to discuss with the Project Steering Group (see Figure 3). The long-list was presented to the Project Steering Group and feedback and advice was sought to create a short-list to take forward for pilot testing. Key takeaways from discussions included the difficulty of presenting some attributes on the long-list in a meaningful way (e.g. visual impact of human activities, condition of seabed) and the need to present biodiversity in an understandable way. Attributes relating to biodiversity levels, restrictions on human activities and access to educational content were taken forward. These were thought to be the most relevant when considering the key characteristics that could be impacted by plausible alternative management options for marine and coastal areas.

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<sup>3</sup> The term 'choice context' is used to describes the overall framing of the choice experiment. In the literature, this is sometimes also described as the 'scenario' or 'hypothetical market' and these terms are considered to be synonymous in this report.

Figure 3: Long-list and Short-list of Attributes for Pilot



It is standard practise to include a monetary attribute in a choice experiment. This is called the payment vehicle and allows for the estimation of willingness to pay for marginal changes in the other attributes. The payment vehicle should be realistic, credible, familiar and binding for all respondents to as great an extent as possible (Johnston et al., 2017).

Household's annual water charge was included as the payment vehicle in the initial questionnaire design. The majority of households in Scotland are subject to a water charge. These are unmetered charges and are based on the council tax banding of their home<sup>4</sup>. As a payment vehicle, this appeared to fulfil the conditions of being realistic, credible, familiar and binding for all respondents. It was explained to respondents that each option presented in the choice experiment would require payment in the form of an increase in their annual household water charge to support the introduction, monitoring and enforcement of the new policy.

There are multiple dimensions to consider when designing a choice experiment. This includes the number of attributes, the number of levels, the range of levels, the number of alternative options presented to respondents and the number of choice cards<sup>5</sup> (Mariel et al., 2021). An experimental design for the pilot questionnaire was generated using nGene, a specialist software package<sup>6</sup>. The experimental design consisted of 36 choice cards, separated into 6 blocks of 6. Each respondent was randomly allocated to a block and then asked to complete 6 choice cards.

<sup>4</sup> For more information, see: [Your Charges 2023 - 2024 - Scottish Water](#)

<sup>5</sup> In a choice experiment, there are typically multiple 'choice cards', which all have the same attributes but varying levels of these attributes. Respondents usually fill out several 'choice cards'. See example choice card in Figure 5.

<sup>6</sup> [ChoiceMetrics \(choice-metrics.com\)](#)

Respondents were offered three options to choose from in each choice card. The first two options represented different management policy options with different cost levels. The third option was always a ‘no change’ status quo option which had no additional cost attached to it.

### 3.3 Pilot Testing

A pilot survey was carried out between December 2022 and January 2023, lasting 3 weeks. The purpose of the pilot was to check respondent’s understanding of the choice experiment, identify potential issues with coding on the survey platform and to gather initial results to discuss with the project steering group to inform the final survey design.

A panel of respondents was provided by TGM Research and a total of 222 complete responses were recorded. Respondents took an average of 18 minutes to complete the pilot. A small number of responses were excluded from the total number of completes as they took less than 5 minutes to complete the survey and displayed behaviour consistent with ‘speeding’ through it (e.g. clicking the same response each time). Despite a relatively small sample, the pilot sample broadly aligned with the target population across age and sex (see Table 1).

Table 1: Pilot Survey Sample Characteristics

<b>Characteristics</b>		<b>Pilot (% of total)</b>	<b>National (% of total)</b>
Age group	16-24	15%	12%
	25-34	18%	17%
	35-44	16%	15%
	45-54	16%	16%
	55-64	15%	17%
	65-+	21%	23%
Sex	Female	53%	51%
	Male	47%	49%

Figures may not sum due to rounding.

Results from the pilot suggested respondents had a good understanding of the trade-offs in the choice experiment presented to them. A mixture of open-ended and multi-choice questions were posed to respondents after they completed the choice tasks. These questions were designed to test respondent’s understanding of the choice tasks and allow them to feedback suggestions for design improvements.

Respondents were asked an open-ended question about what they were generally thinking about when completing the choice cards. Results from this question indicated that respondents were trading-off the attributes with the cost attribute as expected (e.g. see Box 1). Further evidence of this is displayed in Figure 4, which shows that in response to this question, ‘cost’ was the most common word used by respondents. These results indicated that the payment vehicle was working as expected and it was therefore included in the final design.



A final question asked respondents how they found the pilot survey. 89% of respondents said it was 'interesting' or 'educational' and only 2% of respondents said that it was 'difficult to understand'. Overall, the pilot survey provided useful insights to inform the final questionnaire.

### 3.4 Final Choice Experiment Design

The attributes and levels used to describe the options presented to respondents were continuously developed and refined throughout the survey design phase. Results from the pilot led to a number of enhancements to the framing of attributes. In response to pilot results and steering group discussions, attributes relating to the size of area changed and distance to coast were included to provide respondents with additional context and increase the applicability of results to different policy settings. Visual aids were added to attribute descriptions and the framing of attributes was refined to aid understanding based on respondent's feedback in the follow-up questions. The final list of attributes and their levels are described below (summarised in Table 2)

Table 2: Final List of Attributes and Levels

<b>Attribute</b>	<b>Levels</b>
Size of area where change occurs	2.5% of total sea area 5% of total sea area 7.5% of total sea area 10% of total sea area
Distance to coast	Inshore (from the coast out to 12 nautical miles (22 kilometres)) Offshore (from 12 nautical miles out from the coast to 200 nautical miles out from the coast (370 kilometres))
Wildlife and habitats	Very small increase Small increase Medium increase Large increase
Type of restrictions	None Low Moderate High
Educational boards	No Yes
Annual household water charge increase	£10 £20 £30 £50 £70 £100



The experimental design of the final choice experiment followed the same structure as the pilot questionnaire, with 36 choice cards separated into 6 blocks. The final survey questionnaire can be found in Annex 3 and an example choice card can be found in Figure 5 below.

Figure 5: Example Choice Card

	Option A	Option B	Option C
<b>Size of area where change occurs</b>	5% of total sea area	7.5% of total sea area	No Change
<b>Distance to coast</b>	Inshore	Inshore	
<b>Wildlife and habitats</b>	Medium increase	Small increase	
<b>Type of restrictions</b>	Moderate	Low	
<b>Educational boards</b>	No	No	
<b>Annual household water charge increase</b>	£50	£50	

#### 3.4.1 Attribute 1: Size of area where change occurs

The size of area where the change could occur was included as an attribute. This was described to respondents in terms of its percentage compared to Scotland's total sea area. To help contextualise the size of area that could be impacted by management policies, respondents were informed that Scotland's seas are nearly six times larger than the land area of Scotland. A visual aid in the form of a graphic showing the extent of Scotland's seas was also provided (see Figure 6). The levels were selected to represent a plausible range of sea area that may be changed based on current management policy commitments.

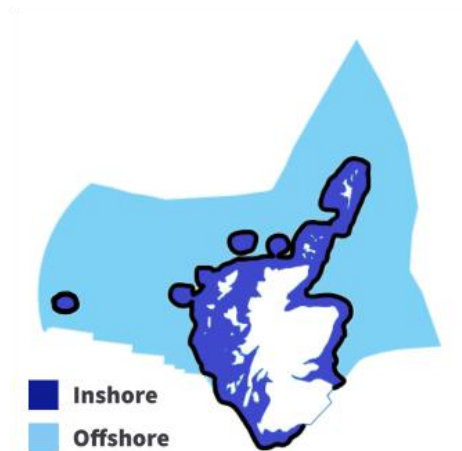
Figure 6: Size of Area Visual Aid



### 3.4.2 Attribute 2: Distance to coast

An attribute related to how far from the coast the new management policies could be introduced was included. Previous research suggests that people hold significant non-use values for offshore marine environments (Börger et al. 2014; Jobstvogt et al. 2014). However, there is limited evidence to show the extent to which people in Scotland have preferences for management policies closer or further away from the coast. It was described to respondents that management policies could either be introduced inshore (from the coast to 12 nautical miles) or offshore (from 12 to 200 nautical miles). A visual aid was also provided to show the extent of Scotland's inshore and offshore sea regions (see Figure 7).

Figure 7: Distance to Coast Visual Aid

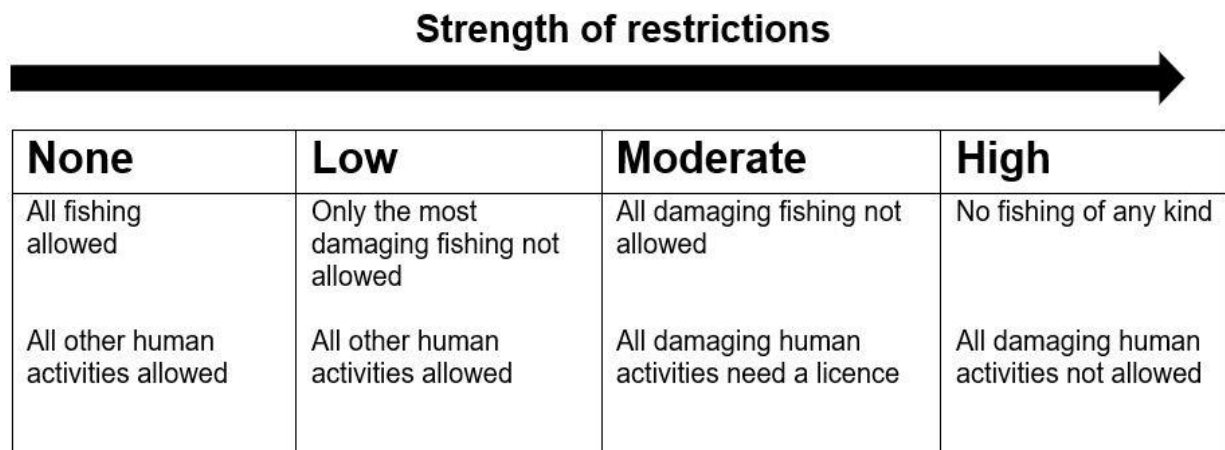


### 3.4.3 Attribute 3: Type of restrictions

A key element of protecting marine biodiversity is reducing the environmental impact of human activities. Area-based measures such as Marine Protected Areas are one of the most commonly used approaches for doing so. This led to an attribute related to the type of restrictions on human activities being included in the choice experiment. It was explained to respondents that new management policies could introduce restrictions on human activities that cause damage to marine wildlife and habitats. Respondents were informed that non-damaging recreational activities would not be impacted by any restrictions.

The levels of attributes were selected based on the different types of restrictions that are typical of Marine Protected Areas. This ranged from no restrictions to high restrictions, which was described as no fishing of any kind and all damaging human activities not allowed. Figure 8 shows the description that respondents were provided for each level of restriction.

Figure 8: Restrictions Visual Aid



#### 3.4.4 Attribute 4: Wildlife and habitats

The Scottish Government’s Biodiversity Strategy to 2045 sets out ambition for Scotland to be Nature Positive by 2030 and to have restored and regenerated biodiversity across the country by 2045<sup>7</sup>. The Blue Economy Vision sets out a long-term outcome for Scotland’s marine ecosystems to be 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<sup>8</sup>. Given this policy context, it was important to include an attribute linked to marine biodiversity.

Previous literature highlights the need to present the complex concept of biodiversity in an easy to understand format (Christie et al., 2006; La Notte et al., 2021). According to a recent survey, around 67% of people in Scotland reported that they felt like they know or have heard of and have some understanding of marine biodiversity (Scottish Government, 2022) This resulted in careful consideration of how to communicate biodiversity in the choice experiment.

There are several examples in the literature that have successfully used simpler proxies for biodiversity (Christie et al., 2006; Börger et al. 2014; etfec, 2022; Jobstvogt et al. 2014; Hynes et al., 2021; La Notte et al., 2021). Approaches have included (but are not limited to) describing biodiversity in terms of the number and/or variety of overall wildlife and/or habitats, the number of specific species or the chance of encountering wildlife and/or habitats.

In this choice experiment, the number and variety of wildlife and habitats was used to describe biodiversity in an easier to understand way. Respondents were informed that new management policies could impact the number and variety of wildlife and habitats. It was then explained that these changes might happen on the seafloor and not be visible to the general population.

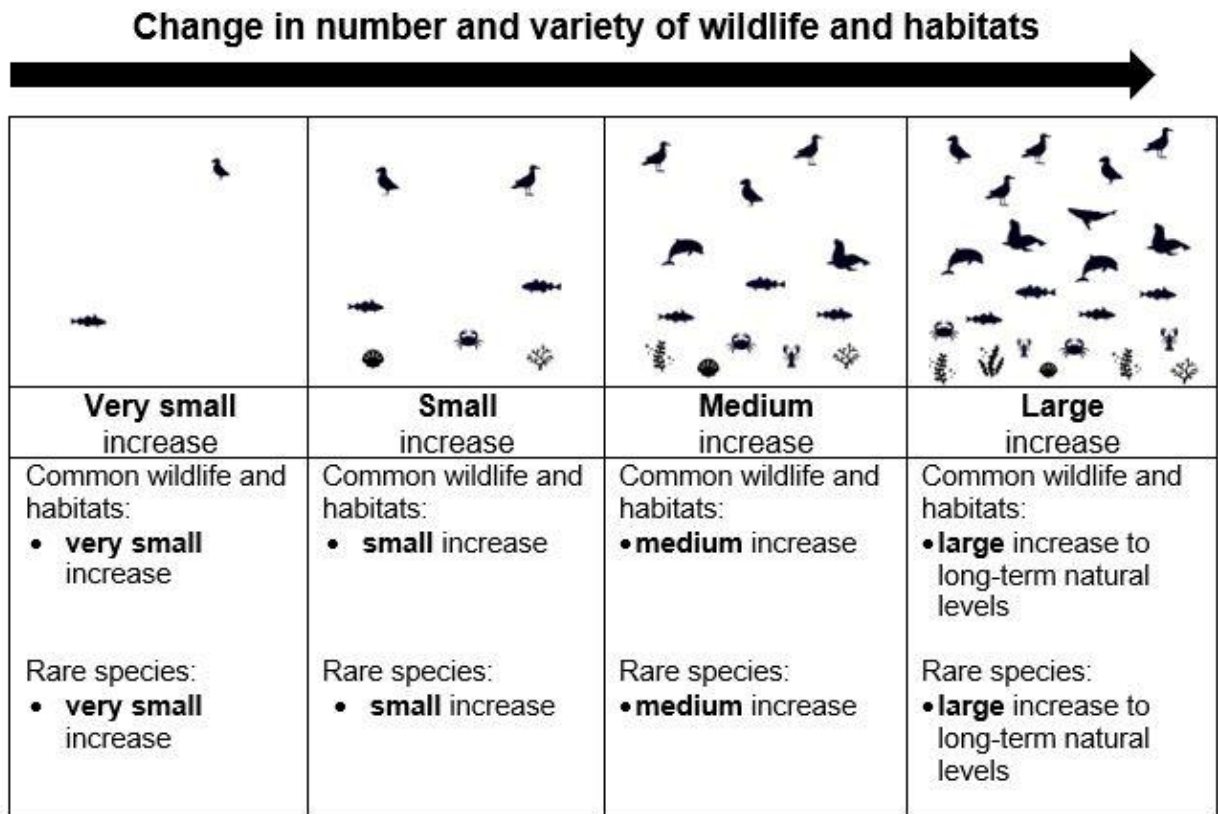
The change presented to respondents was represented by an increase in today’s situation, with levels ranging from ‘very small increase’ to ‘large increase’ (see Figure

<sup>7</sup> [Biodiversity strategy to 2045: tackling the nature emergency - gov.scot \(www.gov.scot\)](https://www.gov.scot/biodiversity-strategy-to-2045-tackling-the-nature-emergency)

<sup>8</sup> [A Blue Economy Vision for Scotland - gov.scot \(www.gov.scot\)](https://www.gov.scot/blue-economy-vision-for-scotland)

9). The 'large increase' level was described to respondents as a large increase to long-term natural levels for both rare and common species. The range of levels was therefore intended to cover the full range of potential wildlife and habitat increases, from a very small increase all the way to what could be considered as full species presence.

Figure 9: Wildlife and Habitats



### 3.4.5 Attribute 5: Educational boards

An attribute related to the provision of educational content in marine and coastal areas around Scotland. Respondents were informed that new management policies could update existing information boards and install new boards with educational content for all ages. This content would be focused on wildlife and habitats in marine and coastal areas around Scotland. This was included to test whether respondents had preferences for additional educational content. As with the other attributes, a visual aid was provided (see Figure 10).

Figure 10: Educational Boards Visual Aid



### 3.4.6 Payment vehicle

The payment vehicle used in the final choice experiment was household's annual water charge. As described above, this was thought to meet the conditions of being realistic, credible, familiar and binding for all respondents to as great an extent as possible (Johnston et al., 2017). Results from the pilot showed that respondents were trading-off the payment vehicle with other attributes as expected and did not indicate any issues.

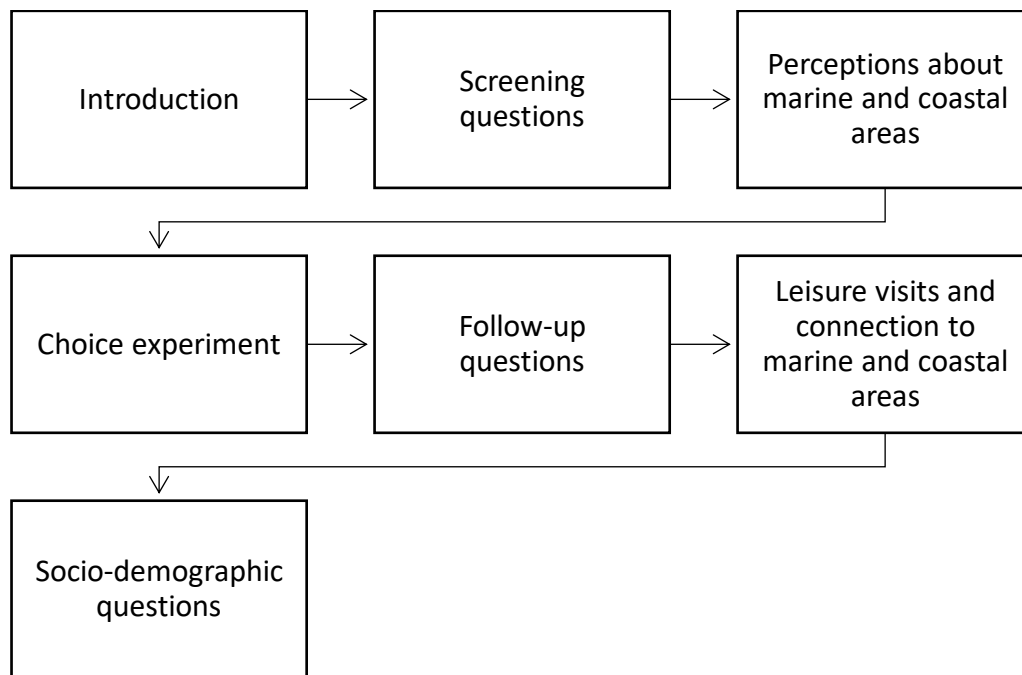
### 3.5 Structure of Final Survey Questionnaire

The structure of the final survey followed a similar format to the pilot (see Figure 11). Respondents were first introduced to the survey and a definition of 'marine and coastal areas' was provided<sup>9</sup>. Screening questions followed for quota monitoring purposes. Respondents were then presented with a series of questions on their perception of marine and coastal areas and the impact of human activities that use these areas. They then proceeded to the choice experiment section of the survey. A range of follow-up questions were included after the choice experiment to check respondent's understanding and identify potential 'protest' respondents (see Section 3.6). There was then a section focused on their interactions with the marine and coastal areas, including leisure visits and connection to the coast. The survey concluded with questions about their socio-demographic background. The survey questionnaire can be found in Annex 3.

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<sup>9</sup> Marine and coastal areas are any part of the seas and coastline around Scotland, including beaches, coastal cliffs and coastal towns and settlements.

Figure 11: Structure of Final Questionnaire



### 3.6 Question for Identifying Protestors

“Protestors” refer to respondents who are unwilling to give any answers at all (Bateman et al., 2002). Protestors can lead to inconsistent valuation estimates and it is therefore important to detect them (Meyerhoff and Liebe 2010).

It is common practice to identify protest behaviour by using additional follow-up questions to examine the reasons why respondents repeatedly selected the status quo option in a choice experiment (Jonhston et al., 2017; Mariel et al., 2021). Additional follow-up questions are important as systemically selecting the status quo option may not necessarily indicate rejection of the choice experiment. Instead, it may be the case that respondents are genuinely not willing to pay anything for the good or service offered to them (Bateman et al., 2002).

To identify protestors in this choice experiment, a follow-up question about reasons for not supporting payment was included. This was used to help to distinguish between genuine zero bids (those that do not value management policies at all) with protest responses. This was intended to allow for assessment of the sensitivity of results to protest responses.

### 3.7 Sampling Approach

The sampling approach aimed to achieve a nationally representative sample of Scotland’s population based on age, sex and geographical area. Quotas were based on national statistics and in a similar way to the pilot, but with an additional quota for geographical area (local authorities). Quotas were not specified for other characteristics such as education levels or household income, although questions on socio-demographics were included at the end of the survey to assess how survey

sample characteristics compare to the national population. Table 3 summarises the sampling quotas.

Table 3. Sampling Quotas

Characteristics		Target (% of total)
Age group	16-24	12%
	25-34	17%
	35-44	15%
	45-54	16%
	55-64	17%
	65-+	23%
Sex	Female	51%
	Male	49%
Local Authority	Aberdeen City	4.2%
	Aberdeenshire	4.8%
	Angus	2.1%
	Argyll and Bute	1.6%
	City of Edinburgh	9.6%
	Clackmannanshire	0.9%
	Dumfries and Galloway	2.7%
	Dundee City	2.7%
	East Ayrshire	2.2%
	East Dunbartonshire	2.0%
	East Lothian	2.0%
	East Renfrewshire	1.8%
	Falkirk	2.9%
	Fife	6.8%
	Glasgow City	11.6%
	Highland	4.3%
	Inverclyde	1.4%
	Midlothian	1.7%
	Moray	1.8%
	Na h-Eileanan Siar (Western Isles)	0.5%
	North Ayrshire	2.4%
	North Lanarkshire	6.2%
	Orkney Islands	0.4%
	Perth and Kinross	2.8%
	Renfrewshire	3.3%
	Scottish Borders	2.1%
	Shetland Islands	0.4%
	South Ayrshire	2.1%
	South Lanarkshire	5.9%
	Stirling	1.7%
West Dunbartonshire	1.6%	
West Lothian	3.4%	

Source: [Mid-Year Population Estimates | National Records of Scotland \(nrsotland.gov.uk\)](https://nrsotland.gov.uk). Figures may not sum due to rounding.

## 4. Results

This section details the results from the final survey questionnaire. This includes a breakdown of the sample characteristics and analysis of selected survey questions, choice experiment results and follow-up questions<sup>10</sup>.

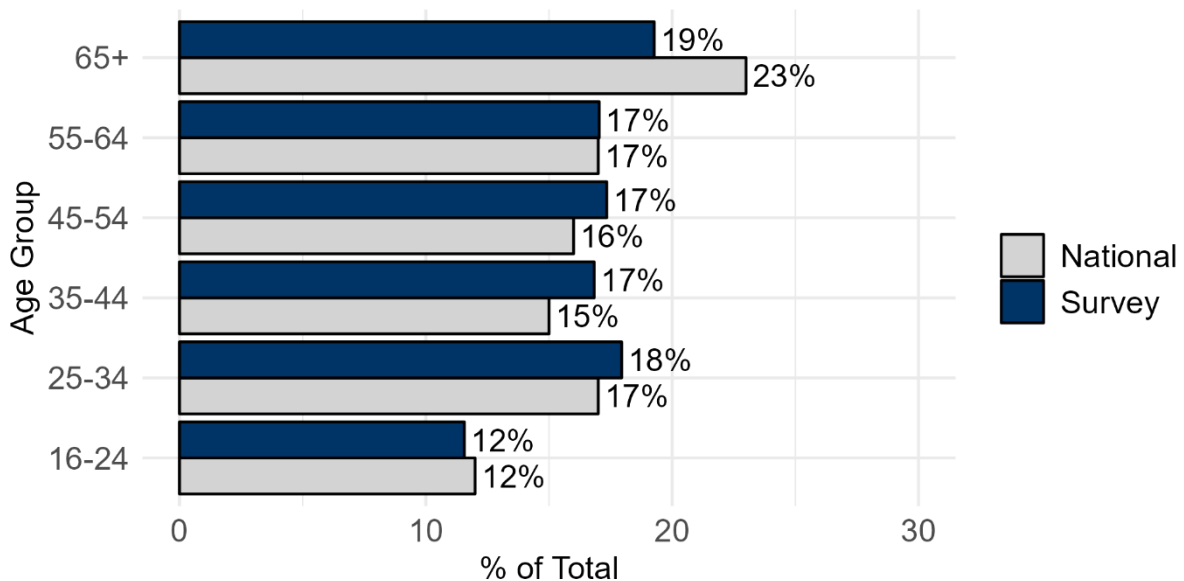
### 4.1 Survey Sample Characteristics

After identifying and removing respondents who took less than 5 minutes (identified as speeders) or did not complete the survey, a total of 986 complete responses were recorded. On average, respondents took 19 minutes to complete the survey. 3% of the total complete responses were identified as exhibiting potential 'protester' behaviour (see Section 3.6 and 4.5 for more detail)<sup>11</sup>.

The representativeness of the survey sample has been assessed by comparing the age, sex and local authority area breakdown against national statistics for Scotland's population<sup>12</sup>.

Figure 12 shows that the age breakdown of the survey sample broadly follows that of national statistics. All age categories are within 0-2 percentage points of the national level, apart from the 65+ age group which is within 4 percentage points.

Figure 12: Age of Respondents



The sex split of the survey sample compared to national statistics is shown in Figure 13. The survey sample had a 48/52% male/female split compared the national population, which has a 49/51% split.

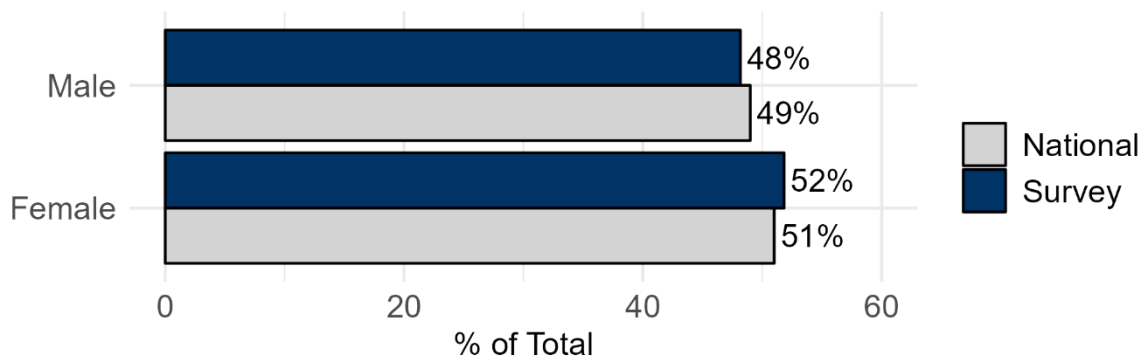
<sup>10</sup> Figures presented in tables and charts may not sum due to rounding.

<sup>11</sup> Potential protesters were kept in the final analysis as their inclusion/exclusion did not have a material impact on the results.

<sup>12</sup> It is recognised that there are many personal characteristics not captured in these quota questions that may have had an impact on respondent's views and perceptions. Furthermore, as is the case in most online surveys, groups of people who do not use or have access to digital devices are likely to be underrepresented.



Figure 13: Sex of respondents



A breakdown of the local authority areas where survey respondents live is presented in Table 4. Overall, the survey sample had a wide geographical spread, reflecting the population structure of Scotland.

Table 4: Local Authority Areas of Survey Sample vs. National Levels

Local Authority Area	Survey (% of total)	National (% of total)
Aberdeen	4.6	4.2
Aberdeenshire	5.5	4.8
Angus	2.1	2.1
Argyll & Bute	1.3	1.6
Clackmannanshire	0.8	0.9
Dumfries & Galloway	2.2	2.7
Dundee	2.4	2.7
East Ayrshire	2.2	2.2
East Dunbartonshire	2.0	2.0
East Lothian	1.8	2.0
East Renfrewshire	1.8	1.8
Edinburgh	10.3	9.6
Falkirk	3.3	2.9
Fife	7.4	6.8
Glasgow	12.1	11.6
Highland	2.3	4.3
Inverclyde	1.4	1.4
Midlothian	1.7	1.7
Moray	2.4	1.8
Na h-Eileanan Siar (Western Isles)	0.5	0.5
North Ayrshire	2.7	2.4
North Lanarkshire	5.2	6.2
Orkney	0.1	0.4
Perth & Kinross	2.7	2.8
Renfrewshire	3.2	3.3
Scottish Borders	2.2	2.1
Shetland	0.4	0.4
South Ayrshire	2.2	2.1
South Lanarkshire	6.0	5.9
Stirling	1.7	1.7

West Dunbartonshire	1.4	1.6
West Lothian	3.5	3.0

As discussed in section 3.7, specific quotas were not set for other individual characteristics such as income, education or employment status. However, a series of questions about respondent's socio-demographics were included at the end of the survey to allow for further comparison of the sample against national levels. Table 5 contains a summary of this comparison.

Table 5: Other Characteristics of Respondents vs. National Levels<sup>13</sup>

Characteristic	Survey (% of total)	National (% of total)
Median household income	£30,001-£40,000	£29,000
Education level of degree or higher	40%	32%
Employed	59%	76%

The median income range of the sample was £30,001-£40,000 and the mode was £20,001-£30,000, compared to a national median household of approximately £29,000. 5% of respondents preferred not to disclose their household income.

40% of the sample stated that they had a bachelor's degree or higher level of qualification, compared to national levels of around 32%. When asked about their employment status, 59% of the sample stated that they are in either full-time, part-time or self-employment, compared to national levels of around 76%.

When asked whether they were part of an environmental organisation, 87% of the sample answered no, 9% said yes and 4% chose to not answer the question. 20% of the sample stated that either they or a close family or friend worked or depended largely on a marine industry, these respondents were therefore classified as having an 'industrial connection'<sup>14</sup>.

#### 4.2 Perceptions about Marine and Coastal Areas in Scotland

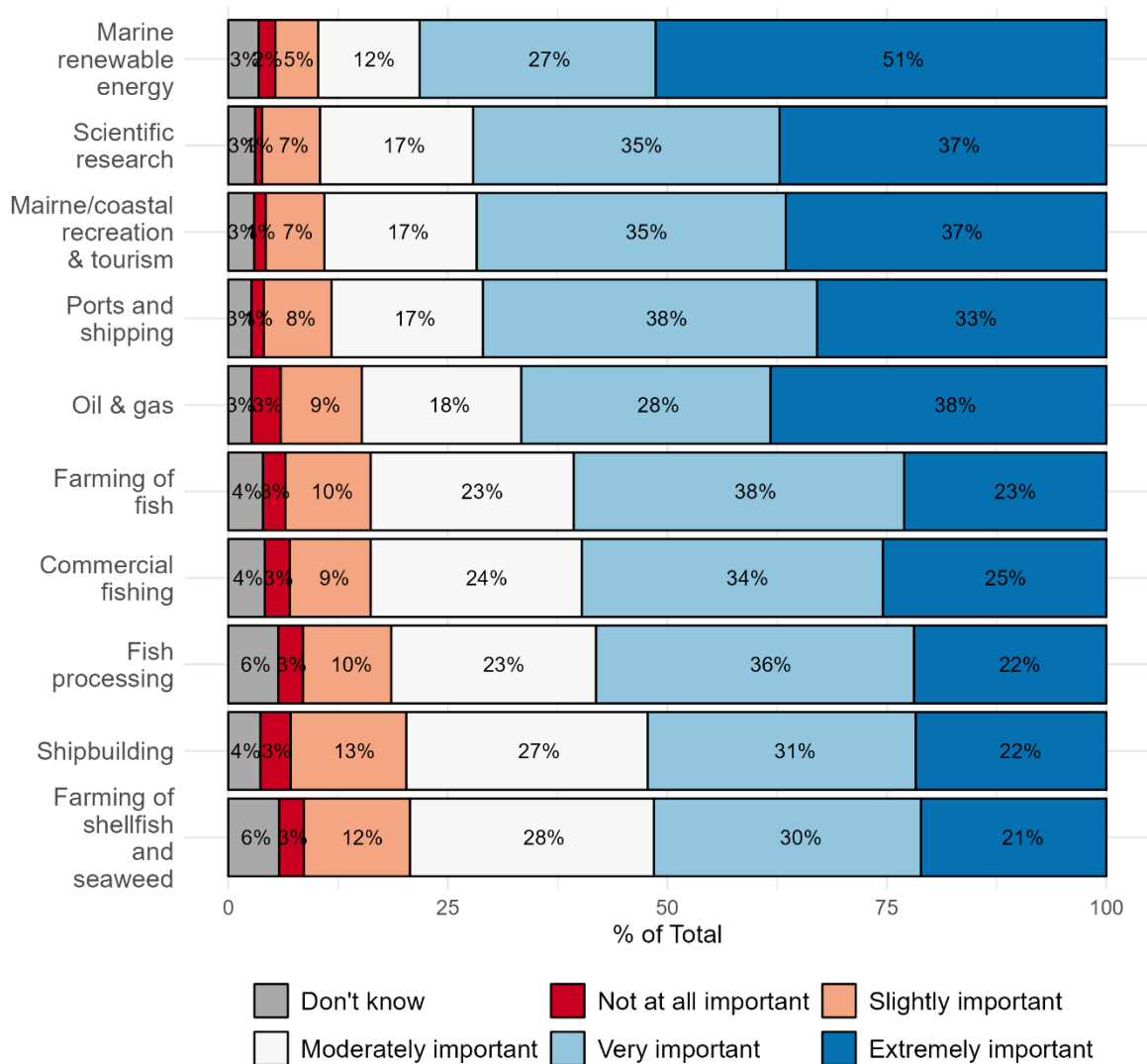
Respondents were asked a series of questions about their perceptions of the environmental condition and impact of human activities on marine and coastal areas in Scotland. These questions were intended to introduce the survey topic to respondents and gather initial information about their general views and experiences.

<sup>13</sup> Sources: [Poverty and Income Inequality in Scotland 2019-22 \(data.gov.scot\)](https://data.gov.scot/); [Scottish Household Survey Data Explorer](#); [Scotland's Labour Market Trends April 2023](#)

<sup>14</sup> The industries considered as a 'marine industry' were: commercial fishing, farming of fish, farming of shellfish and seaweed, fish processing, oil & gas, marine renewable energy, ports and shipping, marine/coastal recreation and tourism, scientific research such as marine biology and shipbuilding.

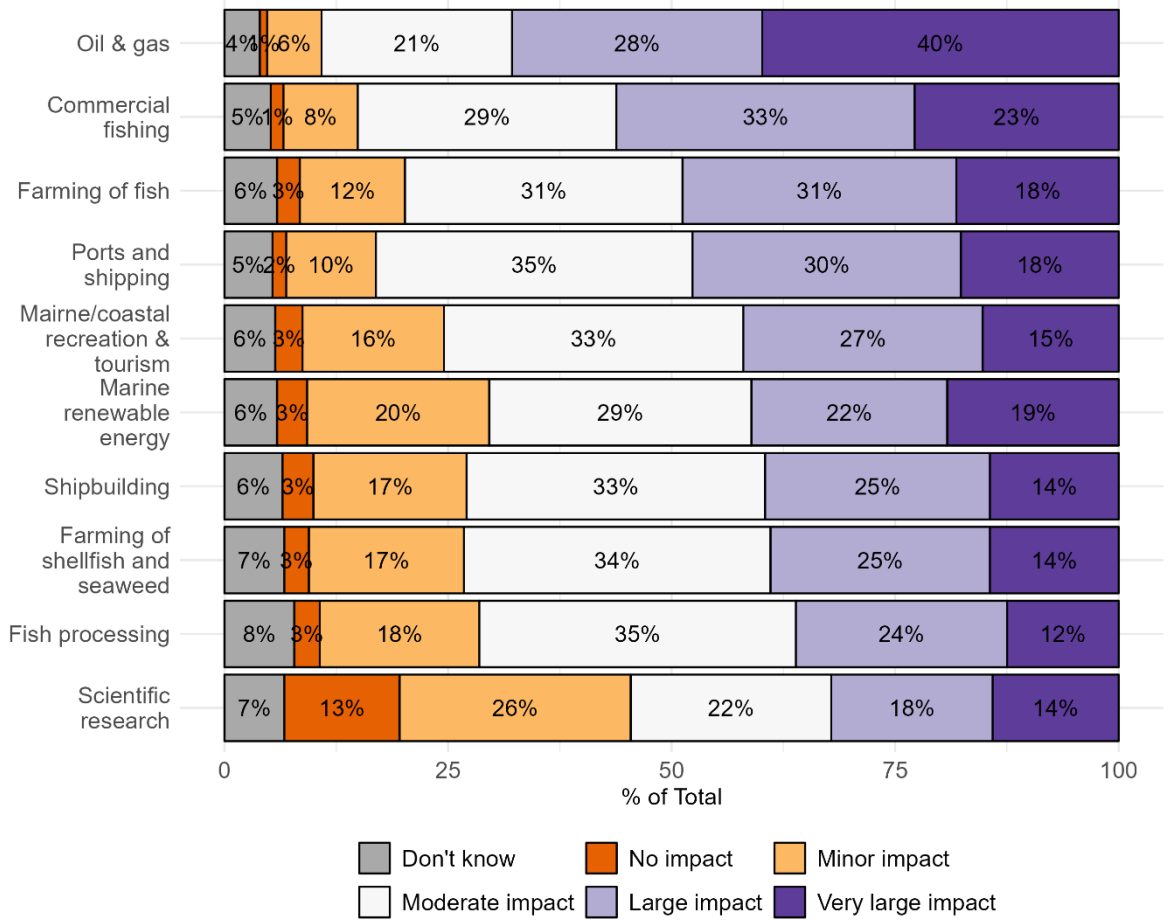
Figure 14 shows respondent's opinions about the importance of marine industries for Scotland's future. Marine renewable energy was the industry that respondents felt was the most important, with 78% of respondents considering it as 'very' or 'extremely' important. Respondents considered farming of shellfish and seaweed to be the least important, with 51% considering it as 'very' or 'extremely' important.

Figure 14: Q. In your opinion, how important are the following industries for Scotland's future?



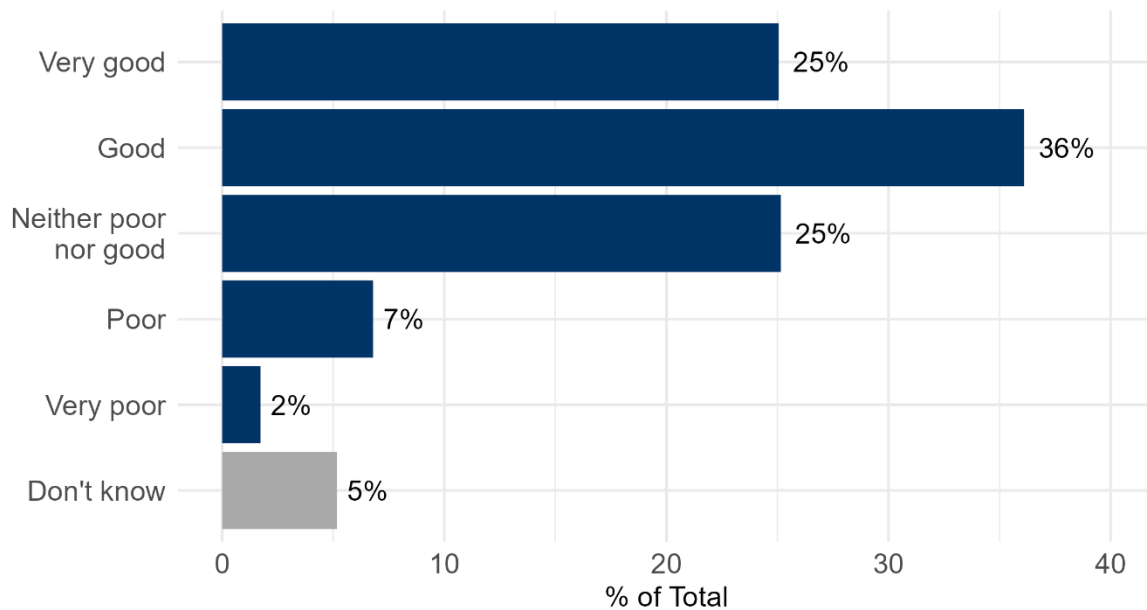
Respondents were asked to state what impact they thought industries had on the environmental condition of marine and coastal areas in Scotland. As shown in Figure 16, the oil & gas industry was considered to have the largest environmental impact, with 68% of respondents thinking that the industry had a 'very large' or 'large' impact. In comparison, scientific research was the industry respondents thought to have the least impact, with 32% thinking the industry had a 'very large' or 'large' impact.

Figure 16: Q. What do you think the impact is of the following industries on the environmental condition of marine and coastal areas in Scotland?



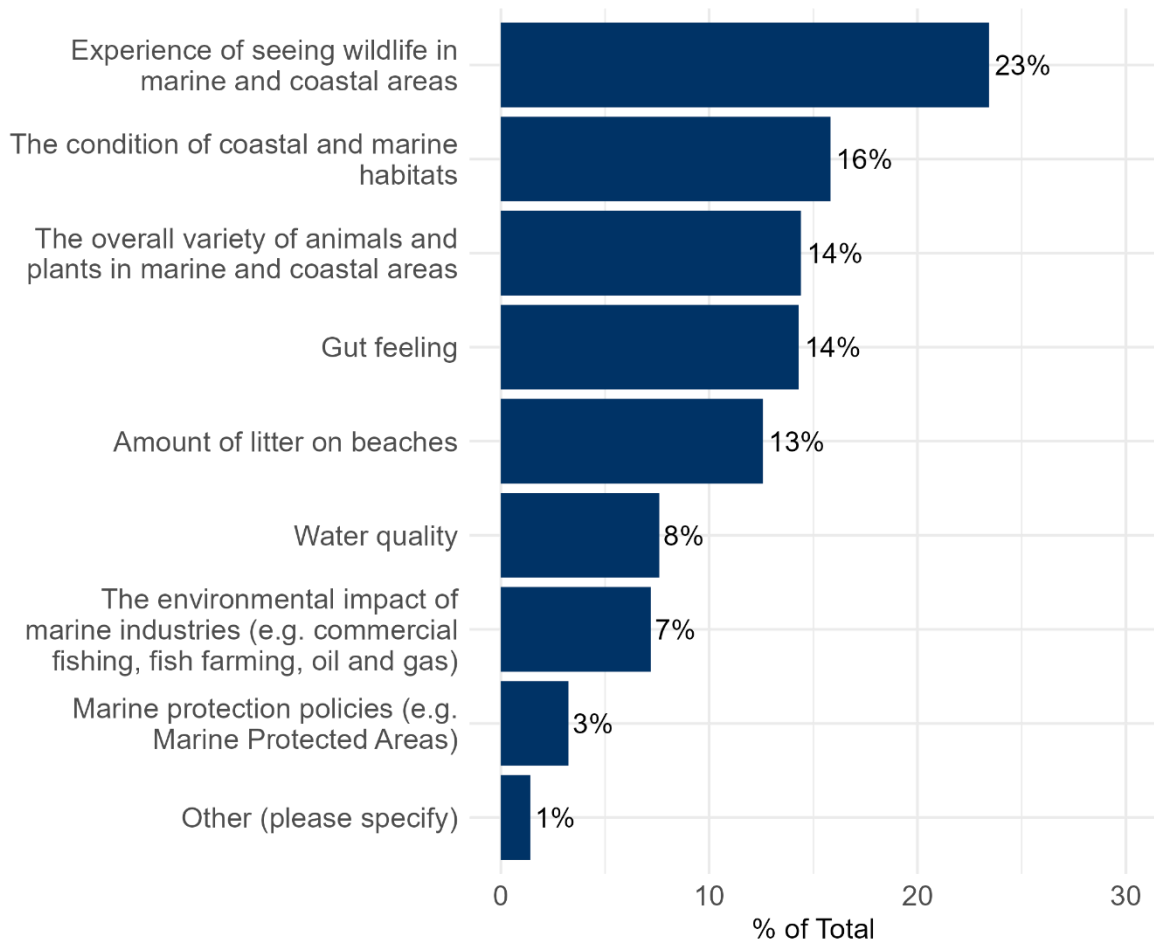
In response to a question about their personal experiences of Scotland's marine wildlife and habitats (see Figure 17), 61% of respondents rated their experiences as either 'very good' or 'good'. Only 9% of respondents reported to have had 'poor' or 'very poor' experiences, with a further 30% answering 'neither poor nor good' or 'don't know'.

Figure 17: Q. Thinking about your personal experiences of Scotland's marine wildlife and habitats, how would you rate these experiences?



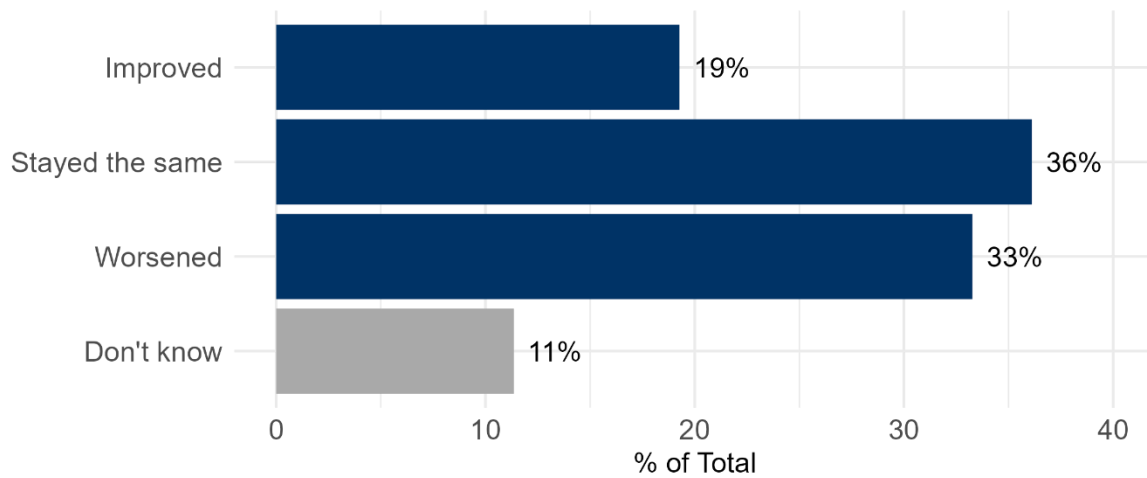
As a follow-up to the question about their personal experiences of Scotland's marine wildlife and habitats, respondents were asked what they were thinking about the most when they answered that question. Answers to this question are summarised in Figure 18, which shows respondents had a broad range of answers when thinking about their personal experiences of wildlife and habitats. The 'experience of seeing wildlife in marine and coastal areas' was what the highest proportion of respondents thought about, with 23% selecting this option. 'The condition of coastal and marine habits', 'the overall variety of animals and plants in marine and coastal areas' and 'gut feeling' had the next highest proportions, with 16%, 14% and 14% respectively.

Figure 18: When you answered the last question, what were you thinking about the most? (select only one option)



Respondents were asked what they thought has happened to the overall environmental condition of marine and coastal areas in Scotland in the past 5 years (Figure 19). 19% of respondents thought that the environmental condition had improved, 36% thought it had stayed the same and 33% thought it had worsened. The remaining 11% said that they did not know.

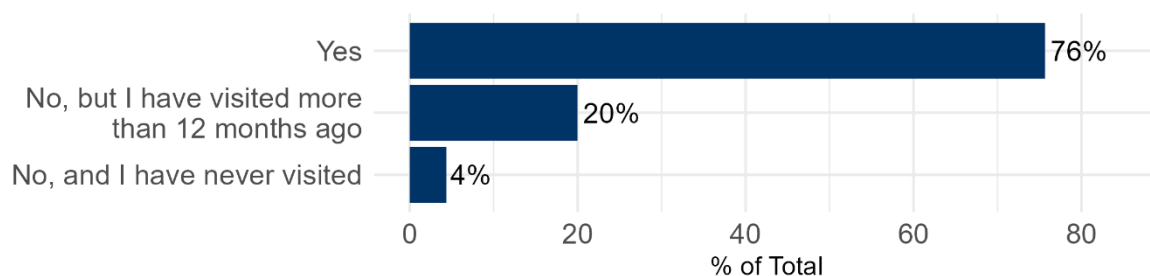
Figure 19: Q. In the past 5 years, do you think the overall environmental condition of marine and coastal areas in Scotland has...



### 4.3 Leisure Visits to Marine and Coastal Areas

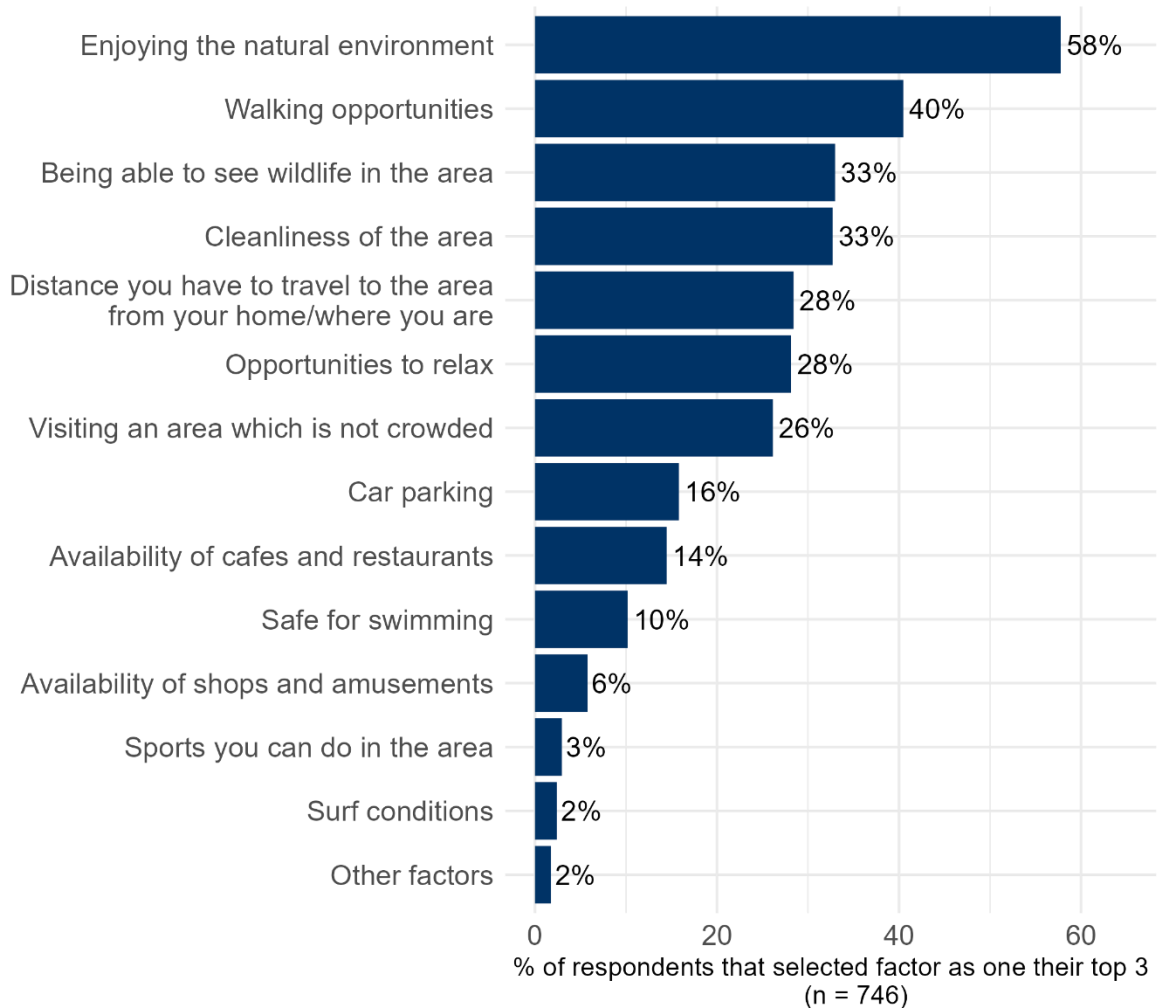
The majority of respondents (76%) had visited a marine or coastal area in Scotland in the last 12 months (see Figure 20). 20% stated that although they had not visited in the last 12 months they had before. Only 4% of respondents had never visited.

Figure 20: Q. Have you visited a marine or coastal area in Scotland in the last 12 months?



Respondents who had visited a marine or coastal area in Scotland in the last 12 months were asked the top 3 factors they consider when deciding which area to visit (see Figure 21). 'Enjoying the natural environment' was the most frequently considered factor, featuring in 57% of responses to this question. 'Walking opportunities' and 'Being able to see wildlife in the area' were the next two most frequently considered. "Surf conditions" was the least considered factor, featuring in only 2% of responses.

Figure 21: Q. What are the top 3 factors that you consider when deciding which Scottish marine and coastal areas to visit?

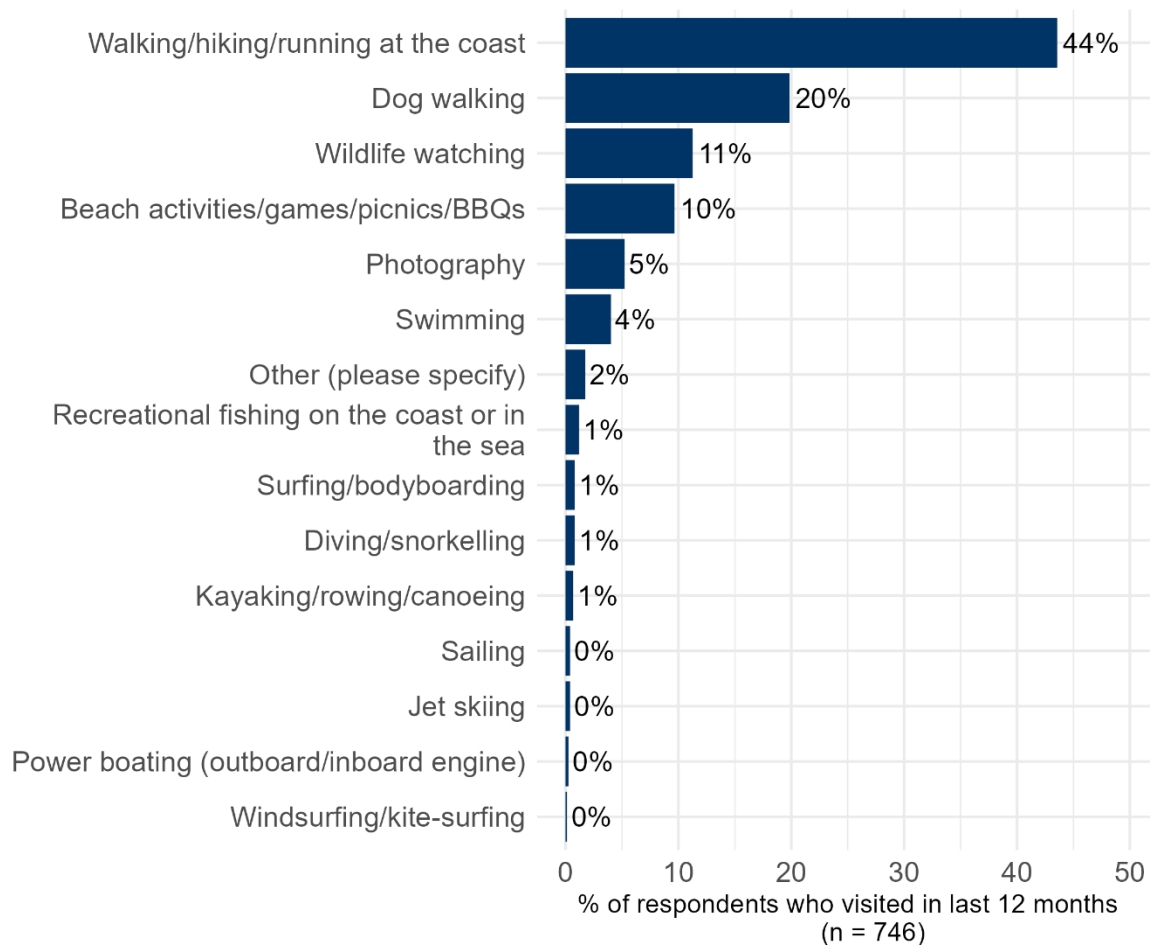


Of those that had visited a marine or coastal area in Scotland in the last 12 months (n = 746), the majority of respondents (75%) stated that ‘walking/hiking/running at the coast’, ‘dog walking’ or ‘wildlife watching’ was the leisure activities they considered to be most important<sup>15</sup> (see Figure 22).

<sup>15</sup> Respondents were asked to consider the ‘most important’ activity as the activity that they undertake most often, they care the most about, or they would not let go.



Figure 22: Respondent's most important leisure activity



Note: percentages have been rounded to nearest whole digit.

#### 4.4 Choice Experiment Analysis

##### 4.4.1 Approach

The overall aim of the choice experiment analysis was to assess respondent's preferences for alternative management options for marine and coastal areas in Scotland. Responses were analysed using conditional and mixed logit econometric models. The first step in the modelling approach involved examining the extent to which each attribute had a significant influence on respondent's choice and whether respondent's had positive or negative preferences for more of each attribute. This then allowed for the estimation of respondent's willingness to pay (WTP) for marginal changes in each of the attributes, which provides a more useful unit of measurement. The determinants of preferences were also assessed using a mixed logit model. Full model outputs can be found in Annex 4.

##### 4.4.2 Preferences for Attributes of Marine and Coastal Areas

Preferences for attributes of marine and coastal areas included in the choice experiment were initially assessed using a conditional logit model. Model results reveal whether respondents have positive or negative preferences for each attribute,

the extent to which each attribute influenced respondent's choices and whether this is statistically significant. A summary of the conditional logit model results is presented in Table 6.

Table 6: Conditional Logit Model Coefficient Estimates

Attribute	Coefficient	Standard Error
Price (annual household water charge)	-0.016***	0.001
Size of area changed (1% of total sea area increase)	0.031**	0.010
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.030	0.047
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	-0.001	0.077
Wildlife and habitats (medium increase)	0.373***	0.063
Wildlife and habitats (large increase)	0.688***	0.067
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.322***	0.076
Type of restrictions (moderate)	0.391***	0.072
Type of restrictions (high)	0.006	0.066
Educational boards (no)	(reference level)	(reference level)
Educational boards (yes)	0.215***	0.046
Status quo	-0.459*	0.180

Note: \*\*\*, \*\* and \* indicate statistical significance at the 0.1%, 1% and 5% level of confidence, respectively.

The results from the conditional logit model show that:

- **Annual household water charge** – respondents have significant and negative preferences for this attribute. This means that all else being equal, respondents prefer management policies with lower costs.
- **Size of area changed (1% increase)** – respondents have significant and positive preferences for a 1% increase in the size of area changed. This means that all else being equal, respondents prefer management policies that result in larger sizes of sea area being changed<sup>16</sup>.
- **Distance to coast** – respondents do not have significant preferences for this attribute. This means that respondent's choices do not appear to be influenced by whether a management policy occurs in an offshore or inshore area.
- **Wildlife and habitats** – relative to a 'very small increase', respondents do not have significant preferences for a 'small increase' in wildlife and habitats. However, respondents do have significant and positive preferences for a

<sup>16</sup> It is important to recognise that this result only applies to the range of area tested in this choice experiment, which was between 2.5% and 10% of Scotland's total sea area. Beyond this range, application of results should be treated with extreme caution.

‘medium increase’ and ‘large increase’, with greater value being attached to a ‘large increase’.

- **Type of restrictions** – relative to no restrictions, respondents have significant and positive preferences for management policies that involve ‘low restrictions’ and ‘moderate restrictions’, with greater value being attached to ‘moderate restrictions’. Respondents do not appear to have significant preferences for ‘high restrictions’.
- **Education boards** – respondents have significant and positive preference for this educational content. All else being equal, respondents prefer management policies that result in additional education content.
- **Status quo (do nothing)** – respondents have significant and negative preferences for the status quo. This means that on average respondents prefer alternative management policies over the do nothing option.

Household marginal WTP estimates for each statistically significant attribute in the conditional logit model are presented in Table 7. WTP has been estimated by taking the marginal rate of substitution between each attribute and the price coefficient from this model. The results show the average amount that respondents are willing to pay for each attribute, relative to the reference level. All results should be considered as average marginal WTP in the context of the scale of area presented to respondents in the choice cards (between 2.5% and 10% of total sea area). All estimates presented below refer to household WTP per year.

Respondents have an average marginal WTP of £1.98 for each additional 1% of total sea area changed by management policies. This result should only be interpreted for the range of area presented in this choice experiment, which was between 2.5% and 10% of total sea area. Preferences may differ beyond the scale that was tested in this choice experiment.

Relative to a ‘very small increase’ in wildlife and habitats, the average WTP for a medium increase is £23.79. Respondents place greater value on a large increase, with an average WTP of £43.85. The large increase was described to respondents as an increase which would see both common and rare species return to ‘long-term natural levels’.

For the type of restrictions attribute, respondents have an average WTP of £20.50 and £24.93 for management policies that involve ‘low’ and ‘moderate’ restrictions, respectively, relative to no restrictions<sup>17</sup>. As explained in Section 3, ‘low’ restrictions were described to respondents as only the most damaging fishing activity is not allowed and all other human activities allowed, while ‘moderate’ restrictions were described as all damaging fishing not allowed and all damaging human activities need a license.

Respondents have an average WTP of £13.69 for updating existing information boards and installing new boards with educational content (for all ages) about wildlife and habitats in marine and coastal areas around Scotland.

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<sup>17</sup> Low restrictions – only the most damaging fishing activity is not allowed, all other human activities allowed

Moderate restrictions – all damaging fishing not allowed, all damaging human activities need a license

Results suggest respondents have a negative WTP for the status quo. This can be interpreted as a positive WTP for alternative management options. Results indicate that respondents have an average WTP of £29.24 for an alternative option presented in the choice cards compared to the status quo do nothing option.

Table 7. Willingness to Pay Estimates – Conditional Logit Model (£ per household per year)

<b>Attribute</b>	<b>Average (mean) WTP</b>	<b>Lower C.I.</b>	<b>Upper C.I.</b>
Area (1% of total sea area increase)	£1.98	£0.70	£3.25
Wildlife and habitats (medium increase)	£23.78	£15.85	£31.71
Wildlife and habitat (large increase)	£43.85	£35.46	£52.23
Type of restrictions (low)	£20.50	£10.95	£30.06
Type of restrictions (moderate)	£24.93	£15.89	£33.96
Educational content (yes)	£13.69	£7.94	£19.43
Status Quo	-£29.24	-£6.77	-£51.70

Note: particular caution should be used when applying the area attribute WTP confidence intervals from the conditional logit model as this attribute has a statistically significant standard deviation coefficient in the mixed logit model, suggesting some evidence of preference heterogeneity (see Section 4.4.3).

#### 4.4.3 Determinants of Preferences

Preferences and WTP were further assessed using a mixed logit model. Conditional logit relies on the assumption that all respondents hold the same preferences for the characteristics of marine and coastal areas (i.e. attributes) and that respondents treat each choice card independently. The mixed logit model relaxes these assumptions and can therefore account for preference heterogeneity amongst respondents.

Table 8 reports outputs from the mixed logit model, which shows a similar pattern of preferences for respondents, with the same relative importance rank for each attribute and attribute level. In this table, results are articulated in mean preference for choice attributes and the standard deviation (heterogeneity) among respondents. Since only one standard deviation coefficient is statistically significant (size of area changed), results suggest that overall people hold homogenous preferences for the marine and coastal area attributes assessed in this choice experiment.

Table 8: Mixed Logit Model Coefficient Estimates

Attribute	Coefficient	Standard Error
<b>Mean Coefficients</b>		
Price (annual household water charge)	-0.016***	0.001
Size of area changed (1% increase)	0.029**	0.011
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.032	0.049
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.014	0.081
Wildlife and habitats (medium increase)	0.389***	0.067
Wildlife and habitats (large increase)	0.714***	0.070
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.324***	0.080
Type of restrictions (moderate)	0.406***	0.077
Type of restrictions (high)	0.005	0.068
Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.222***	0.047
Status quo	-0.507**	0.189
<b>Standard Deviation Coefficients</b>		
Size of area changed (1% increase)	0.057*	0.022
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.051	0.183
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.055	0.302
Wildlife and habitats (medium increase)	0.429	0.241
Wildlife and habitats (large increase)	0.008	0.243
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.217	0.254
Type of restrictions (moderate)	0.061	0.273
Type of restrictions (high)	0.109	0.247
Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.023	0.181
Status quo	0.068	0.196

Note: \*\*\*, \*\* and \* indicate statistical significance at the 0.1%, 1% and 5% level of confidence, respectively.

To assess the extent to which respondent's preferences are determined by their individual characteristics, interactions between the status quo attribute and specific variables that represent respondent's characteristics were added to the mixed logit model. This was done to identify whether respondent's individual characteristics appeared to make them less or more likely to choose an alternative management option over the status quo (do nothing) option.

Respondent's characteristics that were tested in the mixed logit model are described in Table 9. Analysis shows that visitor, regular recreational user, young and industrial connection characteristics affect preferences for the status quo at a statistically significant level. All of these factors appear to have a negative influence on preferences for the status quo, which means that respondents who possess these characteristics tend to dislike the status quo (do nothing) option and prefer alternative management policies. Full model outputs from the mixed logit model with interactions are included in Annex 4.

Table 9: Respondent's individual characteristics tested in mixed logit model

<b>Individual characteristics</b>	<b>Description</b>	<b>Influence on preference for status quo option</b>
Coastal	Respondents who live less than 5 miles from the coast and answered 'yes' when asked if they describe the area they live 'by the coast'	No significant influence
Visitor	Respondents who have visited a marine and coastal area in the last 12 months	Yes – negative influence
Regular recreational user	Respondents who do a recreational activity at a marine and coastal areas at least once a fortnight or more	Yes – negative influence
Young	Respondents aged between 16-34	Yes – negative influence
Male	Male respondents	No significant influence
Industrial connection	Respondents who said that they or a close family or friend work in a marine industry	Yes – negative influence

#### 4.4.4 Aggregation of WTP Estimates

WTP estimates have been aggregated to give indicative total WTP values for the Scottish population. This has been done by applying the average WTP estimates of the survey sample to the total number of households in Scotland (2.53 million). The estimates are summarised in Figure 23 (see Annex 5 for table of results).

As results from the mixed logit model suggested that people tend to have homogenous preferences for the marine and coastal area attributes, aggregate WTP estimates are presented using outputs from the conditional logit model. Results below are presented as a range (95% confidence interval) to account for uncertainty.

Based on the average WTP estimates, model outputs suggest Scottish households are willing to pay between £90m-£132m per year for management policies that result

in a 'large increase' in wildlife and habitats. This decreases to £40m-£80m per year for a 'medium' increase.

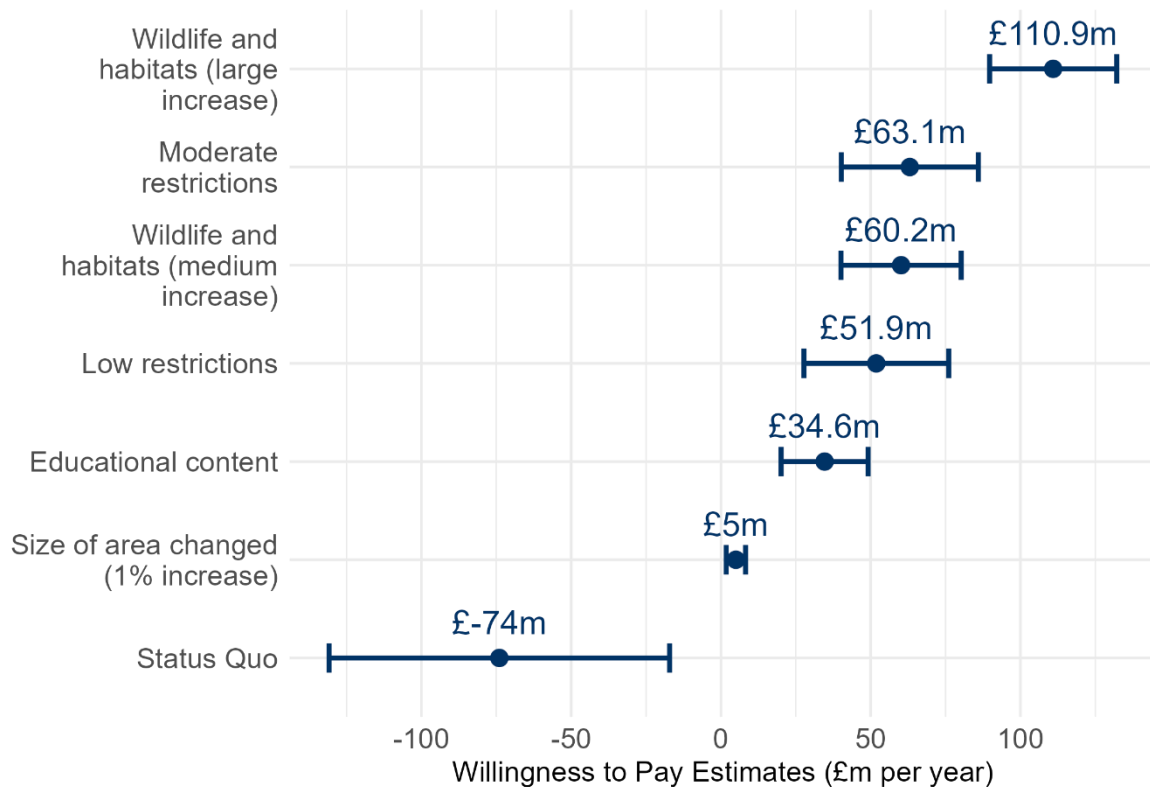
Results suggest that households have positive preferences for management policies that involve 'low' and 'moderate' restrictions on damaging human activities, with aggregate WTP estimates of between £28m-£76m and £40m-£86m per year, respectively.

Households are estimated to be willing to pay around £20m-£49m per year for management policies that involve updating existing information boards and installing new boards with educational content (for all ages) about wildlife and habitats in marine and coastal areas around Scotland.

For every additional 1% of total sea area changed, households are estimated to be willing to pay an additional £2m-£8m per year (within the 2.5% and 10% range of total sea area tested in this choice experiment).

Results suggest that households in Scotland are WTP £17m-£131m for alternative management options (as they have been presented in this choice experiment) over the status quo do nothing option.

Figure 23: Aggregate WTP Estimates – All Scottish Households (£m per year) (Conditional Logit Model)



## 5. Validity of Results

This section includes an assessment of the validity of results, informed by best-practise guidance documents (Bateman et al., 2002; Johnston et al., 2017; Mariel et al., 2021). Validity has been assessed using two criteria:

1. Construct validity: are the results consistent with expectations?
2. Content validity: was the survey questionnaire clear and understandable for respondents?

### 5.1.1 Construct Validity

Overall, results from this choice experiment are consistent with expectations. Respondents expressed negative preferences for the cost attribute (increase in household water charge), which means that, all else being equal, results suggest that respondents prefer options with lower costs. This is consistent with economic theory and prior expectations.

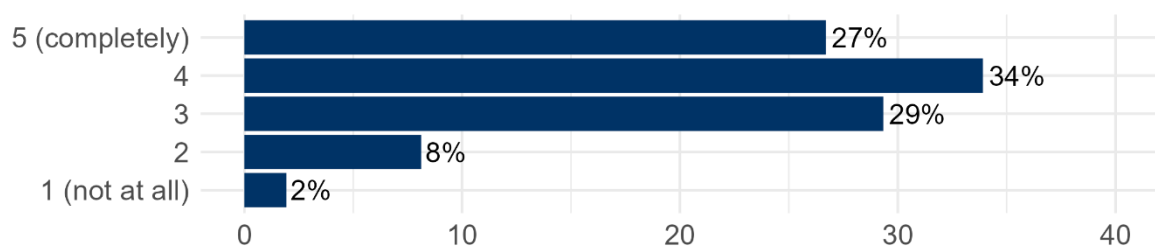
As discussed in Section 2.3, there are a limited number of other stated-preferences valuation that have been undertaken in a Scottish marine context. It is therefore difficult to compare the results from this study with other studies. Although it's not possible to directly compare values, results broadly align with previous research which suggests people in Scotland generally have positive preferences for improving the environmental condition of marine and coastal areas (e.g. Jobstvogt et al. 2014; McVittie and Moran, 2010; Philips et al. (2018).

### 5.1.2 Content Validity

Following the choice tasks, respondents were asked a series of follow-up questions to assess their understanding of the choice experiment and motivations for their choices.

Respondents were asked on a scale of 1 (not at all) and 5 (completely), how clear did they think the choice cards presented were. Results of this question are displayed in Figure 24. Overall, results suggest that respondents felt the choice cards were clearly presented, with only 2% selecting the 'not at all' clear option and the majority of respondents (90%) selecting 3 or above.

Figure 24: Q, On a scale of 1 (not at all) to 5 (completely), how clear do you think the choice cards presented were?

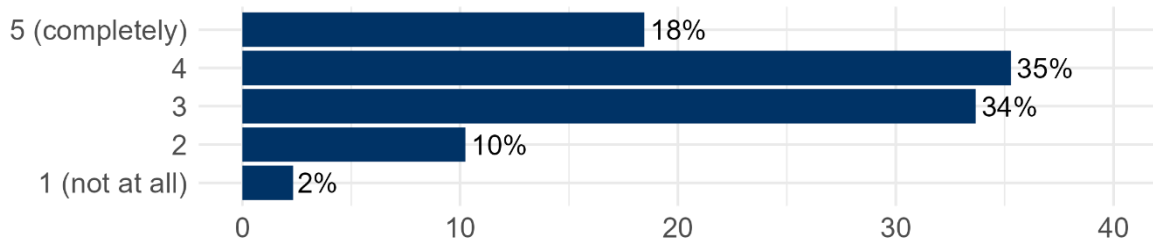


Figures may not sum due to rounding.



A similar question was asked about how sure respondents were of their choices (see Figure 25). 18% of respondents stated that they were completely sure of their choices and 2% stated that they were not at all sure.

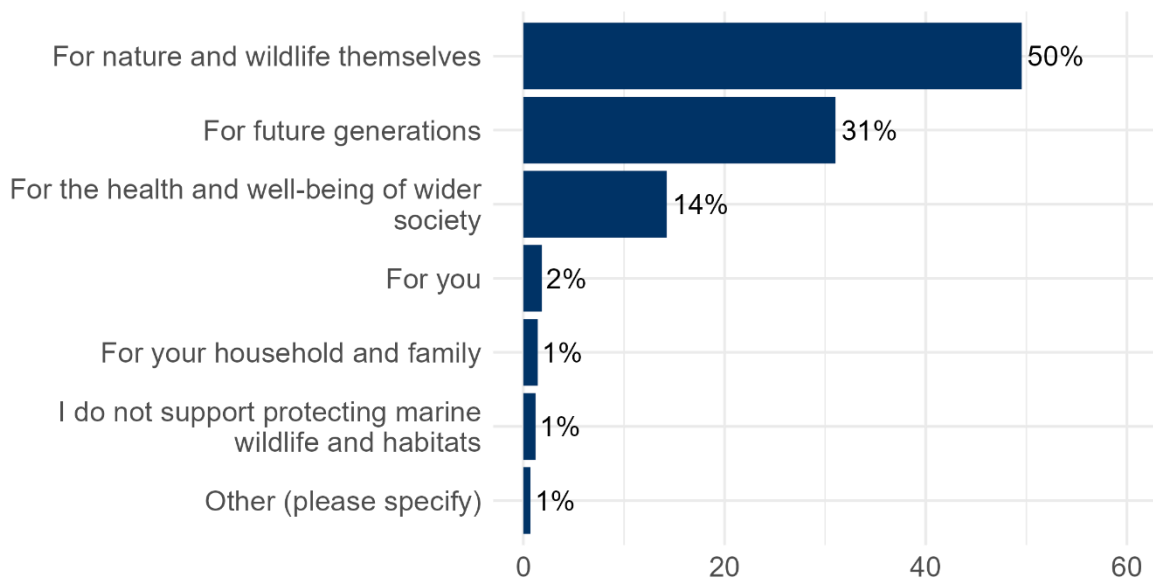
Figure 25: Q. On a scale from 1 (not at all) to 5 (completely), how sure were you of the choices you made?



Figures may not sum due to rounding.

Respondents were asked what they consider as the main reason for protecting marine wildlife and habitats. This question was intended to give an indication of the value motivations of respondents. Figure 26 contains a breakdown of the responses to this question, which shows that respondents appear to hold significant non-use motivations. 50% of respondents considered 'for nature and wildlife themselves' as their main reason, and a further 31% considered 'for future generations' as theirs.

Figure 26: Q. What do you consider as the main reason for protecting marine wildlife and habitats?

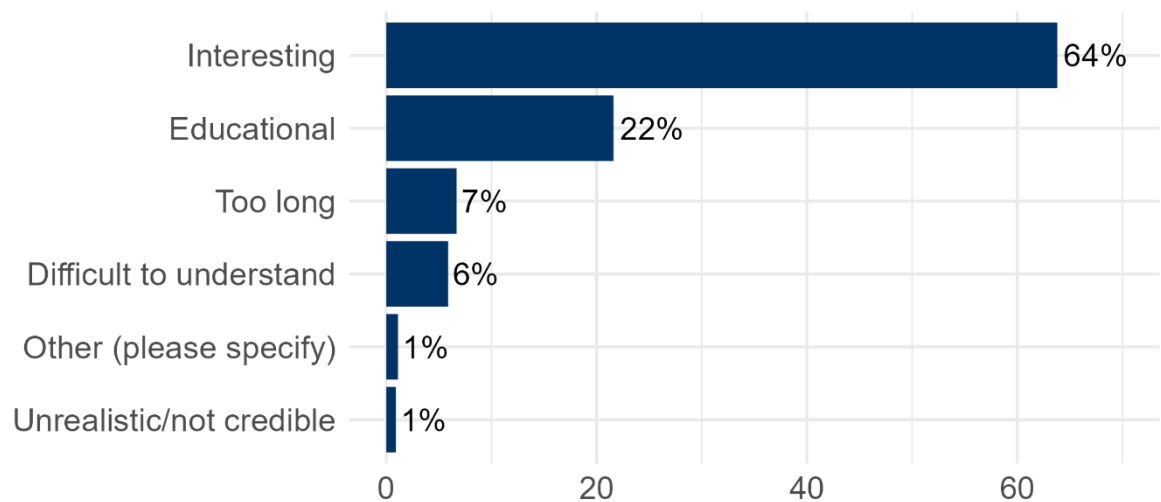


Another follow-up question asked respondents whether there was any reason they would not support payment of a programme to improve marine and coastal areas. This question was intended to identify potential 'protestor' behaviour. As discussed in Section 3.6, high degrees of 'protestor' behaviour can lead to inconsistent valuation estimates. A small number of responses (n = 30, or 3% of total responses) were identified as exhibiting potential 'protestor' behaviour. These respondents selected

the 'status quo' option on all choice cards and stated in this follow up question that they would not support payment because 'the programme should be funded through already existing taxes' or because they feel that 'I already pay enough through my taxes'. Modelling of results was conducted with and without potential protest responses included and was found to have very little impact on the final results. As identifying protestors is a somewhat subjective process, and to reduce the risk that genuine non-zero bids were rejected from the analysis, the full survey sample was used in the final analysis.

A final question asked respondents how they found the survey overall (see Figure 27). The majority of respondents stated that they found the survey interesting (64%) or educational (22%). Only 1% of respondents found the survey to be unrealistic/not credible.

Figure 27: Q. Finally, did you find this survey...



## 6. Conclusion

This research aimed to assess how people perceive, interact with and value marine and coastal areas in Scotland. To do this, a choice experiment survey questionnaire was designed, tested and put to a sample of people representative of Scotland's population across age, sex and geographical location.

An initial survey design was tested on a pilot sample of 222 respondents, which led to further refinement in the design of the final survey questionnaire. A total of 986 complete responses for the final survey questionnaire were recorded. Survey responses were then analysed and results have been summarised in this report, using a combination of descriptive statistics and econometric modelling. Any future application of these results should take into account the underlying uncertainty associated with stated-preferences valuation studies and only be done by expert practitioners.

Key findings include:

- Overall, results from the choice experiment suggest that people in Scotland are supportive of management policies in marine and coastal areas over doing nothing.
- People in Scotland hold significant values for management policies that result in larger areas changed, larger increases in wildlife and habitats, 'low' and 'moderate' levels of restrictions, and additional educational content.
- People who have visited a marine and coastal area in the last 12 months, do regular recreational activities, are younger or have a marine industrial connection tend to have stronger preferences for alternative management options over the status quo.
- Households in Scotland are estimated to be WTP a total of between £90m-£132m per year (£35-£52 per household) for management policies that result in a 'large increase' in wildlife and habitats, decreasing to £40m-£80m per year (£16-£32 per household) for a 'medium' increase.
- For management policies that introduce 'low' and 'moderate' restrictions on damaging human activities, households in Scotland are estimated to be WTP £28m-£76m (£11-£30 per household) and £40m-£86m (£16-£34 per household) per year respectively.
- Households in Scotland are estimated to be WTP around £20m-£49m per year (£8-£19 per household) to update existing and install additional education boards about wildlife and habitats around marine and coastal areas in Scotland.
- For every additional 1% of total sea area changed by management policies, households are estimated to be WTP an additional £2m-£8m per year (£1-£3 per household)<sup>18</sup>.

Expert support and advice to design and carry out this choice experiment has been received by CSERGE at the University of East Anglia. Further guidance has been provided through extensive discussions and feedback from the Project Steering

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<sup>18</sup> Within the 2.5% and 10% range of total sea area tested in this choice experiment

Group. This has helped to produce robust results about how much people in Scotland value characteristics of marine and coastal areas.

## 7. References

Bateman et al., (2002), *Economic Valuation with Stated Preference Techniques: A Manual*. Department for Transport: London

Börger, T. et al., (2014) 'Valuing conservation benefits of an offshore Marine Protected Area', *Ecological Economics*, 108, pp. 229–241.

Christie, M. et al. (2006) 'Valuing the diversity of biodiversity', *Ecological Economics*, 58(2), pp. 304–317.

Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta Review*. London: HM Treasury

eftec (2022) Valuing the Benefits of Species Recovery in England, publication forthcoming, <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20860>

Grilli, G. et al., (2022) 'Could a mix of short- and long-term policies be the solution to tackle marine litter? insights from a choice experiment in England and Ireland', *Ecological Economics*, 201, p. 107563.

HM Treasury. (2022), *The Green Book*. London: HM Treasury

Hynes, S. et al. (2021) 'Valuing the ecosystem service benefits from Kelp Forest Restoration: A choice experiment from Norway', *Ecological Economics*, 179, p. 106833.

Jobstvogt, N. et al., (2014) 'Twenty Thousand sterling under the sea: Estimating the value of protecting deep-sea biodiversity', *Ecological Economics*, 97, pp. 10–19.

Johnston, R.J. et al., (2017), 'Contemporary guidance for stated preference studies', *Journal of the Association of Environmental and Resource Economists*, 4(2), pp. 319–405.

Kenter, J.O. et al., (2013), 'The value of potential marine protected areas in the UK to divers and sea anglers', UNEP-WCMC, Cambridge, UK.

La Notte A. et al., *How much do Europeans value biodiversity? A choice experiment exercise to estimate the "habitat and species maintenance" ecosystem service*, EUR 30953 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-46351-1

Lancaster, K. (1966) 'A New Approach to Consumer Theory', *Journal of Political Economy* 74, pp 132–157.

Mariel, P. et al. (2021) *Environmental valuation with discrete choice experiments: Guidance on design, implementation and Data Analysis*. Cham, Switzerland: Springer.

McFadden, D. (1974), 'Conditional Logit Analysis of Qualitative Choice Behaviour', in P. Zarembka, ed., *Frontiers in Econometrics*. New York: Academic Press.

McVittie, A. and Moran, D. (2010) 'Valuing the non-use benefits of marine conservation zones: An application to the UK marine bill', *Ecological Economics*, 70(2), pp. 413–424.

Paltriguera, L. *et al.* (2018) 'An analysis and valuation of post-designation management aimed at maximising recreational benefits in coastal Marine Protected Areas', *Ecological Economics*, 148, pp. 121–130.

Phillips, P. *et al.*, 2018. The Value of Bathing Waters and the Influence of Bathing Water Quality: Final Research Report. Scottish Government.

Scottish Government (2022), *Ocean literacy survey: headline findings*. Available at: [Knowledge of marine terms - Ocean literacy survey: headline findings - gov.scot \(www.gov.scot\)](https://www.gov.scot/resources/consultations-petitions/embedded/2022-05-08-ocean-literacy-survey-headline-findings) (Accessed: 08 May 2023)

Thurstone, L. (1927), 'A Law of Comparative Judgement', *Psychological Review* 4, 273–286

## 8. Annex

### 8.1 Annex 1: Statement from CSERGE at the University of East Anglia

The Centre for Social and Economic Research on the Global Environment (CSERGE) at the University of East Anglia provided support and capacity building in designing and administering the Choice Experiment (CE) study in this project which is aimed at eliciting the value of the Scottish marine environment. Expert advice and support focussed on three key stages of the research:

- Study design and research timeline management: this process aimed at ensuring robustness of the methodological approach and definition of the key research milestones. CSERGE contributed to define the different steps of the study from consultation with experts to selection of attributes and levels, planning of the pilot design and preparation of the final questionnaire. For these steps, CSERGE supported the discussion with the steering group, the analysis of the pilot survey data, and the preparation and revision of the questionnaire structure to make the CE more relevant to the Scottish context. This stage was crucial to bridge scientific and socio-economic considerations and develop a CE with clear links to the national policy environment, in particular through reframing the restriction and biodiversity attributes and adding an area-based attribute. CSERGE also advised on experimental design options and coding in Ngenex, on the pilot survey distribution including liaising with online sample providers and on the survey coding in Qualtrics.
- Data collection, sampling and data handling: this process aimed at supporting the survey administration through Qualtrics as well as preparing the data for the econometric analysis. For the data collection, a special support was given in setting and monitoring quotas and coordinating the data collection with the survey company. In particular, advice was provided on merging the data collected with the CE experimental design, cleaning the final dataset in preparation for the econometric analysis of choice data, and defining rules to identify protesters and speeders.
- Data analysis: this process aimed at ensuring robustness of the modelling and the analytical approach. Capacity building was provided regarding the modelling of CE data using the R package mlogit for multinomial and mixed multinomial logit models. In addition, support was provided to interpret modelling outcomes including estimated coefficients, willingness-to-pay values, confidence in estimated results, and implications for potential policy scenarios, and considerations around uncertainty.

The CE has been developed following the best practices in environmental valuation and stated preferences, therefore we are confident that results can be robustly used to inform Scottish policies on marine management, including impact assessments and cost-benefit analyses. A balanced trade-off between the detailed, science-informed definition of attributes and levels (e.g., biodiversity changes) and the need to simplify complex issues to facilitate respondent's understanding was required. This resulted in an inevitable generalisation of some aspects of the CE. Nonetheless, the flexibility attained reflects the main characteristics of possible marine management policies (e.g., restrictions). Therefore, the use of results should focus on matching CE

outcomes (in particular willingness-to-pay values) with characteristics of potential policy implementation scenarios and keep in mind the resulting uncertainty.

## 8.2 Annex 2: Acronyms

<b>Acronym</b>	<b>Definition</b>
BTEC	Business and Technology Education Council
CE	Choice experiment
CSERGE	The Centre for Social and Economic Research on the Global Environment
GCSE	General Certificate of Secondary Education
HM	His Majesty's
HND	Higher National Diploma
ICO	Information Commissioner's Office
ISBN	International Standard Book Number
NVQ	Higher National Diploma
RSA	Royal Society of Arts
SQ	Status quo
UNEP	United Nations Environment Program
WCMC	World Conservation Monitoring Centre
WTP	Willingness to Pay

## 8.3 Annex 3. Survey Questionnaire

Thank you for taking the time to participate in this survey. The survey is part of research being conducted by the Scottish Government in collaboration with the University of East Anglia.

The research is about what is important to people about marine and coastal areas in Scotland and how people think they should be managed.

Marine and coastal areas are any part of the seas and coastline around Scotland, including beaches, coastal cliffs and coastal towns and settlements.

The survey will take about 15 minutes to complete.

### **Privacy Notice**

This survey is for a research project to better understand what is important to people about marine and coastal areas in Scotland.

The data collected from this survey will be stored securely with restricted access to authorised Scottish Government and University of East Anglia staff with ethical and scientific approval. All answers provided will be treated in the strictest confidence.

To allow the research to identify trends within the Scottish population, you will be asked to answer standard questions about your age, geographical area you live in, gender and socio-economic status.



The basis for this data collection is the 'public task' basis and the purpose of this research is to inform policy by developing the evidence base on how people value marine and coastal areas. All personal data collected from this survey will be deleted upon publication of the survey results in the next 12 months, which will be reported at an overall level in an anonymous way and individual responses will not be identifiable.

This research is being carried out by Marine Scotland, a directorate of the Scottish Government. If you wish to contact us with any queries relating to this research, you can do so at: [MarineAnalyticalUnit@gov.scot](mailto:MarineAnalyticalUnit@gov.scot).

Under data protection law, you have rights including:

**Your right of access** - You have the right to ask us for copies of your personal information.

**Your right to rectification** - You have the right to ask us to rectify personal information you think is inaccurate. You also have the right to ask us to complete information you think is incomplete.

**Your right to erasure** - You have the right to ask us to erase your personal information in certain circumstances.

**Your right to restriction of processing** - You have the right to ask us to restrict the processing of your personal information in certain circumstances.

**Your right to object to processing** - You have the right to object to the processing of your personal information in certain circumstances.

**Your right to data portability** - You have the right to ask that we transfer the personal information you gave us to another organisation, or to you, in certain circumstances.

You are not required to pay any charge for exercising your rights. If you make a request, we have one month to respond to you.

If you have any concerns about our use of your personal information, you can make a complaint to us at our Central Enquiry Unit: [ceu@gov.scot](mailto:ceu@gov.scot)

You can contact our Data Protection Officer at: [DataProtectionOfficer@gov.scot](mailto:DataProtectionOfficer@gov.scot)

You can also complain to the ICO if you are unhappy with how we have used your data. The ICO's address:

Information Commissioner's Office  
Wycliffe House  
Water Lane  
Wilmslow  
Cheshire  
SK9 5AF

Helpline number: 0303 123 1113 ICO website: <https://www.ico.org.uk>

Agreement to participate is entirely voluntary, and you can withdraw from the survey at any time if you do not want to continue.

Agreement to participate in this study is given by selecting the box below.

- I am at least 16 years old and agree to participate in this survey (1)
- I do not agree (this ends the survey) (2)

Please indicate your age

- 16-24 (1)
- 25-34 (2)
- 35-44 (3)
- 45-54 (4)
- 55-64 (5)
- 65-74 (6)
- 75+ (7)

Please indicate your sex

Note: a question about gender will follow.

- Male (1)
- Female (2)

Is the gender you identify with the same as your sex registered at birth?

- Yes (1)
- No (2)
- Prefer not to say (3)

Please indicate the area where you currently live in Scotland

▼ Aberdeen (1) ... West Lothian (32)

Please can you provide the first half of your postcode?

Depending on your postcode, this should be 3 or 4 characters. Please enter in the box below.

---

The Scottish government is considering introducing new management policies aimed at improving the environmental condition of Scotland's marine and coastal areas.

Marine and coastal areas are any part of the seas and coastline around Scotland, including beaches, coastal cliffs and coastal towns and settlements.





Do you or any of your close family and friends work in or depend largely on the following industries in Scotland? Please select all that apply.

- Commercial fishing (1)
- Farming of fish (2)
- Fish processing (3)
- Oil & gas (4)
- Marine renewable energy such as offshore wind, wave and tidal (5)
- Ports and shipping (6)
- Marine/coastal recreation and tourism e.g. scuba diving, cruise tourism, recreational boating (7)
- Scientific research such as marine biology (8)
- Shipbuilding (9)
- Farming of shellfish and seaweed (10)
- None (11)

Thinking about your personal experiences of Scotland's marine wildlife and habitats, how would you rate these experiences?

- Very poor (1)
- Poor (2)
- Neither poor nor good (3)
- Good (4)
- Very good (5)
- Don't know (6)

When you answered the last question, what were you thinking about the most?

- The overall variety of animals and plants in marine and coastal areas (1)
  - The environmental impact of marine industries (e.g. commercial fishing, fish farming, oil and gas) (2)
  - The condition of coastal and marine habitats (3)
  - Amount of litter on beaches (4)
  - Water quality (5)
  - Gut feeling (6)
  - Marine protection policies (e.g. Marine Protected Areas) (7)
  - Experience of seeing wildlife in marine and coastal areas (8)
  - Other (please specify) (9)
- 

In the past 5 years, do you think the overall environmental condition of marine and coastal areas in Scotland has...

- Improved (1)
- Stayed the same (2)
- Worsened (3)
- Don't know (4)

New management policies in marine and coastal areas are being considered by the Scottish Government. These policies aim to reduce the impact of human activities on vulnerable wildlife and habitats.

Different management policies can exist according to the following characteristics:

- Size of area where the change occurs
- Distance to the coast
- Type of restrictions
- Marine wildlife and habitats
- Educational boards

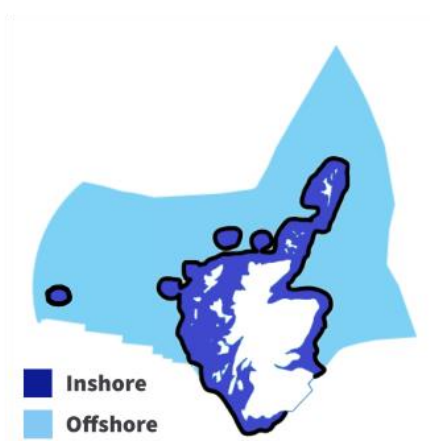
## Size of area where the change occurs



Scotland's seas are nearly six times larger than the land area of Scotland. The new management policies could be introduced in an area equal to:

- 2.5% of total sea area
- 5% of total sea area
- 7.5% of total sea area
- 10% of total sea area

## Distance to the coast



The new management policies could be introduced:


- Inshore - from the coast out to 12 nautical miles (22 kilometres)
- Offshore - from 12 nautical miles out from the coast to 200 nautical miles out from the coast (370 kilometres)



## Type of restrictions

The new management policies could include introducing restrictions on human activities that cause damage to marine wildlife and habitats. Non-damaging recreational activities will not be impacted by restrictions.

### Strength of restrictions








None	Low	Moderate	High
All fishing allowed	Only the most damaging fishing not allowed	All damaging fishing not allowed	No fishing of any kind
All other human activities allowed	All other human activities allowed	All damaging human activities need a licence	All damaging human activities not allowed

## Marine wildlife and habitats

The new management policies will impact the number and variety of wildlife and habitats, although changes might happen on the seafloor and not be visible to the general population.

### Change in number and variety of wildlife and habitats



			
<b>Very small</b> increase	<b>Small</b> increase	<b>Medium</b> increase	<b>Large</b> increase
Common wildlife and habitats: • <b>very small</b> increase	Common wildlife and habitats: • <b>small</b> increase	Common wildlife and habitats: • <b>medium</b> increase	Common wildlife and habitats: • <b>large</b> increase to long-term natural levels
Rare species: • <b>very small</b> increase	Rare species: • <b>small</b> increase	Rare species: • <b>medium</b> increase	Rare species: • <b>large</b> increase to long-term natural levels

## Educational boards



The new management policies will update existing information boards and install new boards with educational content (for all ages) about wildlife and habitats in marine and coastal areas around Scotland.

Considering these characteristics, different management policy options could be introduced. In the following pages, you will be asked your preferences for different management policy options.

Each option will require payment in the form of an increase in your annual household water charge to support the introduction, monitoring and enforcement of the management strategies.

Different management policy options will be presented to you in the form of a choice card. You will be asked to choose your most preferred option in each choice card. This should be the option that you think is best for you. There will be three options: A, B or C.

Choosing option A or B will cost the amounts shown in the choice card and will reduce your ability to make other purchases that may be equally important to you.

Option C is always the same in each choice card and represents the current situation. This means no change in the way marine and coastal areas are managed and no additional cost to your household.

The Scottish Government already allocates resources to managing marine and coastal areas. Any increase in your annual household water charge will be specifically used to fund new management policies in marine and coastal areas.

There are no right or wrong answers, but it is important your answers reflect your true opinions as the results from this survey will be used to help plan future management policies of marine and coastal areas.

On the following pages, you will be presented with six of these choice cards. Treat each choice card separately.

Could you please describe what you were generally thinking about when making your choices for the choice cards?

---

Do you have any suggestions for improving the presentation of the choice cards?

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On a scale of 1 (not at all) to 5 (completely), how clear do you think the choice cards presented were?

- 1 (not at all) (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (completely) (5)

On a scale from 1 (not at all) to 5 (completely), how sure were you of the choices you made?

- 1 (not at all) (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (completely) (5)

On a scale of 1 (not at all) and 5 (completely), how clear did you find the description of the following characteristics in the choice cards?

	1 (not at all) (1)	2 (2)	3 (3)	4 (4)	5 (completely) (5)	Don't know (6)
Size of the area where the change occurs (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distance to the coast (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Type of restrictions (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Marine wildlife and habitats (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which factor influenced your choice the most? Please select one from the list below.

- Size of area (1)
- Distance to coast (2)
- Type of restrictions (3)
- Marine wildlife and habitats (4)
- Educational content (5)
- Increase in your annual household water charge (6)

Which factor influence your choice the least? Please select one from the list below.

- Size of area (1)
- Distance to coast (2)
- Type of restriction (3)
- Marine wildlife and habitats (4)
- Educational content (5)
- Increase in your annual household water charge (6)

Is there any reason why you would not support payment of a programme to improve the environmental condition of marine and coastal areas in your area?

- No, I would support it (1)
  - I cannot afford it (2)
  - The programme should be funded through already existing taxes (3)
  - I think that the current situation is fine (4)
  - I already pay enough through my taxes (5)
  - I am not interested in the environmental condition of marine and coastal areas (6)
  - I do not visit marine and coastal areas (7)
  - Other reason – please specify (8)
-

What do you consider as the main reason for protecting marine wildlife and habitats?

- For nature and wildlife themselves (1)
  - For future generations (2)
  - For the health and well-being of wider society (3)
  - For you (4)
  - For your household and family (6)
  - I do not support protecting marine wildlife and habitats (7)
  - Other (please specify) (8)
- 

Irrespective of the scenarios and payments presented in the previous section, If you were given the possibility to vote, would you keep using public resources to support the protection and management of marine and coastal areas?

- Yes (1)
- No (2)
- Don't know (3)

The following questions aim to know more about your leisure visits to Scottish marine and coastal areas.

---

Approximately how far, in miles, do you live from the coast?

- Less than 5 miles (1)
  - Between 5 and 10 miles (2)
  - Between 10 and 25 miles (3)
  - Between 25 and 50 miles (4)
  - Between 50 and 100 miles (5)
-

Would you describe the area where you live as being “by the coast”? If you live between multiple addresses (for example, as a student, or if you have a second home), please think about your main home.

- Yes – the area where I live is “by the coast” (1)
- No – the area where I live is not “by the coast” (2)
- Don't know (3)

On a scale of 1 to 5, to what extent do you consider yourself to be part of a coastal community? Please place yourself on the scale below, where 1 indicates that you strongly consider yourself part of a coastal community, and 5 indicates that you do not consider yourself to be part of a coastal community at all, or you can choose any number in between

- 1 - I strongly consider myself to be part of a coastal community (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 - I do not consider myself to be part of a coastal community at all (5)
- Don't know (6)

Have you visited a marine or coastal area in Scotland in the last 12 months?

- Yes (1)
- No, but I have visited more than 12 months ago (2)
- No, and I have never visited (3)

What are the top 3 factors that you consider when deciding which Scottish marine and coastal areas to visit?

- Visiting an area which is not crowded (1)
  - Enjoying the natural environment (2)
  - Cleanliness of the area (3)
  - Being able to see wildlife in the area (4)
  - Distance you have to travel to the area from your home/where you are staying (5)
  - Walking opportunities (6)
  - Opportunities to relax (7)
  - Sports you can do in the area (8)
  - Availability of cafes and restaurants (9)
  - Car parking (10)
  - Safe for swimming (11)
  - Surf conditions (12)
  - Availability of shops and amusements (13)
  - Other factors (please specify) (14)
- 

Have you done any of the following leisure activities at a Scottish marine or coastal area in the last 12 months?



Please select all that apply.

- Walking/hiking/running at the coast (1)
  - Beach activities/games/picnics/BBQs (2)
  - Photography (3)
  - Dog walking (4)
  - Wildlife watching (5)
  - Swimming (6)
  - Power boating (outboard/inboard engine) (7)
  - Jet skiing (8)
  - Recreational fishing on the coast or in the sea (9)
  - Kayaking/rowing/canoeing (10)
  - Sailing (11)
  - Diving/snorkelling (12)
  - Surfing/bodyboarding (13)
  - Windsurfing/kite-surfing (14)
  - Other (please specify) (15)
- 

Of those leisure activities, which one is the most important to you?

The most important leisure activity is the one that you undertake most often, you

care the most, or you would not let go. Please select only one activity.

- Walking/hiking/running at the coast (1)
  - Beach activities/games/picnics/BBQs (2)
  - Photography (3)
  - Dog walking (4)
  - Wildlife watching (5)
  - Swimming (6)
  - Power boating (outboard/inboard engine) (7)
  - Jet skiing (8)
  - Recreational fishing on the coast or in the sea (9)
  - Kayaking/rowing/canoeing (10)
  - Sailing (11)
  - Diving/snorkelling (12)
  - Surfing/bodyboarding (13)
  - Windsurfing/kite-surfing (14)
  - Other (please specify) (15)
-

How often have you done (selected choice) at a Scottish marine or coastal area in the last 12 months?

- Daily (1)
  - Weekly (2)
  - Once a fortnight (3)
  - Monthly (4)
  - Once every six months (5)
  - Once a year (6)
- 

And where have you done (selected choice) the most in the last 12 months?

Please select the relevant region from the dropdown list and then enter the name of the specific area/site in the text box.

Region

▼ Argyll (1) ... Not sure (12)

Name of the area/site

\_\_\_\_\_

You indicated that you have not visited a Scottish marine or coastal area in the last 12 months.

---

What was the main reason/s for not visiting a marine or coastal area in Scotland in the last 12 months? Please select all the apply.

- Bad / poor weather (1)
  - Poor physical health (or illness) (2)
  - Poor mental health or wellbeing (3)
  - Lack of facilities and access points for those with disabilities (4)
  - Too busy at home and/or work (5)
  - Not interested and/or prefer to do other leisure activities (6)
  - Cost / too expensive (7)
  - Nowhere near me is nice enough to spend my free time in (10)
  - Stayed at home to stop coronavirus spreading / Government restrictions (11)
  - Poor transport links / access to the coast (12)
  - Lack of parking (or the cost of parking) (13)
  - Takes too long to get there / live too far away (14)
  - People like me don't visit the coast (15)
  - Another reason (please specify) (16)
- 
- No particular reason (17)
  - Don't know (18)

Although you have not visited in the last 12 months, is there a marine or coastal area in Scotland you feel a connection with?

- Yes (1)
- No (2)
- Don't know (3)

Where is the marine or coastal area in Scotland you feel a connection with?

- Argyll (1)
- Clyde (2)
- Forth & Tay (3)
- Moray Firth (4)
- North Coast (5)
- North East (6)
- Outer Hebrides (7)
- Orkney Islands (8)
- Shetland Isles (9)
- Solway (10)
- West Highlands (11)
- Not sure (12)
- None (13)

Why do you feel this connection? Please select all that apply.

- It is closest to my house (1)
  - I used to visit when I was younger (2)
  - My family use that area (3)
  - My friends use that area (4)
  - Other (please specify) (5)
- 

Are you? Please select one option that best applies.

- In full-time employment (31+ hours per week) (1)
- In part-time employment (Up to 30 hours per week) (2)
- Self-employed (3)
- Unemployed – less than 12 months (4)
- Unemployed (long term) – more than 12 months (5)
- Not working – retired (6)
- Not working – looking after house/children/other caring responsibilities (7)
- Not working – long term sick or disabled (8)
- Student – in full-time education (9)
- Student – in part-time education (10)
- Prefer not to say (11)

Are you a member of an environmental organisation?

If yes, please type the name of the organisation in the text box below (you can leave this blank if you prefer not to).

No (1)

Yes (2) \_\_\_\_\_

What is your highest level of qualification? Please select one answer only.

PHD/Doctor (1)

Masters (2)

Bachelor's Degree or equivalent (such as a NVQ level 5) (3)

Higher education (such as a HND or a NVQ level 4) (4)

Scottish Highers or equivalent (such as A levels, a Welsh Baccalaureate, NVQ level 3, BTEC National) (5)

GCSE or equivalent (such as O Level, NVQ level 2, BTEC First or an RSA Diploma) (6)

No qualifications (7)

Other qualifications (please specify) (8)

---

Prefer not to say (9)

Which of the following best describes your total annual household income before tax?

- £0–15,000 (1)
- £15,001–20,000 (2)
- £20,001–30,000 (3)
- £30,001–40,000 (4)
- £40,001–50,000 (5)
- £50,001–60,000 (6)
- £60,001–80,000 (7)
- £80,001–100,000 (8)
- £100,001-£150,000 (9)
- £150,001+ (10)
- Prefer not to say (11)

Finally, did you find this survey...

- Interesting (1)
  - Too long (2)
  - Difficult to understand (3)
  - Educational (4)
  - Unrealistic/not credible (5)
  - Other (please specify) (6)
-



## 8.4 Annex 4: Model Outputs

### Conditional Logit Model Coefficient Estimates

Attribute	Coefficient	Standard Error
Price (annual household water charge)	-0.016***	0.001
Size of area changed (1% of total sea area increase)	0.031**	0.010
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.030	0.047
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	-0.001	0.077
Wildlife and habitats (medium increase)	0.373***	0.063
Wildlife and habitats (large increase)	0.688***	0.067
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.322***	0.076
Type of restrictions (moderate)	0.391***	0.072
Type of restrictions (high)	0.006	0.066
Educational boards (no)	(reference level)	(reference level)
Educational boards (yes)	0.215***	0.046
Status quo	-0.459*	0.180

Note: \*\*\*, \*\* and \* indicate statistical significance at the 0.1%, 1% and 5% level of confidence, respectively.

### Mixed Logit Model Coefficient Estimates

Attribute	Coefficient	Standard Error
<b>Coefficients</b>		
Price (annual household water charge)	-0.016***	0.001
Size of area changed (1% increase)	0.029**	0.011
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.032	0.049
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.014	0.081
Wildlife and habitats (medium increase)	0.389***	0.067
Wildlife and habitats (large increase)	0.714***	0.070
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.324***	0.080
Type of restrictions (moderate)	0.406***	0.077
Type of restrictions (high)	0.005	0.068

Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.222***	0.047
Status quo	-0.507**	0.189
<b>Standard Deviation Coefficients</b>		
Size of area changed (1% increase)	0.057*	0.022
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.051	0.183
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.055	0.302
Wildlife and habitats (medium increase)	0.429	0.241
Wildlife and habitats (large increase)	0.008	0.243
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.217	0.254
Type of restrictions (moderate)	0.061	0.273
Type of restrictions (high)	0.109	0.247
Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.023	0.181
Status quo	0.068	0.196

Note: \*\*\*, \*\* and \* indicate statistical significance at the 0.1%, 1% and 5% level of confidence, respectively.

#### Mixed logit model with interactions

Attribute	Coefficient	Standard Error
<b>Mean Coefficients</b>		
Price (annual household water charge)	-0.017***	0.001
Size of area changed (1% increase)	0.028*	0.011
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.029	0.049
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.009	0.082
Wildlife and habitats (medium increase)	0.401***	0.068
Wildlife and habitats (large increase)	0.717***	0.071
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.332***	0.080
Type of restrictions (moderate)	0.413***	0.077
Type of restrictions (high)	0.003	0.069

Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.221***	0.048
coast.SQ	-0.097	0.085
rec.SQ	-0.187*	0.090
indust.SQ	-0.204*	0.091
male.SQ	0.032	0.066
young.SQ	-0.393***	0.080
visit.SQ	-0.420***	0.078
Status quo	-0.016	0.199
<b>Standard Deviation Coefficients</b>		
Size of area changed (1% increase)	0.062	0.022
Distance to coast (inshore)	(reference level)	(reference level)
Distance to coast (offshore)	0.044	0.183
Wildlife and habitats (very small increase)	(reference level)	(reference level)
Wildlife and habitats (small increase)	0.042	0.304
Wildlife and habitats (medium increase)	0.398	0.248
Wildlife and habitats (large increase)	0.003	0.244
Type of restrictions (none)	(reference level)	(reference level)
Type of restrictions (low)	0.188	0.257
Type of restrictions (moderate)	0.038	0.275
Type of restrictions (high)	0.140	0.247
Educational boards (no)	(reference level)	(reference level)
Educational Content (yes)	0.044	0.182
Status quo	0.120	0.198

Note: \*\*\*, \*\* and \* indicate statistical significance at the 0.1%, 1% and 5% level of confidence, respectively.

## 8.5 Annex 5: Aggregate WTP Estimates

<b>Attribute</b>	<b>Aggregate WTP</b>	<b>Lower C.I.</b>	<b>Upper C.I.</b>
Wildlife and habitats (large increase)	£110.93m	£89.72m	£132.14m
Moderate restrictions	£63.06m	£40.19m	£85.93m
Wildlife and habitats (medium increase)	£60.16m	£40.09m	£80.23m
Low restrictions	£51.87m	£27.69m	£76.04m
Educational content	£34.63m	£20.10m	£49.15m
Size of area changed (1% increase)	£5.00m	£1.77m	£8.23m
Status Quo	-£73.97m	-£130.81m	-£17.14m



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