



ENVIRONMENTAL VALUE LOOK-UP TOOL

User Guide

For Department for Environment, Food & Rural Affairs (Defra)

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CONTENTS

SUMMARY	iii
1. INTRODUCTION	1
2. WHEN TO USE THE EVL TOOL	2
2.1 The policy development cycle	2
2.2 Using indicative values	2
3. HOW TO INTERPRET INDICATIVE VALUES	4
3.1 Compiling indicative values	4
3.2 Understanding indicative values.....	5
4. HOW TO USE THE ENVIRONMENTAL VALUE LOOK-UP TOOL	6
4.1 Structure of the EVL Tool.....	6
4.2 Before using the EVL Tool	7
4.3 Finding an indicative value.....	9
4.4 Coverage of the EVL Tool.....	12
4.5 Aggregating an indicative value	13
4.6 Presenting results	16
4.7 Illustrative examples using the EVL Tool	18
REFERENCES	24
ANNEX 1: BROAD HABITAT TYPES	25
ANNEX 2: ENVIRONMENTAL IMPACT/GOOD CATERGORISATION	29
ANNEX 3: INDICATIVE VALUE QUALITY RATING	30

SUMMARY

Overview

The Environmental Value Look-Up (EVL) Tool has been developed for Defra to provide indicative values for environmental impacts for use by analysts in Government departments, non-departmental public bodies, and other organisations. This User Guide accompanies the EVL Tool. It provides supporting information on: (i) when to use the tool; (ii) how to interpret indicative values; and (iii) how to use the tool.

Understanding indicative values

The EVL Tool provides indicative values for:

1. First-cut, rapid analysis of environmental impacts; and
2. Valuing secondary or incidental impacts in appraisals and assessments that might otherwise overlook environmental impacts.

The current set of indicative values are based on a review of over 350 UK studies, from 2000 onwards, that have estimated the value of impacts and goods and services associated with the natural environment.

Indicative values are not suitable for use in situations where significant environmental impacts are expected. This will include cases where environmental objectives are the main focus of the policy or project intervention. More detailed assessments of impacts will be required along with more robust approaches to valuation. This includes formal value transfer applications or primary economic valuation studies. Indicative values may, though, provide a useful starting point for scoping the requirements of these more detailed analyses.

Using indicative values

Whether it is appropriate to use indicative values for environmental impacts in an economic appraisal depends on:

- The level of accuracy in evidence required for the decision to be made; and
- The expected significance of the environmental impacts.

These judgements relate to the proportionality of effort in appraisal, taking account of the time and resources available for gathering and analysing data for the assessment of impacts. Similar considerations also apply when using the EVL Tool in other settings, such as policy briefings and ecosystem accounting.

Key points to note when using indicative values are:

- Indicative values should be interpreted as broad generalisations of the values that have been observed for different environmental goods and impacts.
- In most cases, indicative values will not provide a one-to-one mapping to the impacts (costs and benefits) to be valued in a particular appraisal.
- Indicative values may help determine where to focus further appraisal effort.

How to use the EVL Tool

The EVL Tool is a Microsoft Excel workbook. It contains a ‘look-up’ table (database) of indicative values. The tool has a user interface with a search function for selecting indicative values based on specific selection criteria.

Indicative values are provided for different types of environmental goods and impacts, organised by ‘broad habitat’ type (a means of classifying the natural environment).

Note that the EVL Tool does not include indicative values for all combinations of broad habitat type and environmental impact/good. This is due to gaps in the evidence base and/or no suitable studies being available.

The EVL Tool is structured as a series of tabs (worksheets):

Tabs in the EVL Tool	Description
1. User interface	The "User Interface" tab allows you to search for indicative values based on the type of habitat and environmental impact or good.
2. Detailed results	The "Detailed Results" tab presents further information on the indicative value (e.g. summary details of the underlying supporting study or studies).
3. Database	The "Database" tab contains all the 'indicative' values currently within the tool.
4. Aggregation	The "Aggregation" tab allows you to calculate annual aggregate values (£/year), present value estimates (£ PV) and equivalent annual value estimates (£/year) using your selected indicative value(s).
5. Biodiversity studies	The "Biodiversity Studies" tab presents a summary of studies and values not included in the tool but that may be useful for value transfer exercises for biodiversity and cultural services valuations (e.g. conservation of habitats and species, landscape and cultural values associated with the natural environment).
6. Useful links	The ‘Useful Links’ tab provides a list of further references for users of the tool (e.g. appraisal guidance, guidance on valuing environmental impacts, etc.).

Further details

Further details on the EVL Tool can be found in this User Guide which includes worked examples using indicative values from the tool.

It is also strongly recommended that users of the EVL Tool consult an economist for guidance on the appropriate use in an economic appraisal.

For further guidance please contact Colin Smith, Defra Biodiversity and Ecosystems Evidence team: Colin.Smith2@defra.gsi.gov.uk.

1. INTRODUCTION

The Environmental Value Look-Up (EVL) Tool has been developed by eftec for Defra to provide indicative values for environmental impacts for use by analysts in Government departments, non-departmental public bodies, and other organisations.

This User Guide accompanies the EVL Tool and provides supporting information on:

1. **When to use the EVL Tool** - the policy and project analysis settings for which the EVL Tool is intended;
2. **How to interpret indicative values** - the main points to understand when using the EVL Tool to inform policy and project analyses; and
3. **How to use the EVL Tool** - the practical steps for selecting indicative values and calculating environmental cost and benefit estimates, including illustrative examples of using the tool.

Links to other resources are also highlighted. This includes supplementary Green Book guidance for environmental appraisal (HM Treasury and Defra, 2012) and Defra's value transfer guidelines (eftec, 2010), which are available to support more detailed assessments of environmental impacts.

Note for readers

The User Guide focuses on the use of the EVL Tool in an economic appraisal setting. The tool can be used in other contexts - for example for policy briefings that provide an overview of existing environmental valuation evidence in particular topic area, or high level ecosystem accounts. The key points for using the tool apply equally to appraisal and these alternative uses.

It is strongly recommended that users of the EVL Tool consult an economist for guidance on the appropriate use in an economic appraisal.

For further guidance please contact Colin Smith, Defra Biodiversity and Ecosystems Evidence team: Colin.Smith2@defra.gsi.gov.uk.

2. WHEN TO USE THE EVL TOOL

The EVL Tool provides indicative values for:

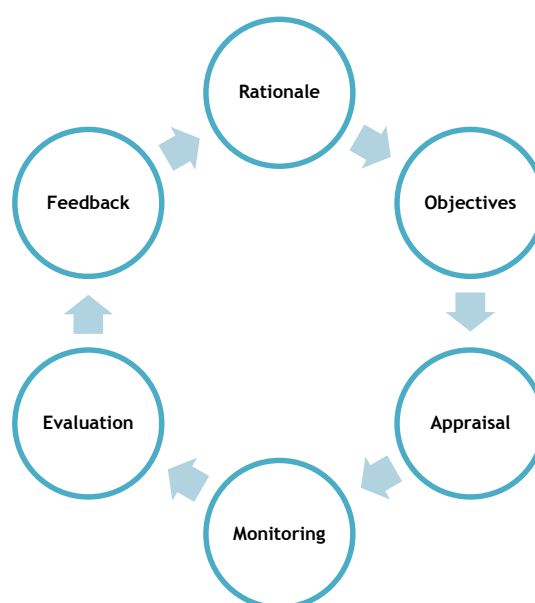
1. First-cut, rapid analysis of environmental impacts; and
2. Valuing secondary or incidental impacts in appraisals and assessments that might otherwise overlook environmental impacts.

Indicative values sourced from the tool are broad generalisations of the valuations that have been observed for different environmental goods and impacts.

2.1 The policy development cycle

Indicative values for environmental impacts can be useful inputs at different stages of the policy development cycle¹. For example:

- **Objectives:** understanding the situation in terms of the potential significance of environmental impacts;
- **Appraisal:** developing and appraising options by screening options and impacts and valuing ‘secondary’ impacts; and
- **Monitoring and evaluation:** assessing environmental outcomes.



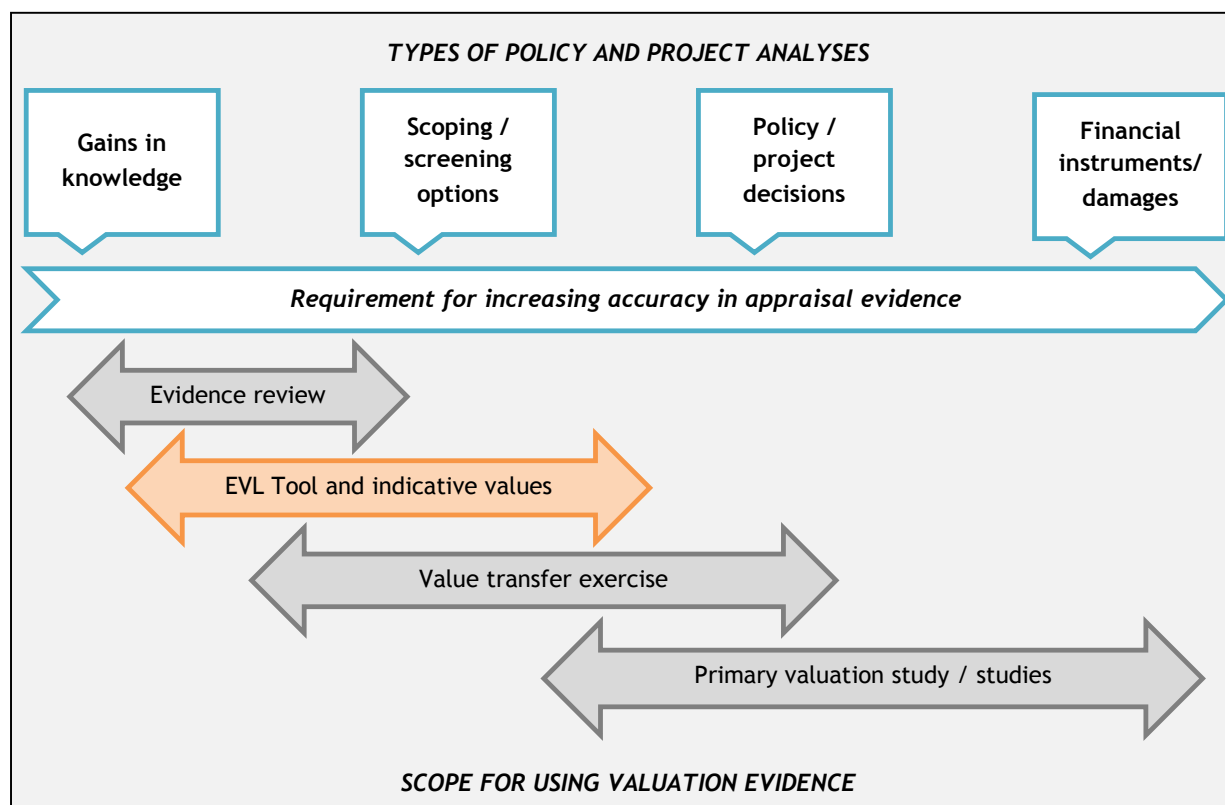
2.2 Using indicative values

Indicative values are not suitable for situations where significant environmental impacts are expected. This will include cases where environmental objectives are the main focus of the policy or project intervention.

In these instances more detailed assessments of impacts are required along with more robust approaches to valuation. This includes formal value transfer applications or primary economic valuation studies. However, indicative values may provide a useful starting point for scoping the requirements of these more detailed analyses.

¹ HM Treasury Green Book (2003) ROAMEF (Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback) policy cycle.

The use of indicative values will be in appraisal cases with lower requirements for accuracy in assessing environmental impacts:



Whether it is appropriate to use indicative values for environmental impacts in an economic appraisal depends on:

1. The level of accuracy in evidence required for the decision to be made; and
2. The expected significance of the environmental impacts.

These judgements relate to the proportionality of effort in appraisal, taking account of the time and resources that are available for gathering and analysing data for the assessment of impacts.

Similar considerations also apply when using the EVL Tool in other settings, such as policy briefings and ecosystem accounting.

3. HOW TO INTERPRET INDICATIVE VALUES

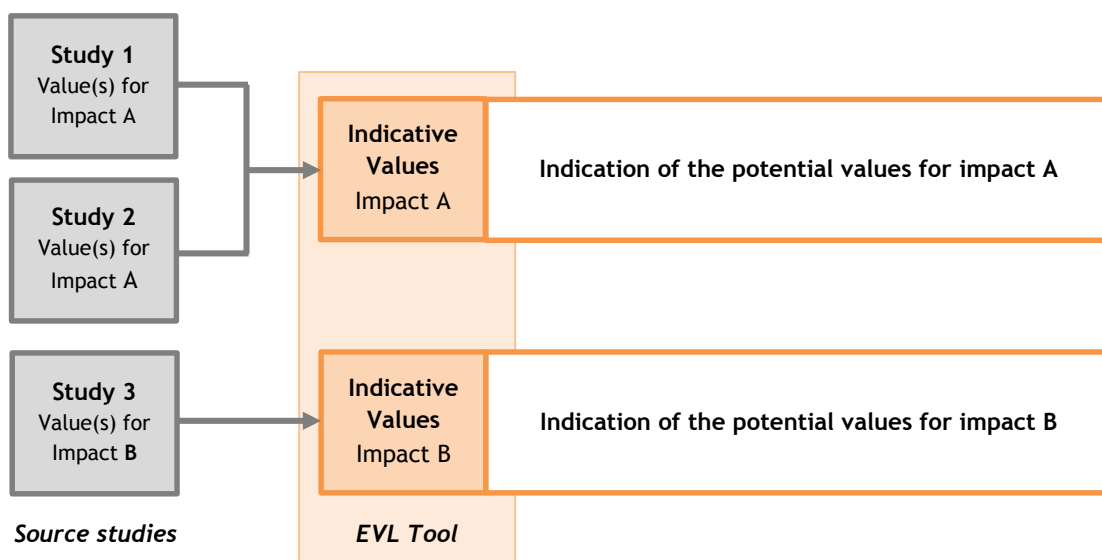
Indicative values provided in the EVL Tool are sourced from UK studies that have estimated the value of impacts and goods and services associated with the natural environment.

The current set of indicative values are based on a review of over 350 UK-focused studies from 2000 onwards. Based on established criteria for value transfer, the review identified source studies that provide valuation evidence with the potential to be applied to a broad set of appraisal cases.

3.1 Compiling indicative values

The process for compiling indicative values is summarised in the accompanying Technical Report ‘Development of ‘Look-Up’ Environmental Value Estimates for Initial Appraisal Within Cost-Benefit Analysis’ (eftec, 2015a). Overall, the EVL Tool provides links to three main sources of valuation evidence:

1. **Indicative values** - these consist of approximately 40 sets of values² for various combinations of broad habitat type and environmental good/impact. Indicative values can be based on a single source study or multiple source studies that value the same environmental good or impact:



The example below shows the woodland recreation and tourism values that are included in the EVL Tool. Valuation evidence is consolidated from four source studies into a range of values that reflects different types of recreational use of woodlands:

Woodlands - recreation and tourism (£/visit) (2014 £)			
EVL Tool indicative values		Source studies*	
Low: £2 - £6	General users (informal activities)	Sen et al. (2014) Scarpa (2003)	£4 - £6 £2 - £4
Central: £10	Specialist users (e.g. nature watchers)	Christie et al. (2006)	£10
High: £19	Specialist users (e.g. cyclists)	Christie et al. (2006)	£19

Note: *Source study valuations are rounded to the nearest £1 and inflated to 2014 price terms.

² October 2015 version of EVL Tool (v4).

2. **Valuations provided by current UK Government guidance for specific externalities** - for the purposes of consistency these are ‘sign-posted’ in the tool (rather than being embedded in the tool to avoid duplication):
 - Valuation of energy use and greenhouse gas emissions (DECC, 2014);
 - Air quality damage cost guidance (Defra, 2011);
 - Environmental noise (impacts on sleep disturbance, annoyance, hypertension, productivity and quiet) (Defra, 2014);
 - Local environment quality (Defra, 2013); and
 - Flood risk management and coastal erosion (Environment Agency, 2015).
3. **Further studies and values related to biodiversity and cultural services** - this evidence is included as a separate look-up table and may be useful for value transfer exercises for biodiversity and cultural services valuations (e.g. conservation of habitats and species, landscape and cultural values associated with the natural environment). See Section 4.4.

3.2 Understanding indicative values

Key points for interpreting and understanding the use of indicative values are:

- **Indicative values should be interpreted as broad generalisations of the values that have been observed for different environmental goods and impacts.** This monetary evidence may be informative in appraisal weighing environmental impacts alongside other economic and social impacts of a policy or project.
- **In most cases indicative values will not provide a one-to-one mapping to the impacts (costs and benefits) to be valued in a particular appraisal.** The source study valuations relate to various levels of provision of environmental goods and different types and scales of impact. There is a ‘margin of error’ when using indicative values. This is due to the uncertainty resulting from using the source valuations in a broad and generalised way.

The EVL Tool has limited scope for adjusting indicative values to account for context specific factors in an appraisal. These factors include: the current level of environmental quality / provision of the environmental good; the scope of the change in its provision; the location and timing of this change; etc. More detailed assessments that build on a first-cut analysis provided by the tool should aim to provide an explicit account of these factors. Further guidance is provided in Defra’s value transfer guidelines (eftec, 2009).

- **Indicative values may help determine where to focus further appraisal effort.** This can include highlighting the need for more detailed value transfer or primary valuation evidence where: (i) the scale of environmental impacts influences cost-benefit analysis results that inform policy or project options (including mitigation options); and/or (ii) where the trade-offs between different impacts (environmental or otherwise) is uncertain.

4. HOW TO USE THE ENVIRONMENTAL VALUE LOOK-UP TOOL

The EVL Tool is a Microsoft Excel workbook. It contains a ‘look-up’ table (database) of indicative values. The tool has a user interface with a search function for selecting indicative values using specific selection criteria.

Indicative values are provided for different types of environmental goods and impacts, organised by ‘broad habitat’ type (a means of classifying the natural environment).

4.1 Structure of the EVL Tool

Broad habitats

The broad habitat types specified in the EVL Tool are based on the UK National Ecosystem Assessment (2011) classification. Broad habitats refer to different types of land cover which form an entry point to understanding natural capital and the benefits that nature provides. These are as follows (see Annex 1 for descriptions):

- Mountains, moors and heaths;
- Semi-natural grasslands;
- Enclosed farmland;
- Woodland;
- Freshwater, wetlands and floodplains;
- Urban (green space);
- Coastal margins; and
- Marine.

Environmental impacts/goods

The categorisation of the environmental impacts/goods covered by the EVL Tool is based on the supplementary guidance to the HM Treasury Green Book ‘Accounting for Environmental Impacts in Policy Appraisal’ (HM Treasury and Defra, 2012). This combines a variety of ecosystem services and wider environmental impacts. The categorisation of environmental impacts and goods in the EVL Tool is outlined in Annex 2 and described below.

Ecosystem service classification	
Provisioning services	e.g. food, fibre, fuel, genetic resources
Regulating services	e.g. air quality, climate regulation, natural hazard regulation
Cultural services	e.g. recreation and tourism, aesthetic value
Supporting services	Support provisioning, regulating and cultural services
Wider environmental impacts classification	
Air quality	-
Biodiversity	e.g. variety and abundance of species, changes to habitats
Adapting to climate change	-
Landscape	e.g. landscape character, visual amenity
Noise and nuisance	e.g. noise pollution
Waste management	-
Water including flood risk	e.g. pollution, abstraction, risk of flood

4.2 Before using the EVL Tool

Before using the EVL Tool, the environmental impact or good to be valued needs to be assessed. This should provide a description of the change in environmental quality or the provision of the good resulting from the policy or project under consideration. It should be based on relevant scientific and technical evidence (or judgements).

A checklist of requirements is provided in the table below. Use this to structure a rapid assessment of the environmental impact/good:

Checklist for rapid assessment of environmental impacts/goods for EVL Tool	
What is the environmental / impact good?	<i>Describe in qualitative terms</i>
Why is there a change in the provision of environmental quality or the good?	<i>Describe the impact of the policy or project option</i>
How is the change measured in physical terms?	
Where is the change/impact taking place?	<i>Describe the spatial location and extent of the impact of the policy or project option</i>
When will the change take place?	<i>Describe the likely timing and time profile of the of the impact of the policy or project option</i>
Who is affected?	<i>Describe the population or groups that are affected by the impact of the policy or project option</i>

Tip ⇒ It may be necessary to consult with technical/science and policy analyst colleagues to determine what evidence is available on the physical impacts of the policy or project option being appraised.

Various resources are available to assist with a preliminary assessment of environmental impacts as summarised in Box 1.

Box 1: Resources to consult in a preliminary assessment of environmental impacts

- **Accounting for environmental impacts - Supplementary Green Book guidance (HM Treasury and Defra, 2012).** This guidance should be consulted *before* using the EVL Tool for the first time. It contains: (i) an outline of the ecosystem service framework that provides underpinning principles for the assessment of environmental impacts; (ii) technical guidance on the valuation of environmental impacts; and (iii) step-by-step guide to valuing environmental effects.

Tip ⇒ Use ‘Wider Environmental Checklist and Flow Chart’ included in the guidance as a further resource to provide a rapid assessment of the environmental impact/good you are assessing.

- **Defra value transfer guidelines (eftec, 2010).** These show how environmental evidence should be presented to match (in definition and units) the relevant economic value evidence.

Tip ⇒ Consult the ‘Summary of Value Transfer Steps’ for further details on key information needed for defining environmental impacts/goods for valuation.

- **Ecosystem assessment resources.** The GOV.UK ‘Guidance for policy and decision makers on using an ecosystems approach and valuing ecosystem services’ provides a starting point, including links to:
 - An introductory guide to valuing ecosystem services
 - Defra research and case studies that contribute to the body of evidence on the importance of the natural environment to society and using an ecosystems approach.
 - The UK National Ecosystem Assessment (UKNEA, 2011): the first analysis of the UK’s natural environment in terms of the benefits it provides to society and our continuing economic prosperity.

Tip ⇒ Consult the UKNEA (2011) Synthesis Report for a comprehensive overview of how the natural environment contributes to human welfare. An extract is provided in Annex 1 for reference, showing the relative importance of the broad habitat types in delivering ecosystem services.

Useful reports and resources can also be accessed from Natural England’s ‘Access to Evidence - Ecosystem Services’ webpage. This includes the Ecosystem Services Transfer Toolkit that provides a literature review of the effect of land management actions on the provision of ecosystem services.

Tip ⇒ The Ecosystem Services Transfer toolkit is provided as an Excel workbook with a Quick Start Guide. The spreadsheet can be searched and queried to find evidence of the effects of specific land management actions on ecosystem services provided by a range of habitats.

4.3 Finding an indicative value

The EVL Tool has six main tabs (worksheets) plus a ‘home page’ with links for navigating between tabs:

- **User Interface:** use this to search for indicative values based on the type of habitat and environmental impact or good.
- **Detailed Results:** this provides further information on the indicative value, including summary details of the source studies.
- **Database:** this contains the look-up table for the indicative values
- **Aggregation:** use this to calculate annual values (£/year) and present value estimates (£ PV) for the selected indicative value(s).
- **Biodiversity Studies:** this provides a list of studies and valuation evidence not included in the tool but potentially useful for value transfer exercises for biodiversity and cultural services valuations (see Section 4.4).
- **Useful Links:** this provides a list of further references for users of the tool (e.g. appraisal guidance, guidance on valuing environmental impacts, etc.).

User interface

The **user interface** is shown in Figure 1. This tab allows you to search for indicative values in two steps using the drop down menu options provided:

- Step 1 - Select the broad habitat type you need indicative values for.
- Step 2- Select the type of environmental impact or good you need an indicative value for.

Results are displayed in the fields below the drop down menu:

User interface - fields	
Indicative values	Monetary unit values based on the selected broad habitat type and environmental impact or good. Depending on the selected combination and source studies low, central and high values may be available.
Unit	The units for the indicative value (e.g. £/visit; £/tonne; £/hectare).
Indicative value quality rating (see Annex 3)	A red-amber-green (RAG) rating for the valuation displayed based on: <ol style="list-style-type: none"> 1. The strength of evidence on which the indicative values are based (quality and robustness of individual source studies) 2. The consistency of valuations between source studies
Important considerations	Accompanying notes for using the indicative value(s) in practical applications

The EVL Tool does not include indicative values for all combinations of broad habitat type and environmental impact/good. This is due to gaps in the evidence base and/or no suitable studies

being available. Once a board habitat type is selected, the environmental impact/good drop down menu will only display the impacts/goods that values are available for in the tool.

The user interface can be used to assess multiple environmental impacts successively. This can be done by changing the selected board habitat type and/or environmental impact/good.

Tip ⇨ use the ‘RESET’ button on the top right-hand corner of the user interface to clear the selection from the drop-down menus.

Figure 1: User interface

Environmental Value Look-Up (EVL) Tool

RESET

Complete Steps 1 and 2 by selecting the broad habitat first and then the type of environmental impact/good to search for indicative values.

Selection criteria

Step 1 - Select the **broad habitat** you want to find indicative values for:

Step 2 - Select the **type of environmental impact/good you want to find** indicative values for. Note: only impacts/goods for which indicative values are available can be selected in this step:

Indicative values

	Low	Central	High
Indicative values (unit value and range)			
Unit			
Indicative value quality rating			
Important considerations			

Click here for further details on these values

Indicative quality rating			
Strength of evidence (A)	Level of consistency (B)		
	Low (1)	Moderate (2)	High (3)
Low (1)			
Moderate (2)			
High (3)			

User interface (EVL Tool v4; 26/10/2015)

Detailed results tab

The **detailed results** tab can be accessed from the user interface. It presents further information about the selected indicative value, including a summary of the source study/studies as follows:

Detailed results - fields	
Broad habitat	<i>Displayed in user interface</i>
Environmental impact/good	
Value (low, central, high)	
Units	
No. of source studies	Number of studies underlying indicative value(s)
Method(s)	Method(s) used in source studies to estimate indicative value(s)
References	Full study reference(s) if users need to refer to the study for more information (e.g. to undertake value transfer if it is judged as necessary)
Indicative value quality rating	<i>Displayed in user interface</i>
Definition of good	Information about (dis)benefits provided by broad habitat, physical characteristics, and components of total economic value measured.
Change in provision	Qualitative and/or quantitative description of the change in terms of nature, direction, timing and scale.
Location	Specific geographical area (e.g. region, area of habitat, etc.)
Affected population	User/non-user beneficiary population including size, patterns of user and/or socio-economic profile.
Substitutes	The number and quality of substitutes and whether they are accounted for in the selected indicative value(s)
Market construct	Whether the good is a private good, public good, etc.
Notes for value transfer	More detailed than the 'important considerations' presented in the user interface. This field explains the robustness and use of the indicative value(s) in terms of the limitations of method(s) and sampling of studies and applicability of values across different locations and populations. Some tips on how to aggregate the value (and undertake more detailed value transfer, if required) are provided.

The summary information set out on the detailed results tab follows the criteria set out in the Defra value transfer guidelines. It is provided to help judge the 'goodness of fit' of the selected indicative value(s) to the environmental impacts you are assessing in your appraisal case. This can also help scope requirements of more detailed analyses of environmental impacts.

4.4 Coverage of the EVL Tool

Database

This **database** tab contains all of the indicative values included in the tool within a look-up table. This is the source information for the results that are displayed in the user interface tab and in the detailed results tab. This tab consists of approximately 40 indicative values as well as links to existing Government guidance.

The database tab provides an alternative option for searching for look-up values.

Tip ⇒ use the filter function on the look-up table column headings to display indicative values by broad habitat type and/or environmental impact/good.

For some assessments of environmental impacts, there may be a requirement for more information than currently provided in the database tab. In such cases, study titles can be used to search the Environmental Valuation Reference Inventory (EVRI) database (www.evri.ca).

Biodiversity studies

Values associated with biodiversity can be broadly categorised as:

- **Direct and indirect use values associated with biodiversity:** this is the contribution of biodiversity to supporting the provision of final good and services.

In the EVL tool this aspect of ‘biodiversity value’ is captured in the indicative values that are provided for other final goods and services. For example, the contribution of biodiversity to the provision of agricultural crops, timber, carbon sequestration, and recreation (including wildlife watching).

Valuing this aspect of biodiversity separately can lead to double-counting other values included in the EVL Tool. Exceptions would be cases where impacts on biodiversity may jeopardise future levels of provision of these goods by impacting on the resilience of ecosystems. Accounting for these impacts is beyond the scope of the tool and requires more detailed scientific and economic assessments.

- **Cultural value, including biodiversity non-use values:** these values are associated with conserving habitats and wildlife, including non-use values, which are separate from the valuations for final goods and services described above. It also includes wider cultural values - for example for conserving landscapes and iconic features of the natural environment - that also have an embedded element of biodiversity.

The available evidence base is varied and, at present, it is not sufficiently consistent to be able to consolidate it to specify indicative values for the EVL tool. Therefore it is recommended that a formal value transfer exercise should be the starting point for assessments of impacts concerning ‘cultural’ biodiversity values and the conservation of habitats and wildlife.

To support value transfer exercises, a list of UK studies capturing cultural values associated with conserving habitats and wildlife, including biodiversity non-use values is provided in the EVL tool. This is included as a separate look-up table on the biodiversity studies tab, which can be accessed via the ‘Detailed Results’ tab when “Biodiversity - cultural values including habitats and wildlife conservation” is selected as an environmental impact/good on the user interface.

Further discussion on the valuation of biodiversity, the available evidence, and its suitability for indicative value applications is provided in an accompanying discussion paper 'Valuing Biodiversity' (eftec, 2015b).

4.5 Aggregating an indicative value

The EVL Tool provides indicative values for environmental impacts and goods in unit value terms. For example: £/visits, £/household/year, or £/hectare/year. In most appraisal cases, unit values need to be aggregated to estimate the aggregate benefit or cost over a number of years.

Aggregation tab

A function for calculating aggregate benefit and cost estimates for environmental impacts is included within the EVL Tool. This is provided on the **Aggregation** tab as shown in Figure 3. A link to the aggregation tab is included on the detailed result tab.

Aggregate values can be calculated using the indicative values selected on the user interface tab as follows. Note that fields that require your input are highlighted in **green**:

1. **Indicative value:** Step 1 - use the drop down menu to display the required indicative value.
2. **Aggregation:** specify the unit value and quantity for the impact/good:
 - Step 2 - input the indicative value to be used - the unit value to be used in the calculation needs to be inputted manually. This provides flexibility to select a particular value in cases where the tool gives a range of indicative values to choose between.
 - Step 3 - input the quantity for calculating the aggregate value (e.g. no. of visitors; tonnes; hectares).

Tip ⇒ The quantity entered must be in the same unit that the unit value is expressed in.
3. **Time period for the analysis:** Input the parameters for calculating aggregate values:
 - Step 4 - Input the year when the impact starts.
 - Step 5 - Input the time period for calculating the aggregate value.
 - Step 6 - Input the first year of the time horizon for the analysis (year 0 for discounting future values).
4. **Headline results:** these are reported in a standard table format. See Figure 4 (Section 4.6).
 - Select the scale for the monetary results to be reported in (£, £k, or £m).
 - Equivalent annual value (£/yr) - represents the equivalent series of (equal) cash flows over the selected time horizon.
 - Present value (£ PV) - the discounted sum of future values over the selected time horizon.

Present values and equivalent annual values are calculated in accordance with the HM Treasury Green Book (2003) declining discount rate schedule. Supporting calculations are shown at the bottom of the Aggregation tab worksheet.

The fields shown on the aggregation tab are:

Aggregation tab (Step 1 -6) - fields	
Broad habitat	As selected on user interface
Environmental impact/good	
Step 1 - Select indicative value	Drop-down menu to display results from user interface tab
Indicative value	Indicative value corresponding to drop-down menu selection (Step 1)
Unit	The units for the indicative value (e.g. £/visit; £/tonne; £/hectare).
Step 2 - Indicative value to use	Input field - enter unit value to be used in aggregate value calculation
Step 3 - Quantity for calculating the aggregate value	Input field - enter quantity for the impact/good
Step 4 - Year when impact starts	Input field - select start year for impact from drop-down menu
Step 5 - Time period for analysis	Input field - select time period for analysis from drop-down menu
Step 6 - First year of the time period	Input field - select first year for time period from drop-down menu

Figure 3: Aggregation tab (Steps 1 - 6)

AGGREGATION

RESET

Use this tab to calculate annual aggregate values (£/year) and present value estimates (£ PV) for your selected indicative values.

COLOUR KEY
User input required
No user input required

1. INDICATIVE VALUE

This summarises the broad habitat and environmental good/impact selected in the user interface tab.

Broad habitat type:

Type of environmental impact/good:

	Main policy option	Sensitivity 1	Sensitivity 2
Step 1 - Select indicative value			

Using the drop down list. Two additional columns are provided to enable you to undertake sensitivity analysis for key variables/areas of uncertainty

Indicative value:

Unit:

2. AGGREGATION

	Main policy option	Sensitivity 1	Sensitivity 2
Step 2 - Input the indicative value you want to use			
Step 3 - Enter the quantity to calculate the aggregate value			

3. TIME PERIOD FOR THE ANALYSIS

Step 4 - Enter the year when your impact starts
Using the drop down list

Step 5 - Enter the time period for your analysis (number of years)
Using the drop down list

Step 6 - Select the first year of the time horizon for your analysis
Using the drop down list

Note the year selected **MUST** be earlier than or equal to the year entered in Step 4

Aggregation tab - Steps 1-6 (EVL Tool v4; 23/10/2015)

Key points to account for when calculating aggregate values include:

- **Any selected unit value for an environmental good/impact is in effect a first approximation in the appraisal** - it should be subject to appropriate sensitivity testing.
- **Where possible select a range of unit values** - e.g. high / low - to reflect the potential bounds of the indicative valuation. The purpose of using the EVL Tool is to reflect the possible scale of costs and benefits associated with environmental goods and impacts.

Tip ⇒ the aggregation function allows up to three calculations (i.e. sensitivity tests) to be inputted. Use this to test the sensitivity of results to different unit values and aggregation quantities. You can also use 'RESET' button on the aggregation tab to clear all your inputs and re-start the aggregation process.

- **Consider the risk of double counting.** The coverage of source studies means that some indicative values represent a combination or bundle of environmental goods/impacts (e.g. recreation and tourism as well as aesthetic value). When using these values, you should be aware of all goods/impacts that are covered.

Tip ⇒ the detailed results tab provides information on the definition of impact/good covered by the indicative value(s). Use this information as cross-check against double-counting when valuing multiple environmental goods/impacts.

- **Check that values are aggregated over the appropriate population.** Some indicative values apply to specific groups and are not applicable to the general population (e.g. specialist users of site, such as anglers for freshwater recreation).

Tip ⇒ the detailed results tab provides 'notes for value transfer' for scaling indicative values across different locations and populations.

4.6 Presenting results

Headline results are presented on the Aggregation tab in a standard table format (Figure 4). This reports the parameters used in calculating the aggregate value estimates, based on Steps (1) - (6) on the Aggregation tab.

Figure 4: Aggregation tab (results table)

4. HEADLINE RESULTS			
Select unit to present valuations results in (nearest whole number) <input type="text"/>			
<i>Using the drop-down list</i>			
Details of the environmental impact being assessed			
Broad habitat type:			
Type of environmental impact/good being valued:			
Variables used to assess policy option	Main policy option	Sensitivity 1	Sensitivity 2
Aggregation quantity			
Indicative value (unit value)			
Unit			
Indicative value quality rating			
Results	Main policy option	Sensitivity 1	Sensitivity 2
Equivalent Annual Value (£/year)			
Present value (PV) estimate (£)			
Valuation presented to the nearest			
Impacts starting from (year)			
Time period for assessment (number of years)			
Base year			
Source study/studies			
Notes: 1. Indicative value sourced from Defra Environmental Value Look-Up (EVL) Tool (2015) 2. All values are reported in 2014 £. 3. Future values are discounted in accordance with HM Treasury Green Book (2003) for impacts over a time period of up to one hundred years, based on the a declining discount rate of 3.5% for years 0 - 30, 3% for years 31 - 4. Annual equivalent values represent the equivalent series of (equal) cash flows over the selected time horizon. Values are calculated based on annuity rates that are consistent with the HM Treasury Green Book (2003) declining discount rate schedule.			

Aggregation tab - Headline Results (EVL Tool v4; 26/10/2015)

The summary table is provided in a standard format so that results from the EVL Tool can be reported with a transparent audit trail in an economic appraisal report. For example, the table can be included in an annex that sets out supporting calculations.

As a minimum, the following information should be provided:

- The aggregate value estimate(s) and the time period for the calculation, noting that future values are discounted in line with HM Treasury Green Book guidance (2003).
- The unit value(s) selected from the EVL Tool and used in the aggregate value calculation(s).
- The physical impact/affected population used in the aggregate value calculation. As with the unit value, this is - in effect - an assumption in the appraisal. An assessment should be provided as to the reliability of the physical impact estimate, based on the data and evidence you use.
- Results of sensitivity testing concerning the unit value used and the quantity for the physical impact. This is consistent with the purpose of the look-up tool to reflect the possible scale of costs and benefits associated with environmental goods and impacts.

Box 2 sets out a generic text template for describing the use of the EVL Tool in an economic appraisal. The summary table and template text can be adapted for the specific needs of an assessment.

Box 2: Describing the use of the EVL Tool in an appraisal report

“The policy [*name*] is expected to have an environmental impact [*describe qualitatively*]. This impact has been valued in monetary terms using the Defra Environmental Value Look-up (EVL) Tool, which is suitable for use in cases of: (1) first-cut, rapid analysis of environmental impacts; and (2) valuing secondary or incidental impacts in appraisals and assessments that might otherwise overlook environmental impacts.

The EVL Tool provides ‘indicative values’ sourced from a review of over 350 UK-based studies from 2000 onwards that have estimated the value of environmental impacts or the value of goods and services derived from the natural environment. The source study valuations (driven by the availability of evidence) relate to various levels of provision of environmental goods and different types and scale of impacts. As such, indicative values are not expected to provide one-to-one mapping with the impacts (costs and benefits) that are valued in a particular appraisal.

The [*environmental impact*] is estimated to be approximately [*£ range*] in present value / equivalent annual terms. This is based on an indicative unit value [*£/unit range*] and physical impact / affected population of [*physical impact / affected population range*]. The monetary valuation for the [*environmental impact*] should be interpreted as indicative of the potential scale of cost / benefit.”

Further points to consider in using the EVL Tool and reporting results include:

- **The broader economic appraisal context for sensitivity testing.** This could include calculating thresholds and switching analysis to help determine the assumptions under which an environmental impact could alter the decision criteria for an appraisal (e.g. switch from positive to negative net present value (NPV)). This is particularly important when the policy or project being appraised involves potentially irreversible changes to habitats and their ability to provide benefits to people.

Tip ⇒ The aggregation tab can be used to calculate switching values by manually entering different unit values to change the calculated aggregate value(s). This could be a useful starting point for formulating a more sophisticated approach.

- **Recommendations for further refinements that are needed for the assessment of environmental impacts.** If the assessment is an initial screening exercise and/or environmental impacts are shown to be a potentially significant component of the appraisal, further analysis should be recommended for the next iteration of the appraisal. This could include formal value transfer analysis, primary valuation, or further scientific/technical assessment of the impact in physical terms.

4.7 Illustrative examples using the EVL Tool

Worked example 1: Loss of recreational benefits provided by a woodland site

Policy context

An area of woodland is located in the fringes of an urban area. It is used by local residents and visitors for a range of activities, including walking and nature watching. The Local Authority is reviewing a proposal to develop the site for a combination of residential and commercial properties. Construction will start in 2017, which will remove much of the woodland. The EVL Tool can be used to provide an indicative valuation for the loss of the amenity value to local residents and visitors.

Selecting an indicative value

The **User interface** shows the selection of the ‘woodland’ broad habitat type and ‘recreation and tourism’ as the environmental impact/good:

Environmental Value Look-Up (EVL) Tool

RESET

Complete Steps 1 and 2 by selecting the broad habitat first and then the type of environmental impact/good to search for indicative values.

Selection criteria

Step 1 - Select the **broad habitat** you want to find indicative values for:

Woodland

Step 2 - Select the **type of environmental impact/good** you want to find indicative values for. Note: only impacts/goods for which indicative values are available can be selected in this step:

Recreation and tourism

Indicative values

	Low	Central	High
Indicative values (unit value and range)	Approx. 2.00 - 6.00 (general users/informal recreation activities)	Approx. 10.00 (e.g. nature watchers)	Approx. 19.00 (e.g. cyclists)
Unit	£/visit		
Indicative value quality rating	Strength of evidence: High Level of consistency: High		
Important considerations	Valuation relates to the number of trips per person. The range of values is driven by the type of user.		

Click here for further details on these values

Strength of evidence (A)	Indicative quality rating		
	Level of consistency (B)		
	Low (1)	Moderate (2)	High (3)
Low (1)			
Moderate (2)			
High (3)			

The ‘low’ value is judged to be most appropriate as the woodland is mainly used for informal recreation activities. A mid-point of £4 per visit is chosen for aggregating the indicative value.

Estimating the loss of amenity value

The **Aggregation** tab is used to estimate the potential loss of amenity value to local residents and visitors:

1. INDICATIVE VALUE			
This summarises the broad habitat and environmental good/impact selected in the user interface tab.			
Broad habitat type:	Woodland		
Type of environmental impact/good	Recreation and tourism		
Step 1 - Select indicative value	Main policy option	Sensitivity 1	Sensitivity 2
	Low		
<i>Using the drop down list. Two additional columns are provided to enable you to undertake sensitivity analysis for key variables/areas of uncertainty</i>			
Indicative value:	Approx. 2.00 – 6.00 (general users/informal)	Complete Step 1	Complete Step 1
Unit:	£/visit		
2. AGGREGATION			
	Main policy option	Sensitivity 1	Sensitivity 2
Step 2 - Input the indicative value you want to use	4.00		
Step 3 - Enter the number of visits to calculate the aggregate value	50,000		
3. TIME PERIOD FOR THE ANALYSIS			
Step 4 - Enter the year when your impact starts <i>Using the drop down list</i>	2017		
Step 5 - Enter the time period for your analysis (number of years) <i>Using the drop down list</i>	10		
Step 6 - Select the first year of the time horizon for your analysis <i>Using the drop down list</i>	2015	<i>Note the year selected must be earlier than or equal to the year entered in Step 4</i>	

- Based on local survey data, the number of visits to woodland is known to be 50,000 visits per year³. This is entered into the **Step 3** field on the aggregation tab.
- The loss of amenity value is assumed to occur in 2017 when construction work commences. This is entered into the **Step 4** field.
- The loss of value is to be assessed over a 10-year time horizon starting from 2015. This entered into the **Step 5** and **Step 6** fields.

³ If the number of visits to the woodland affected were not known, secondary data is needed. Existing sources include recreation surveys such as Natural England's MENE (Monitor of Engagement with the Natural Environment) survey: <https://www.gov.uk/government/collections/monitor-of-engagement-with-the-natural-environment-survey-purpose-and-results> [Accessed August 2015].

The headline results are displayed on the **Aggregation** tab in the standard format for reporting results from EVL Tool. It includes a summary of the main input variables (unit value; aggregation quantity):

Details of the environmental impact being assessed			
Broad habitat type:	Woodland		
Type of environmental impact/good being valued:	Recreation and tourism		
Variables used to assess policy option	Main policy option	Sensitivity 1	Sensitivity 2
Aggregation quantity (number of visits)	50,000		
Indicative value (unit value)	4.00		
Unit	£/visit	£/visit	£/visit
Indicative value quality rating	Strength of evidence: High	Strength of evidence: High	Strength of evidence: High
Results	Main policy option	Sensitivity 1	Sensitivity 2
Equivalent Annual Value (£m/year)	0.2		
Present value (PV) estimate (£m)	1.6	0.0	0.0
Valuation presented to the nearest	£m	£m	£m
Impacts starting from (year)	2017		
Time period for assessment (number of years)	10		
Base year	2015	2015	2015
Source study/studies	1. Christie, M., Hanley, N., Garrod, B., Hyde, T., Lyons, N., Bergmann, A., & Hynes, S. 2006. Valuing Forest Recreation Activities: Final Phase 2 Report. Forestry Commission: Edinburgh 2. Scarpa, R. (2003) "The recreation value of 'woodlands'". Report for the Forestry Commission 3. Sen, A., Hanwood, A. R., Bateman, I. J., Mundag, P., Crowe, A., Brander, L., Rajgoudhari, J., Lovett, A.A., Foden, J. & Provins, A. (2014). Economic assessment of the recreational value of ecosystems: Methodological development and national and local application. Environmental and Resource Economics, 57(2), 233-249.		
Notes:	1. Indicative value sourced from Defra Environmental Value Look-Up (EVL) Tool (2015) 2. All values are reported in 2014 £. 3. Future values are discounted in accordance with HM Treasury Green Book (2003) for impacts over a time period of up to one hundred years, based on the a declining discount rate of 3.5% for years 0 - 30, 3% for years 31 - 4. Annual equivalent values represent the equivalent series of (equal) cash flows over the selected time horizon. Values are calculated based on annuity rates that are consistent with the HM Treasury Green Book (2003) declining discount rate schedule.		

Results

The loss of amenity value to local residents and visitors is assessed to be approximately £1.6m in present value terms, over a 10 year time period. This is equivalent to a cash value of £0.2m per year in annual equivalent value terms.

The valuation is based on the assumption that all visits to the woodland are lost. It does not account for any opportunities that local residents and visitors may have for switching their recreation activities to alternative sites. It is therefore likely to be an upper-end estimate of the loss of amenity value if suitable alternative sites are available.

Other factors

The loss of the woodland will also have wider environmental impacts, including a change in climate regulation. This can be valued using DECC's guidance for valuing greenhouse gas emissions, which can be accessed via the EVL Tool.

There may also be impacts to biodiversity (e.g. habitats and species). Suitable evidence for a value transfer exercise could be sourced via the **Biodiversity Studies** tab included in the EVL Tool.

Worked example 2: Impact of the designation of a Marine Conservation Zone on cod stocks

Policy context

The proposed Marine Conservation Zone (pMCZ) covers an area of 1000 km². The site provides a range of ecosystem services including cod fisheries. Part of the rationale for designating the site - scheduled for 2016 - is to help ensure the protection of future cod stocks. The EVL Tool can be used to provide an indicative valuation for cod stocks that are protected by designating the site as an MCZ.

Selecting an indicative value

The **User interface** tab shows the selection of the ‘marine’ broad habitat type and ‘food’ as the environmental impact/good:

Environmental Value Look-Up (EVL) Tool

RESET

Complete Steps 1 and 2 by selecting the broad habitat first and then the type of environmental impact/good to search for indicative values.

Selection criteria

Step 1 - Select the **broad habitat** you want to find indicative values for:

Marine

Step 2 - Select the **type of environmental impact/good you want to find** indicative values for. Note: only impacts/goods for which indicative values are available can be selected in this step:

Food

Indicative values

	Low	Central	High
Indicative values (unit value and range)	Approx. 300.00 - 700.00	Approx. 1,000.00 - 4,000.00	Approx. 6,000.00 - 11,000.00
Unit	£/tonne, first sale value		
Indicative value quality rating	Strength of evidence: High Level of consistency: Moderate		
Important considerations	Valuation relates to fish landings. The range of values is driven by the type of species.		

Click here for further details on these values

Strength of evidence (A)	Indicative quality rating		
	Level of consistency (B)		
	Low (1)	Moderate (2)	High (3)
Low (1)			
Moderate (2)			
High (3)			

The ‘central’ value is judged to be most appropriate as the value of cod falls within this range, based on information provided in the **Detailed Results** tab in the EVL Tool. A values of £3,000 per tonne of cod is chosen for aggregating the indicative value.

Estimating the value of conserving cod stocks

The **Aggregation** tab can be used to estimate the value of conserving cod stocks:

1. INDICATIVE VALUE			
This summarises the broad habitat and environmental good/impact selected in the user interface tab.			
Broad habitat type:	Marine		
Type of environmental impact/good	Food		
Step 1 - Select indicative value	Main policy option Central	Sensitivity 1 Central	Sensitivity 2
<i>Using the drop down list. Two additional columns are provided to enable you to undertake sensitivity analysis for key variables/areas of uncertainty</i>			
Indicative value:	Approx. 1,000.00 - 4,000.00	Approx. 1,000.00 - 4,000.00	Complete Step 1
Unit:	£/tonne, first sale value		
2. AGGREGATION			
	Main policy option	Sensitivity 1	Sensitivity 2
Step 2 - Input the indicative value you want to use	3,000.00	3,000.00	
Step 3 - Enter the volume of fish (in tonnes) to calculate the aggregate value	50	50	
3. TIME PERIOD FOR THE ANALYSIS			
Step 4 - Enter the year when your impact starts <i>Using the drop down list</i>	2016	2016	
Step 5 - Enter the time period for your analysis (number of years) <i>Using the drop down list</i>	25	50	
Step 6 - Select the first year of the time horizon for your analysis <i>Using the drop down list</i>	2015	<i>Note the year selected must be earlier than or equal to the year entered in Step 4</i>	

- Based on historical data, the volume of cod that can be landed from this site is known to be 50 tonnes per year⁴. This is entered into the **Step 3** field on the **Aggregation** tab.
- Designation of the site is scheduled for 2016, representing the year from which cod stocks will be protected. This is entered into the **Step 4** field.
- The value of the stock is assessed over a 25 year time horizon starting from 2015, with an additional time horizon of 50 years considered as a sensitivity test. This entered into the **Step 5** and **Step 6** fields.

⁴ If the volume of landings from the site affected were not known, secondary data is needed. Existing sources include data on landings from the Marine Management Organisation: www.gov.uk/government/statistical-data-sets/uk-sea-fisheries-annual-statistics-report-2013 [Accessed August 2015].

The headline results are also displayed on the **Aggregation** tab in the standard format for reporting results from EVL Tool. It includes a summary of the main input variables (unit value; aggregation quantity):

Details of the environmental impact being assessed			
Broad habitat type:	Marine		
Type of environmental impact/good being valued:	Food		
Variables used to assess policy option	Main policy option	Sensitivity 1	Sensitivity 2
Aggregation quantity (volume of fish (in tonnes))	50	50	
Indicative value (unit value)	3,000.00	3,000.00	
Unit	£/tonne, first sale value	£/tonne, first sale value	£/tonne, first sale value
Indicative value quality rating	Strength of evidence: High	Strength of evidence: High	Strength of evidence: High
Results	Main policy option	Sensitivity 1	Sensitivity 2
Equivalent Annual Value (£m/year)	0.1	0.1	
Present value (PV) estimate (£m)	2.5	3.7	0.0
Valuation presented to the nearest	£m	£m	£m
Impacts starting from (year)	2016	2016	
Time period for assessment (number of years)	25	50	
Base year	2015	2015	2015
Source study/studies	MMO (2013) UK Sea Fisheries Statistics 2013 - Chapter 3. Edited by Lucy Radford. London: MMO. https://www.gov.uk/government/statistical-data-sets/uk-sea-fisheries-annual-statistics-report-2013 [Accessed September 2015].		
Notes:			
1. Indicative value sourced from Defra Environmental Value Look-Up (EVL) Tool (2015)			
2. All values are reported in 2014 £.			
3. Future values are discounted in accordance with HM Treasury Green Book (2003) for impacts over a time period of up to one hundred years, based on the a declining discount rate of 3.5% for years 0 - 30, 3% for years 31 -			
4. Annual equivalent values represent the equivalent series of [equal] cash flows over the selected time horizon. Values are calculated based on annuity rates that are consistent with the HM Treasury Green Book (2003) declining discount rate schedule.			

Results

The value of conserving cod stocks is assessed to be approximately £2.5m - £3.7m in present value terms, over 25 and 50 year time periods. This is equivalent to a cash value of £0.1m per year in annual equivalent value terms.

The valuation is based on the assumption that all fishing activities cease following the designation of the site as a MCZ. In practice though, the site's level of protection from fishing may only affect a proportion of fish stocks.

The indicative value used in the calculation is based on market prices for cod. This may be considered as lower-end proxy value as it accounts only for the role of cod stocks as an input to food provisioning services (i.e. direct use value). It does not account for any wider marine ecology impacts.

Other factors

Fisheries have a wider role in the marine environment beyond the provision of food, and there may be wider biodiversity impacts that result from the proposed policy. Suitable evidence for a value transfer exercise to assess impacts on marine biodiversity could be sourced via the **Biodiversity Studies** tab included in the EVL Tool.

REFERENCES

Christie, M., Hanley, N., Garrod, B., Hyde, T., Lyons, N., Bergmann, A., & Hynes, S. (2006) Valuing Forest Recreation Activities: Final Phase 2 Report. Forestry Commission: Edinburgh

Department for Energy and Climate Change (DECC) (2014) Valuation of energy use and greenhouse gas emissions, supplementary guidance to the HM Treasury Green Book on Appraisal and Evaluation in Central Government. <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal> [Accessed September 2015]

Department for Environment, Food and Rural Affairs (2011) Air Quality Damage Cost Guidance. <https://www.gov.uk/air-quality-economic-analysis> [Accessed September 2015]

Department for Environment, Food and Rural Affairs (2013) Local environment quality: economic analysis. <https://www.gov.uk/guidance/local-environment-quality-economic-analysis> [Accessed September 2015].

Department for Environment, Food and Rural Affairs (2014) Environmental Noise: Valuing impacts on: sleep disturbance, annoyance, hypertension, productivity and quiet. <https://www.gov.uk/noise-pollution-economic-analysis> [Accessed September 2015].

eftec (2010) Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal. Report for the Department for Environment, Food and Rural Affairs. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182376/vt-guidelines.pdf [Accessed July 2015].

eftec (2015a) Development of 'Look-Up' Environmental Value Estimates for Initial Appraisal Within Cost-Benefit Analysis - Technical Report. Final Technical Report to Defra.

eftec (2015b) Valuing biodiversity. Final discussion paper to Defra.

HM Treasury. (2003). *The Green Book: Appraisal and Evaluation in Central Government*. London: HM Treasury.

Environment Agency (2015) Flood and coastal defence: develop a project business case. <https://www.gov.uk/flood-and-coastal-defence-appraisal-of-projects> [Accessed September 2015].


HM Treasury and Department for Environment, Food and Rural Affairs (2012) Accounting for environmental impacts: Supplementary Green Book guidance. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191500/Accounting_for_environmental_impacts.pdf [Accessed July 2015].


Scarpa, R. (2003) "The recreation value of Woodlands". Report for the Forestry Commission UKNEA (2011). The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.


Sen, A., Harwood, A. R., Bateman, I. J., Munday, P., Crowe, A., Brander, L., Raychaudhuri, J., Lovett, A.A., Foden, J. & Provins, A. (2014) Economic assessment of the recreational value of ecosystems: Methodological development and national and local application. *Environmental and Resource Economics*, 57(2), 233-249.


UK National Ecosystem Assessment (2011). The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.


ANNEX 1: BROAD HABITAT TYPES


Broad habitat	Sub-habitats	Description
Mountains, moors and heaths¹ 	Blanket Bog	Rainfall-fed bog in upland environments
	Mountains, Moors and Upland Heaths	Upland heath, montane habitats and associated wetlands (flushes, fens). Also include rock and scree habitats such as limestone pavements
	Lowland Heath	Lowland habitats dominated by heather family or dwarf gorse species
<p><u>UKNEA (2011) description</u> Lowland heaths are highly fragmented, while mountains and upland moors and heaths provide the largest unfragmented semi-natural habitats in the UK. Mountains, moorlands and heaths are the source of around 70% of the UK's drinking water, hold an estimated 40% of UK soil carbon, and include some of the country's most iconic landscapes. They cover 18% of the UK land area.</p>		


Broad habitat	Sub-habitats	Description
Semi-natural grasslands² 	Semi-natural grasslands	All grasslands unimproved for agricultural purposes
<p><u>UKNEA (2011) description</u> Semi-natural grasslands once covered a large proportion of the UK's land area, largely the result of low-intensity traditional farming. The extent of semi-natural grasslands is now extremely reduced, with high-diversity grasslands comprising 2% of UK grassland (≥1% of total land area). Semi-natural grasslands are highly valued culturally - the South Downs, dominated by chalk downland, receives around 40 million visitor days a year.</p>		


Broad habitat	Sub-habitats	Description
Enclosed farmland³ 	Enclosed arable farmland	Arable, horticultural land and improved grassland as well as associated boundary features e.g. hedgerows
<p><u>UKNEA (2011) description</u> The most extensive form of land use in the UK, accounting for around 40% of land area and producing around 70% of the UK's food. Most is managed for cereal, cattle and sheep production. Half the area of Enclosed Farmland is arable land, mostly in eastern England; almost all the rest is nutrient enriched grassland, mostly in wetter, western parts of the UK. As well as playing a crucial role in provisioning services, Enclosed Farmland is also of great cultural significance and is a major determinant of landscape in much of lowland UK.</p>		

Broad habitat	Sub-habitats	Description
Woodland⁴ 	Woodland	Includes broadleaved and coniferous woodlands both natural woods and planted (wet woodland included here).
	<u>UKNEA (2011) description</u> This habit type includes managed plantations as well as ancient, semi-natural woodlands. Woodlands cover 12% of the UK's land area, making the country one of the least wooded in Europe. At least 80% is less than 100 years old and just 5% is classified as ancient woodland. Much planting in the past century has been of coniferous trees (often non-native). Only in England is woodland dominated by broadleaved species. Much of the woodland estate is managed as a source of timber, but woodlands are increasingly valued for their delivery of other ecosystem services, particularly recreation and carbon storage.	

Broad habitat	Sub-habitats	Description
Freshwater, wetlands and floodplains⁵ 	Standing open waters	Lakes, ponds, reservoirs and canals
	Rivers and streams	Streams and rivers down to the tidal limit
	Groundwaters	Aquifers and significant quantities of below ground water
	Wetlands	Lowland fens, raised bogs, swamps, reedbeds and floodplain wetlands
	<u>UKNEA (2011) description</u> Freshwaters include open waters, wetlands and floodplains. In the UK there are more than 389,000 kilometres of rivers, 200,000 hectares of permanent lakes and nearly half a million small ponds. There are also estimated to be at least 390,000 hectares of fen, reedbed, lowland raised bog and grazing marsh and nearly 1 million hectares of floodplain. Freshwater habitats are a major source of water for a wide range of uses and are important for recreation, including angling, boating and other water sports, and in hazard (notably flood) regulation.	

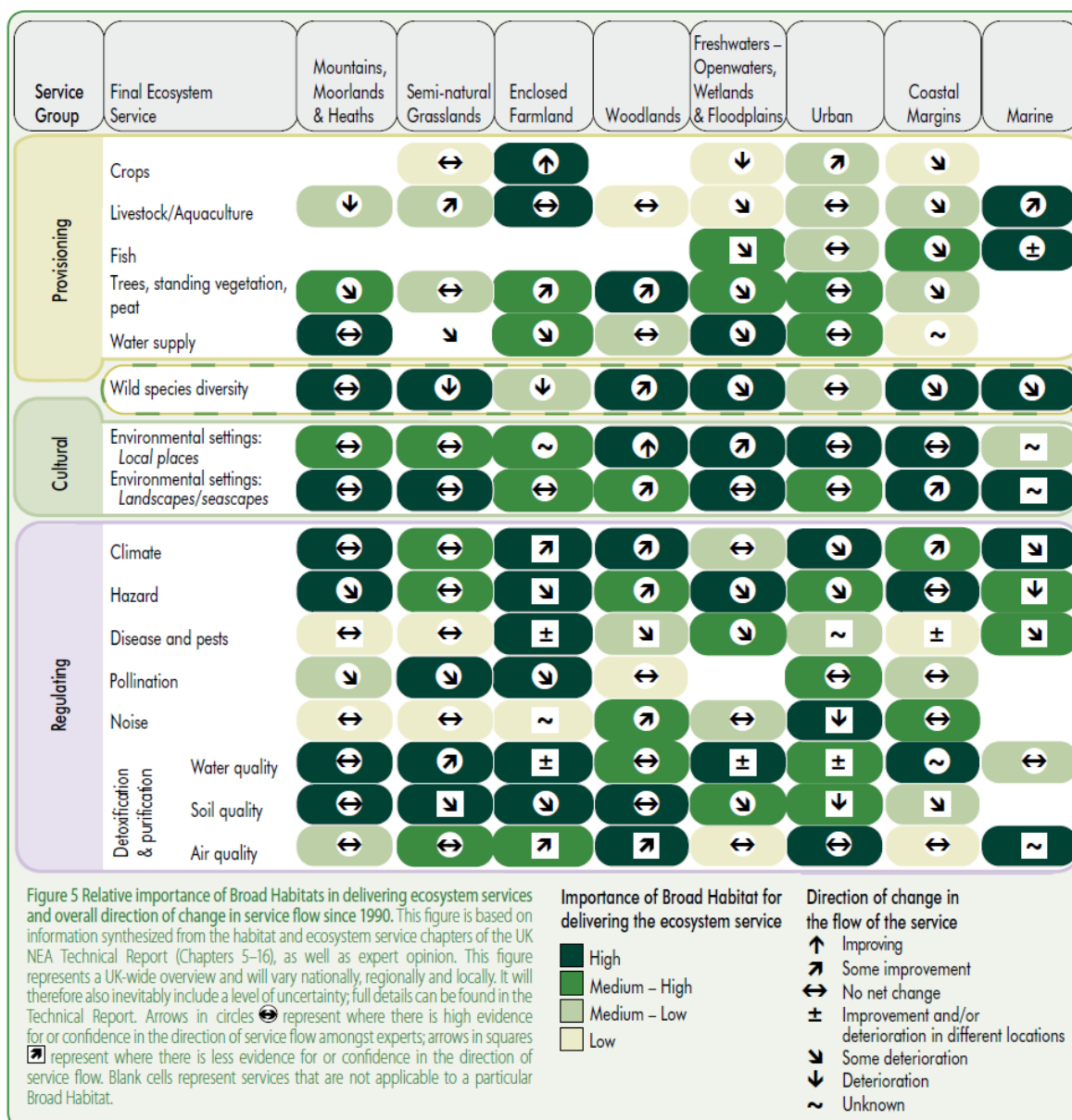
Broad habitat	Sub-habitats	Description
Urban (green space)⁶ 	Built urban	The built environment elements of urban space e.g. buildings, roads, industrial works
	Green space	The natural environment elements of built up areas e.g. parks, gardens, towpaths, urban trees
	<u>UKNEA (2011) description</u> Urban areas in the UK cover just under 7% of land area. They are home to 8 out of 10 people, often living at extremely high population densities. Green space is very limited in extent, and access to it is unequally distributed; it thus assumes disproportionate cultural significance. Urban areas depend very largely on other habitat types for provision of most of their ecosystem services.	

Broad habitat	Sub-habitats	Description
Coastal margins⁷ 	Coastal dunes and sandy shores	Dune systems and the upper zone of sandy shores
	Saltmarsh	The upper zone of vegetated intertidal habitat - transition into other intertidal habitats
	Transitional and coastal waters	Estuaries, coastal lagoons and other near shore waters (Water Framework Directive definition)
	<u>UKNEA (2011) description</u> Coastal Margins, comprising sand dunes, machair, saltmarsh, shingle, sea cliffs and coastal lagoons, cover just 0.6% of the UK's land area. Culturally, Coastal Margins are of immense significance. There are over 250 million visits per year to the UK coast, of which around one third are to natural habitats. These areas are also important in coastal defences, sediment transport and as nursery grounds for fish.	

Broad habitat	Sub-habitats	Description
Marine⁸ 	Intertidal rock	Bedrock, boulders and cobbles which occur in the intertidal zone. Colonised by mussels/barnacles and seaweeds depending on exposure
	Intertidal sediment	Shingle (mobile cobbles and pebbles), gravel, sand and mud in the intertidal zone
	Subtidal rock	Bedrock, boulders and cobbles in the subtidal zone colonised by seaweeds (infralittoral zone) or animal communities (circalittoral zone)
	Shallow subtidal sediment	Shingle (mobile cobbles and pebbles), gravel, sand and mud in the subtidal zone
	Deep sea bed	The sea bed beyond the continental shelf break
	<u>UKNEA (2011) description</u> Marine habitats of the UK cover more than three and a half times the land area. They are highly variable, comprising a very wide range of sub-habitats. Inshore Marine habitats are of great cultural importance, offering many opportunities for tourism and recreation. Offshore habitats support fisheries and provide a wide range of other ecosystem services, such as avoidance of climate stress and waste breakdown and detoxification.	

Notes: Definitions sourced from UK National Ecosystem Assessment (2011). Images sourced from flickr (<https://www.flickr.com/>) as follows: ¹: Nicolas Vigier. ²: Elescir. ³: Susanne Nilsson. ⁴: Coconino National Forest. ⁵: Berit Watkin. ⁶: Adrian Scottow. ⁷: Ronald Saunders. ⁸: Jim Champion. All photos licensed under <https://creativecommons.org/licenses/by-sa/2.0/legalcode>. Full links available upon request.

Extract from UKNEA (2011): Relative importance of Broad Habitats in delivering ecosystem services and overall direction of change in service flow since 1990



Source: extract from UKNEA (2011) (Fig. 5; p11).

ANNEX 2: ENVIRONMENTAL IMPACT/GOOD CATERGORISATION

Ecosystem service type	Examples of type(s) of good provided
Food	Crops, meat, fruit, fish
Fibre and fuel	Timber, wool
Genetic resources	Genetic information used for animal/plant breeding and biotechnology
Biochemicals, natural medicines, pharmaceuticals	-
Ornamental resources	Shells, flowers
Fresh water	Water for human use (e.g. drinking, washing, industrial processes)
Air quality regulation	Air quality that has no adverse impact upon human health or wellbeing
Climate regulation	A comfortable climate that has no adverse impact upon human health or wellbeing. The result of both global scale and local scale effects (e.g. urban cooling by trees)
Waste regulation	Removal of pollutants through storage, dilution, transformation and burial
Natural hazard regulation	Natural regulation of extreme events such as flooding, drought and landslides
Pest regulation	-
Disease regulation	-
Erosion regulation	Soil retention/prevention of land erosion
Water purification and waste treatment	-
Pollination	-
Cultural heritage	Maintenance of important landscapes, species
Recreation and tourism	Active enjoyment of the natural environment (e.g. walking, fishing, canoeing)
Aesthetic value	Passive enjoyment of the natural environment (e.g. landscape appreciation and views)

Source: Millennium Ecosystem Assessment (2005); Defra (2007)

Defra Assessing Environmental Impact Guidance - wider environmental impacts	
Air quality	-
Biodiversity	Gains or losses in the variety of species Gains or losses in variety and abundance within species Gains or losses in the amount space for ecosystems and habitats Gains or losses in the physical connectedness between ecosystems and habitats Environmental changes within ecosystems and habitats
Adapting to climate change	-
Landscape	Landscape as a resource in its own right, dealing with changes in the fabric, character, qualities and quality of the landscape and requiring expert knowledge of factors such as, for example, landscape character, typologies, distribution, rarity, condition and quality Visual qualities and the effects these may have on aesthetic experience and visual amenity.
Noise and nuisance	Noise is broadly defined as any unwanted sound. Most noise is generated as a by-product of economic activity, from the production and consumption of goods and services.
Waste management	-
Water including flood risk	Water pollution Water abstraction Risk of flood or coastal erosion

Source: <https://www.gov.uk/assessing-environmental-impact-guidance>

ANNEX 3: INDICATIVE VALUE QUALITY RATING

The EVL Tool includes a red-amber-green (RAG) rating for each indicative value. This is intended to provide a guiding assessment for the strength of evidence that supports the indicative value. The assessment is based on:

- A. An assessment strength evidence (quality and robustness) of individual source studies; and
- B. The consistency of valuations estimates between source studies for the same/similar environmental impacts/goods that are consolidated to produce the indicative values

The rating scales are set out below:

Strength of evidence (A)	Level of consistency (B)		
	Low (1)	Moderate (2)	High (3)
Low (1)	2	3	4
Moderate (2)	3	4	5
High (3)	4	5	6